



Me 'n' Mine<sup>TM</sup>

CBSE  
**X**

**Answer Book**  
**Pullout Worksheets**  
**Science**



  
NEW SARASWATI  
HOUSE



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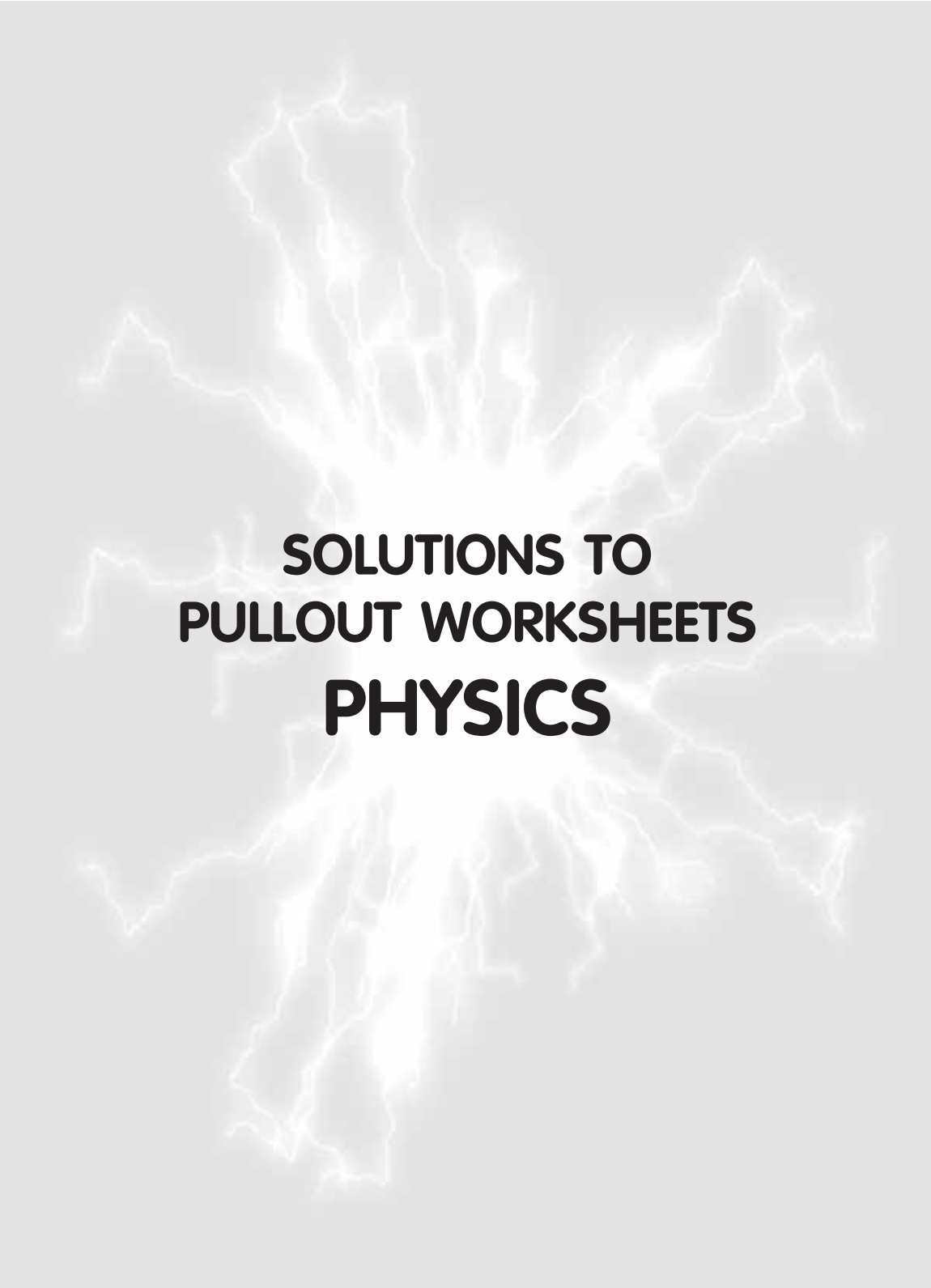
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**SOLUTIONS TO  
PULLOUT WORKSHEETS  
PHYSICS**

## 1

## ELECTRICITY

## WORKSHEET-1

1. Ampere
2. SI unit of electric potential is joules/coulomb (*i.e.*, Volts)
3. Current is the rate of flow electric charge.
4. Ammeter is a device used to measure current.
5. Voltmeter is a device used to measure potential difference.
6. Ammeter is always connected in series whereas voltmeter, in parallel in a circuit.
7. Since  $R \propto \frac{l}{A}$ , therefore, when length is doubled, resistance will also be doubled.
8. Since 1 electron has  $1.6 \times 10^{-19} \text{C}$  charge. Therefore 1 coulomb charge =  $\frac{1}{1.6 \times 10^{-19} \text{C}} = 6.25 \times 10^{18}$  electrons.
9. A basic entity capable of independent existence. It is of two types +ve and -ve. SI unit—coulomb.
10. Net charge is -ve.
11. Whenever two charges  $q_1$  and  $q_2$  are separated by a distance ' $r$ ' from their centres, there exists a force of attraction or repulsion which is directly proportional to product of two charges and inversely to square of distance between them.



$$F \propto \frac{q_1 q_2}{r^2}$$

$$F = K \frac{q_1 q_2}{r^2}$$

$$12. F = K \frac{q_1 q_2}{r^2} = \frac{9 \times 10^9 \times 1.6 \times 10^{-19} \times 1.6 \times 10^{-19}}{(1 \times 10^{-6})^2} = 2304 \times 10^{-19} \text{ N.}$$

13. It means work done in moving a unit positive charge between points A and B in that field is 3 J.
14. 1 volt = 1 joule/1 coulomb.  
Potential or potential difference.
15. Resistivity of a given material is a constant. Therefore, it is not affected by change in length of wire.
16. Least possible when three are in parallel =  $1.03 \Omega$ .  
Maximum possible when three are in series =  $10 \Omega$ .
17.  $2 \Omega$ .
18. Because surface charges get removed and come to the surface.
19. A bulb of 50 W became  $P \propto R$ .
20. 1 joule = 1 volt  $\times$  1 coulomb.

## WORKSHEET-2

1. In series circuit (i) as resistances are connected one after other. Therefore, effective resistance is more, hence, current is less (ii) if one appliance is defective or not working in series others would also not work.

2. **Electric circuit.** It is a closed path within which electric current moves.

**Open electric circuit.** In an open electric circuit, the electric current does not flow as there is some break in the path, i.e., either the key is open or some other end is not connected.

**Closed electric circuit.** In this electric current flows as the path is closed.

3. (a) It is a straight line passing through zero.

(b) Slope of this graph at any point gives resistance of the circuit.

$$4. E = P \times t = 1200 \times \frac{20}{60} = 400 \text{ W} \quad \text{or} \quad E = 0.4 \text{ units} = 0.4 \text{ kWh}$$

5. A parabolic or concave reflector throws heat radiations to maximum distance if the filament is at the focus of that reflector.

$$6. \quad R = \rho \times \frac{l}{A}$$

$$\rho = \frac{RA}{l} = 10 \times \frac{22}{7} \times \frac{0.1 \times 10^{-3} \times 0.1 \times 10^{-3}}{1} = 3.14 \times 10^{-7} \Omega \text{ m.}$$

7. As per Coulomb's law  $F \propto \frac{q_1 q_2}{r^2}$ .

So, if distance is doubled then force will reduce to  $\frac{1}{4}$ th its original value.

$$8. \quad e = -1.6 \times 10^{-19} \text{ C}, \quad \alpha = +2e = 3.2 \times 10^{-19} \text{ C}, \quad r = 1 \times 10^{-6} \text{ m}$$

$$F = K \frac{q_1 q_2}{r^2};$$

$$F = \frac{9 \times 10^9 (-1.6 \times 10^{-19}) \times (3.2 \times 10^{-19})}{(1 \times 10^{-6})^2} = 4.6 \times 10^{-35} \text{ N.}$$

$$9. \quad I = \frac{nq}{t}$$

$$10 \times 10^{-3} = \frac{n \times 1.6 \times 10^{-19}}{1}$$

$$\Rightarrow n = 6.25 \times 10^{16} = 6.25 \times 10^{16} \text{ electron/sec.}$$

$$10. \left( \frac{R_2 - R_1}{R_1} \right) \times 100 = \frac{1}{A} \left( \frac{l_2 - l_1}{l_1} \right) \times 100 \quad \therefore \% \text{ increase} = 25\%$$

Resistivity is a constant, therefore, it will not increase.

## WORKSHEET-3

$$1. (a) \quad R_1 = 10 \Omega, \quad l_1 = l, \quad l_2 = 3l, \quad R_2 = ?$$

$$A_1 = A, \quad A_2 = \frac{A}{3}$$

$$R = \rho \frac{l}{A}$$

$$\frac{R_1}{R_2} = \frac{l_1 A_2}{l_2 A_1} = \frac{lA}{3lA}$$

$$\frac{R_1}{R_2} = \frac{1}{9} \quad \Rightarrow R_2 = 9R_1.$$

2. Power input = 60 J/s, Power output = 7.5 J/s

$$\text{Efficiency} = \frac{7.5}{60} \times 100 = 12.5\%$$

3. Heat energy =  $I^2 R t$

$$= (5)^2 \times (20) \times 30 = 25 \times 20 \times 30 = 15000 \text{ J.}$$

4. If resistances are  $R$ , then in series =  $2R$

$$\text{In parallel} = \frac{R}{2}$$

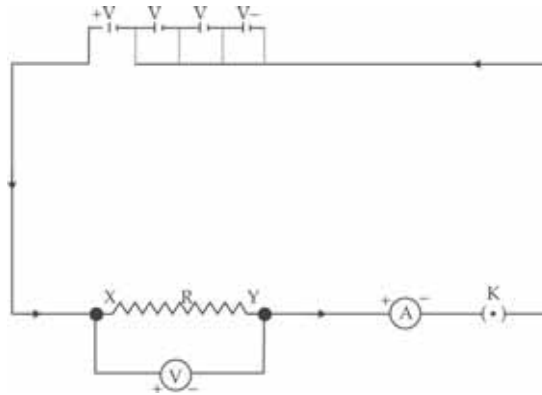
$$\text{Heat in series} = I^2 2R t$$

$$\text{Heat in parallel} = I^2 R t / 2$$

$$\text{Ratio} = \frac{2I^2 R t}{I^2 R t / 2} = \frac{4}{1}$$

$$= 4 : 1.$$

5. Under conditions of temperature and pressure remaining constant, electric current passing through a circuit is directly proportional to applied voltage.



6. (a) Silver is a better conductor.

(b) Silver.

### WORKSHEET-4

1. (a)  $P = VI = 2.5 \times 750 \times 10^{-3} = 1875 \times 10^{-3} = 1.875 \text{ W.}$

(b)  $R = V/I = 2.5/750 \times 10^{-3} = 3.33 \Omega.$

(c)  $E = P \times t = 1.875 \times 4 = 7.5 \text{ Wh} = 7.5 \times 10^{-3} \text{ kWh.}$

2. Let the same resistances be  $x$  and other be  $y$ , then

$$\text{Series} \quad x + x + y = 30 \quad \text{or} \quad 2x + y = 30$$

$$\text{Parallel,} \quad \frac{1}{x} + \frac{1}{x} + \frac{1}{y} = \frac{1}{3} \quad \text{or} \quad \frac{x}{2} + y = 3$$

$$\text{Solving, we get} \quad x = 18 \Omega$$

$$y = -6 \Omega.$$

3. (a) Power =  $I^2 R = (4)^2 \times 60 = 16 \times 60 = 960 \text{ W.}$

(b)  $V = IR = 4 \times 60 = 240 \text{ V.}$

(c)  $t = 2 \times 60 = 120 \text{ sec}$

$$E = P \times t = 960 \times 2 \times 60 = 115200 \text{ joules.}$$

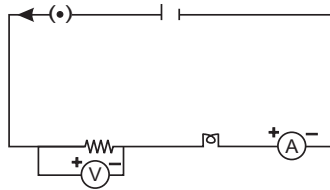


4. (a) Key open, then  $R = 12 \Omega$ ,  $V = 6 \text{ V}$   $\therefore I = \frac{V}{R} = 0.5 \text{ A}$ .

(b) Key closed, then  $R = 6 \Omega$ ,  $V = 6 \text{ V}$   $\therefore I = \frac{V}{R} = 1 \text{ A}$ .

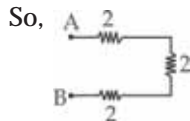
### WORKSHEET-5

1.



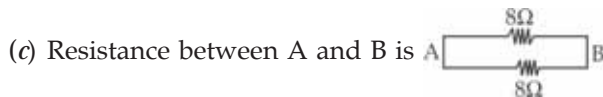
2. (a)  $4\Omega \parallel 4\Omega$   $\frac{1}{R} = \frac{1}{4} + \frac{1}{4} = \frac{1}{2}$

$\therefore R = 2 \Omega$



Resistance between A and B =  $2 + 2 + 2 = 6 \Omega$ .

(b) Resistance between A and B =  $2 + 1 + 3 + 1 + 2 + 1 + 3 = 13 \Omega$ .

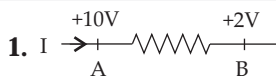


$$\frac{1}{R} = \frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$$

So,  $R = 4 \Omega$ .

- It is a process of providing an alternative path to excessive charge that may sometimes leak of the body of a high voltage metallic appliance. The colour of earth wire is green. One end of this wire is connected to the appliance and the other is earthed. Earth is always at zero potential, therefore any extra charge successfully reaches earth without affecting appliances thus, preventing shocks.
- It is a safety device made up of a high resistance with low melting point, which works on principle of heating effect of electric current. No, because a fuse will not work effectively if used this way. Commonly used is alloys of copper and tin.
- It is 220 V A.C. with 50 Hz frequency. 50 Hz specify frequency of alternating current. Household circuits have parallel arrangement because if something goes wrong with one appliance other should not be affected. Also in parallel arrangement, all appliances get same voltage input.

## WORKSHEET-6



Placement of ammeter and voltmeter

Direction of current

Placement of 4 cells in series

Closed key

$V \propto I$

Current flowing through a conductor is directly proportional to the potential difference across it, if other physical conditions are constant.

2. (a) Electrical resistivity of a conductor remains constant at a particular temperature, whereas, electrical resistance of a conductor changes with change in length or area of cross-section of the conductor.

(b)  $R = 10 \Omega$        $\rho = 1.6 \times 10^{-8} \Omega\text{m}$        $A = 20 \times 10^{-4} \text{cm}^2 = 20 \times 10^{-8} \text{cm}^2$ ,  $I = ?$

$$R = \frac{\rho l}{A} \qquad \therefore \quad I = \frac{RA}{\rho}$$

$$I = \frac{10 \Omega \times 20 \times 10^{-8} \text{m}^2}{1.6 \times 10^{-8} \Omega\text{m}} = \frac{2000}{16} \text{m}$$

$$I = 125 \text{ m (answer with correct unit)}$$

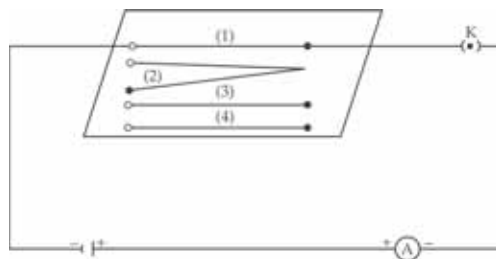
3. (a) (i) It means 1 joule of work is required to be done in order to move 1 coulomb of charges between these two points. Voltmeter is the device which is used to measure potential difference across a conductor.

(ii)  $Q = 5 \text{ C}$ ;  $V = 12 \text{ V}$

Energy given to charge;  $W = VQ = 12 \times 5 = 60 \text{ J}$ .

- (b) ➤ Complete an electric circuit consisting of a cell, an ammeter, a nichrome wire of length  $l$  [say, marked (1)] and a plug key, as shown in Fig.

- Now, plug the key. Note the current in the ammeter.



- Replace the nichrome wire by another nichrome wire of same thickness but twice the length, that is  $2l$  [marked (2) in the Fig.].

- Note the ammeter reading.

- Now replace the wire by a thicker nichrome wire, of the same length  $l$  [marked (3)]. A thicker wire has a larger cross-sectional area. Again note down the current through the circuit.

- ▶ Instead of taking a nichrome wire, connect a copper wire [marked (4) in Fig.] in the circuit. Let the wire be of the same length and same area of cross-section as that of the first nichrome wire [marked (1)]. Note the value of the current.
- ▶ Notice the difference in the current in all cases.

### WORKSHEET-7

1. When charges are separated due to friction between two surfaces, it is called frictional electricity. Since here charges are separated but they do not move, it is also known as static electricity.
  - (a) On rubbing glass rod with silk, glass rod acquires positive charge and silk acquires negative charge.
  - (b) Ebonite when rubbed with fur gets negative charge whereas fur gets positive charge.
2. (a) Electricity bill unit is kWh.
  - (b) Using CFL (instead of tungsten bulbs) and ISO certified star-rated electrical appliances.
  - (c) Self-discipline and responsible behaviour.
3. (a) (i) Potential difference across each device remains the same whereas in series connections, it gets distributed.
  - (ii) If one device is switched off, it does not affect the other devices.
  - (b) Wisdom, helping the friend.
4. The experimental set-up did not work, because the electric circuit was open, *i.e.*, either the key was open or other end of wire was not connected properly. The students lack discipline and respect for teacher.

### WORKSHEET-8

1. (a) The bulbs connected in series will give less light in comparison with the bulbs connected in parallel to the same source. It is because

$$R_s = R + R + R = 3R$$

Hence,  $I_s = \frac{V}{3R}$  in series combination

$$\frac{1}{R} = \frac{1}{R} + \frac{1}{R} + \frac{1}{R} = \frac{3}{R}$$

$$R_p = \frac{R}{3}$$

Hence,  $I_p = 3\frac{V}{R}$  in parallel combination

It is clear that  $I_p > I_s$ .

Therefore, the bulbs connected in parallel will give more light.

- (b) If one bulb in the series circuit gets fused, all the bulbs will stop glowing as the circuit is now broken. However, in case of parallel combination, if one of the bulb gets fused, the other two bulbs will keep glowing with the same brightness as  $V$  is same.

### WORKSHEET-9

1. (a) 2. (c) 3. (b) 4. (b) 5. (b) 6. (c) 7. (b) 8. (c) 9. (c)

### WORKSHEET-10

1. (c) 2. (d) 3. (c) 4. (d) 5. (c) 6. (c) 7. (b) 8. (b)

### WORKSHEET-11

1. If temperature and other physical conditions such as pressure, mechanical strain, etc. remain the same, the current ( $I$ ) flowing through a conductor is directly proportional to the potential difference ( $V$ ) across the conductor, *i.e.*,

$$I \propto V \text{ or } V = IR$$

where  $R$  is a constant called resistance.

If a graph is plotted between the current ( $I$ ) flowing through the conductor and the applied potential difference ( $V$ ) between its ends, it will be a straight line.

2. Following precautions should be taken:
1. The ends of connecting wire should be neat and clean.
  2. Never allow the current to flow in the resistance of wire for a long time.
  3. Range of voltmeter should be greater than the applied voltage.
  4. When not in use, supply of current should be switched off.
  5. A low resistance rheostat must be used.
3. Voltmeter is used to find potential difference whereas ammeter is used to find current. Voltmeter is connected in parallel and ammeter in series.
4. The least quantity that can be measured accurately by an instrument is called the least count of the instrument.

$$\text{Least count} = \frac{\text{Range}}{\text{Total divisions}} = \frac{2}{20} = 0.1 \text{ A.}$$

5. The obstruction offered by the conductor to the flow of electric current through it is called the resistance of the conductor.

It depends on:

- (i) Length of the conductor.
  - (ii) Area of cross-section of conductor.
  - (iii) Nature of material.
6. As per Joules's law of heating effect ( $H = I^2Rt$ ) the wire will be heated up, its temperature increases, accordingly, its resistance increase.

7. (a)  $\text{Slope} = \frac{\text{Change in } I}{\text{Change in } V} = \frac{0.3 - 0.1}{3.0 - 1.0} = \frac{0.2}{2.0}$

Resistance = reciprocal of the graph between  $V$  and  $I = \frac{2.0}{0.2} = 10 \Omega$ .

(b) Ohm's law

8. Resistance is the obstruction offered by the conductor to flow of electric current through it.

$$R = \frac{V}{I} = \frac{1.8 \text{ V}}{180 \text{ m A}} = \frac{1.8}{180 \times 10^{-3}} = 10 \Omega.$$

### WORKSHEET-12

1. (b) 2. (c) 3. (c) 4. (d) 5. (d) 6. (d) 7. (c) 8. (c) 9. (c) 10. (c)

### WORKSHEET-13

1. (c) 2. (d) 3. (c) 4. (a) 5. (b) 6. (b) 7. (b)

### WORKSHEET-14

- The deflection in the ammeter is reduced to half the previous value, *i.e.*, ammeter shows half of the previous reading.
- It is difficult to install a new circuit for new installation of electric appliances.
  - As one fuse controls all light, fans and other electric appliances of a single room circuit, all of them will be put off when the fuse blow off.
- Electric bulb and electric heater cannot be connected in series because they need widely different values of current to operate properly.
  - If one bulb is fused, the circuit is broken and none of the other components work.
- The ends of connecting wire should be neat and clean.
  - All the connections should be tight and properly connected as per circuit diagram.
  - A low resistance rheostat should be used in the circuit to obtain a large variation in current.
  - The positive terminal of the ammeter and voltmeter must be connected to the positive terminal of the battery or battery eliminator.
- Student A will determine the equivalent resistance of the series combination while student B will determine the equivalent resistance of the parallel combination of  $R_1$  and  $R_2$ .
- The arrangement in which a number of resistors are connected in such a way that they provide only one path to the flow of current is called the series combination of the resistors.
  - One terminal of each resistor should be connected and the voltmeter has to be connected between the other free terminal of both the resistors.
- Total resistance decreases in parallel combination.
  - The voltmeter is not correctly connected in the circuit.
    - The resistors  $R_1$  and  $R_2$  are not correctly connected in parallel.
- The arrangement of resistors in which they are connected in such a way that their one end will be at higher potential and other end at lower potential, is called parallel combination.
  - The resistors  $R_1$  and  $R_2$  have not been correctly connected in parallel.
    - The voltmeter has not been correctly connected in the circuit.

### CHAPTER TEST

- Electric current flowing through a metallic wire is directly proportional to the potential difference.
- kWh
- Given

$$R_1 = 2\Omega, R_2 = 4\Omega,$$

$$R = R_1 + R_2 = 4\Omega; V = 6V$$

$$I = \frac{V}{R} = \frac{6V}{6\Omega} = 1A$$

$$\text{Heat energy } (H) = I^2 R t = (1)^2 \times 4 \times 5 = 20 = 20 \text{ joules.}$$

4. Electrical resistivity is the resistance offered by conductor of unit length and unit area of cross-section. Current decreases because according to Ohm's law  $R \propto \frac{1}{I}$  also  $R \propto l$ .
5. (a) Because (i) Effective resistance of circuit is less (ii) If one appliance doesn't work, other can work.  
 (b) Because fuse is used to cut off the excessive current flowing through the circuit using heating effect.
6. Silver, copper, aluminium, gold.
7. (a) No, because in series, effective resistance increases so, current decreases also the applied p.d. is different.  
 (b) In series circuit, no bulb will glow whereas in parallel circuit, the rest of the bulbs will glow.
8. According to Joule's law of heating; heat energy produced in a circuit is

$$H \propto I^2 \text{ (Current)}$$

$$\propto \text{Resistance}$$

$$\propto \text{Time}$$

$$H \propto I^2 R t \text{ or } H = I^2 R t.$$

- (a) Applications in electric geyser, heater, ovens and electric bulb.  
 (b) Alloys are preferred than pure metals because (i) They have high resistivity in comparison to constituent metals. (ii) They don't oxidise on heating.
9. If two  $8 \Omega$  resistors are connected in series,

(a)  $\therefore$  Effective resistance ( $R$ ) =  $R_1 + R_2$   
 $= 8 + 8 = 16 \Omega.$

(b)  $I = \frac{4}{4} = \frac{V}{R} = 1 \text{ A.}$

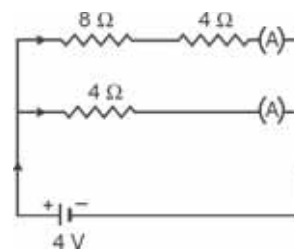
(c)  $V = 4 \text{ V.}$

(d)  $P = IV$   
 $= 1 \times 4 = 4 \text{ W.}$

(e) Current flowing through  $16 \Omega$  combination

i.e.,  $I = \frac{4}{16} = 0.25 \text{ A.}$

$\therefore$  Difference in ammeter readings  
 $= 1 - 0.25 = 0.75 \text{ A.}$



## 2

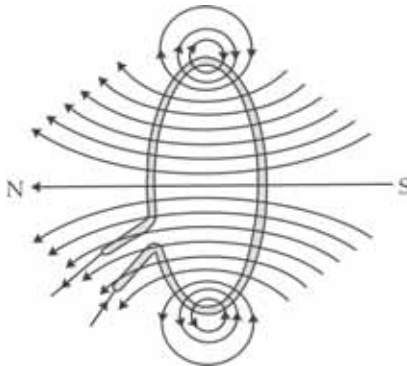
## MAGNETIC EFFECTS OF ELECTRIC CURRENT

## WORKSHEET-16

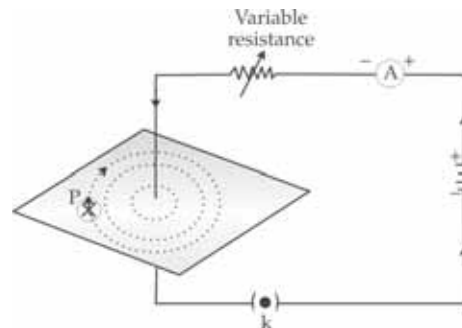
1. In the live wire.
2. Ammeter, voltmeter, loudspeaker, etc.
3. (a) Larger the radii smaller is resistance offered.  
(b) To differentiate also from others.
4. Materials which are attracted by a magnet are known as magnetic materials, *e.g.*, steel, iron.
5. Electromagnet has the ability to behave like a magnet only when electric current passes through it unlike permanent magnet. The polarity of its poles and strength of magnet can be changed in case of electromagnet.
6. Alnico, Nipermag.
7. **Fleming's right-hand thumb rule.** If we stretch thumb of right hand in the direction of electric current, then folded fingers give the direction of induced magnetic field.
8. These are imaginary lines drawn to indicate the path taken by a compass when moved around a magnet.
9. (a) These originate at north pole and end at south pole to form a closed loop.  
(b) No two field lines can intersect each other.
10. (a) tesla (b) weber (c) oersted
11.  $10^{-4}$ ,  $10^4$
12. (a) It is used in cranes for lifting heavy loads.  
(b) It is used in electric bells.
13. (a) Electric Generator—Mechanical energy (coil) → Electrical energy.  
(b) Electric Motor—Electric energy → Mechanical energy (coil)
14. Cu and tin alloy.
15. It is the region around a magnet within which another magnet/magnetic material can experience force of attraction or repulsion due to it.
16. By inserting the steel bar inside the solenoid and switching on electric current.
17. By using a compass, which shows deflection.
18. When they are perpendicular to each other.

## WORKSHEET-17

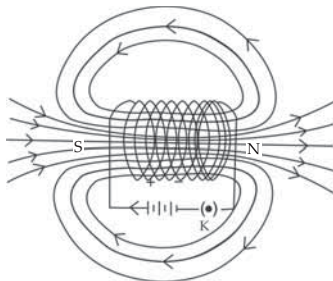
1.



2.



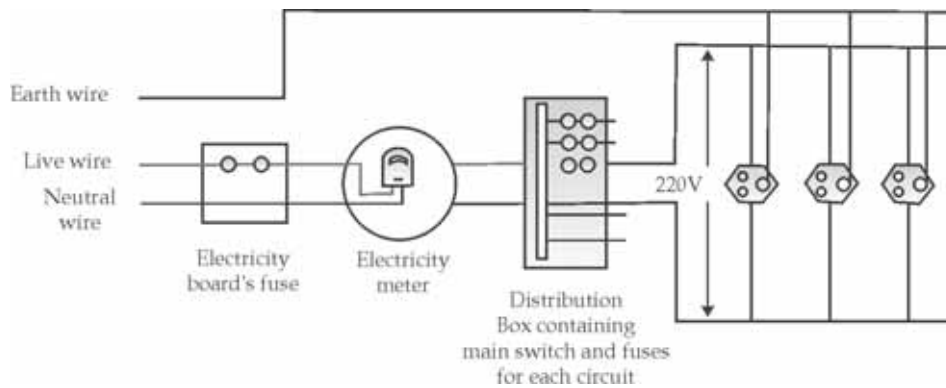
3.



4.  $F = BIL$ , where  $B$  = Magnetic field,  $I$  = Current,  $L$  = Distance.

Force is maximum when magnetic field is perpendicular to the plane of coil.

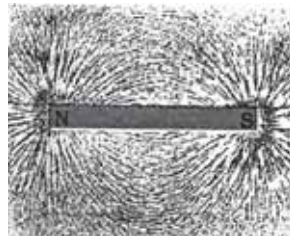
5.



6. Fix a sheet of white paper on a drawing board using some adhesive material.

Place a bar magnet in the centre of it.

Sprinkle some iron filings uniformly around the bar magnet. A salt-sprinkler may be used for this purpose.



Now, tap the board gently.



## WORKSHEET-18

- (a) It varies inversely with radius.

(b) It varies directly with number of turns of wire in the coil.

(c) It varies directly with the strength of current flowing in the coil.
- (a) The strength of magnetic field increases.

(b) The strength of magnetic field increases.

(c) The polarity or direction of field lines reverses.
- (a) Overloading is the act of connecting many devices to a single supply point and trying to draw a large amount of current. Short circuiting is a situation of flow of large current due to malfunctioning of devices or the joining of the supply and the neutral wire.

(b) Alloys have higher resistivity and do not oxidise or burn readily at high temperatures.
- (a) It prevents damage to the appliance and the circuit due to overloading. It is connected in series with the household circuit.

$$(b) I = \frac{P}{V} = \frac{1 \text{ kW}}{220 \text{ V}} = \frac{1000 \text{ W}}{220 \text{ V}} = 4.55 \text{ A}$$

The electric current flowing/required by the electric iron is more than the current that can flow through the fuse without its melting.

Hence, fuse wire will melt, circuit breaks and the electric iron will not work.

- (a) **Activity:**

  - Take a coil of wire, AB, having a large number of turns and connect it to a galvanometer.
  - Move the north pole of a strong bar magnet towards one end, B, of the coil. The galvanometer shows a momentary deflection indicating the presence of electric current in the coil AB.
  - When the magnet is withdrawn/taken away from the coil, the galvanometer again shows momentary deflection in a direction, opposite to the first, indicating that the current is set up in the opposite direction.

**Rule :** Fleming's right-hand rule: stretch the thumb, forefinger and middle finger of right hand so that these are perpendicular to each other. If the forefinger indicates the direction of the magnetic field and the thumb shows the direction of motion of the conductor, then the middle finger will show the direction of current generated in the coil.

(b) (i) The galvanometer shows a momentary deflection (due to electric current induced in it).

(ii) The galvanometer shows a momentary deflection (due to change in amount of electric current).

## WORKSHEET-19

- (a) CFL and ISO certified star-rated electrical appliances consume less energy as compared to tungsten bulbs and local branded appliances. So one can save electricity by using CFL and ISO certified star-rated electrical appliances.

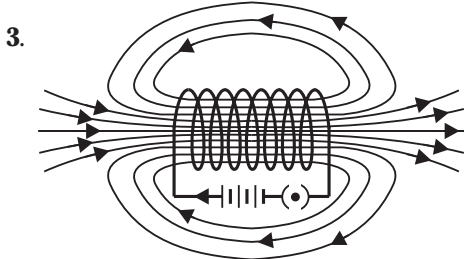
(b) Energy consumed by one bulb

$$= P \times t$$
$$= 200 \text{ W} \times 6 \text{ h}$$

	= 0.2 kW × 6 hours
	= 1.2 kWh
Therefore, energy consumed by three bulbs	= 3 × 1.2
	= 3.6 kWh
Energy consumed by TV set	= $P \times t$
	= 0.04 kWh × 4 h = 0.16 kWh
Energy consumed by two fans	= 2 × 0.06 kW × 4 hours
	= 0.48 kWh
So total energy consumption in a day	= 3.6 + 0.16 + 0.48
	= 4.24 kWh
So total energy consumption in June	= 30 × 4.24 = 127.2 kWh
Total cost	= 127.2 × 5 = ₹ 636

(c) Wisdom, awareness.

2. (a) The wire, with red insulation cover, receives supply of electric power through a main supply. It is called live wire (or positive). Another wire, with black insulation is called neutral wire. The wire which has insulation of green colour is called earth wire, which is usually connected to a metal plate deep in the earth near the house. It ensures that any leakage of current to the metallic body of appliance keeps its potential to that of earth, and the user may not get a severe electric shock.
- (b) When live wire and neutral wire come in contact, it causes spark and fire. This is called short circuiting.
- (c) Awareness and responsible behaviour.



Magnetic field patterns inside the solenoid indicates that the magnetic field is same at all points inside the solenoid.

This principle is utilized to magnetise a piece of magnetic material like soft iron when placed inside the coil.

Ways to strengthen this electromagnet:

- (i) Increase the amount of electric current through it.
- (ii) Increase the number of turns of coil.

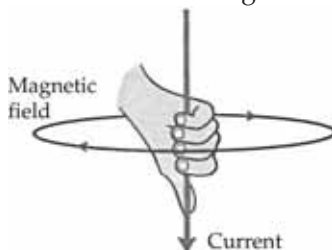
## WORKSHEET-20

1. (a) **Magnetic field.** It is the region around a magnet within which another magnet or a magnetic substance experiences force of attraction due to it.

Direction of magnetic field lines can be determined by:

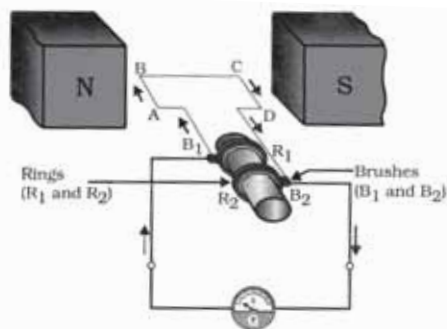
- (i) using a compass, where needle points.
- (ii) by drawing tangent to field lines at that point.

- (b) **Right-hand thumb rule.** If we stretch thumb of right hand and fold the fingers then thumb indicates the direction of current and folded fingers the direction of induced magnetic field.



## CHAPTER TEST

1. Velocity
2. (i) Red—live wire (ii) Black—neutral wire (iii) Green—earthing
3. **AC.** Current which varies in its magnitude and changes direction continuously.  
**DC.** Current which has a constant magnitude and no change in direction.
4. It depends on direction of magnetic field, direction of electric current and direction of motion of conductor.
5. Conversion of electrical energy to mechanical energy.  
Power of commercial motor can be enhanced by using:
  - (i) Electromagnet in place of permanent magnet.
  - (ii) Large numbers of turns of conducting wire in current carrying coil.
  - (iii) Soft iron core.
6. Earth wire provides a low-resistance conducting path for the current so that any leakage of current to the metallic body goes to the ground. By earthing user is saved from severe electric shock.
7. Current drawn by oven =  $\frac{2000}{220} = 9.09 \text{ A}$ .  
Rating of fuse 5A. This will not let the oven draw is required value of current. It must be replaced by 10A fuse.
8. (a) **Over loading.** It occurs when we connect a number of appliance in the same socket.  
(b) **Short circuiting.** It occurs when live and neutral wires accidentally touch each other resulting in electrical sparks.  
(c) **Earthing.** The phenomenon of providing an alternating path to excessive charge that may sometimes leak to andy to high voltage appliance by connecting it to earth.
9. **Principle.** Conversion of mechanical energy to electrical energy.



An AC generator can be converted to DC generator by changing slip rings with split ring commutators.

# 3

## SOURCES OF ENERGY

### WORKSHEET-22

1. The usual components of biogas are methane, carbon dioxide, hydrogen and hydrogen sulphide.
2. Cow dung cake.
3. Hotspots are those regions on earth's crust under which molten rocks have been trapped due to push from deeper hot areas.  
The energy obtained from hot molten rocks beneath the earth's surface is called geothermal energy.
4. Wind energy farm is the large area over which number of wind mills have been erected. Output of one wind mill is not enough to generate electricity at commercial level.
5. Nuclear fusion.
6. Chemical energy from battery into-electrical energy and then light energy.
7. (i) Windmills convert energy of wind into mechanical power which can be used in pumping water, grinding, etc.  
(ii) Windmills can also use generator to convert wind energy into electrical energy.
8. A solar cell is a device to convert solar energy to electricity.
9. Solar cooker and solar heater.
10. A solar cell panel is an arrangement of large number of solar cells in combination that can deliver enough electricity for practical use.
11. Problems associated with construction of dams are submergence of agricultural and residential land, destruction of large ecosystems, production of polluting gas methane from submerged vegetation, etc.
12. It checks the exit of infrared rays.
13. Silicon and silver.
14. Geothermal energy.
15. Oxides of nitrogen and sulphur.
16. Water gets recycled through hydrological cycle hence, it gets refilled in reservoir of dams each time it rains thus, its potential energy can be generated again and again.
17. Nuclear fusion.
18. Compressed Natural Gas.
19. CNG is environment-friendly as it does not produce pollution of any type.
20. 0.7 watt.
21. Black surface is preferred for making solar devices because it absorbs more heat as compared to white or reflecting surface under identical conditions.
22. Biogas emits 80% less hydrocarbons and 60% less nitrogen oxide.

## WORKSHEET-23

1. A good source of energy is the one which is easily available, economical, pollution free and convenient to use.
2. Yes, wind, water, ocean are some of the examples of pollution free source of energy. They do not leave any residue or poisonous gases.
3. We are looking at alternate sources of energy to replace the conventional sources which are non-renewable and causing pollution of the environment.
4. Now they are used to run turbines and produce electricity.
5. The increase in the demand for energy is affecting our environment adversely as:
  - It puts a pressure on source of energy as well as increases the investment on the power stations.
  - Since most of the energy is produced from coal, petroleum, hence, acid rain, global warming and other pollution related problems are caused.
6. (a) CNG is non-renewable while hydrogen is renewable fuel.  
(b) Hydrogen on burning produces only water vapours while CNG on burning produces greenhouse gases which may lead to global warming hence, hydrogen is a cleaner fuel than CNG.
7. I would use renewable and pollution free sources of energy to heat my food. Because, it would not disturb the ecological balance as well as it would be reproduced in nature by cyclic process when it would be used once.
8. Four characteristics of biogas:
  - High heating capacity.
  - Burns without smoke.
  - Leaves no residue.
  - Can be easily used for cooking, heating and lighting.
9. (a) **Winds.** It can be established only in those areas where wind blows at a higher speed than 15 km/hour to maintain the required speed of the turbine.  
(b) **Tides.** The locations where dams to harness this energy can be built, are limited.
10. **We classify energy sources as:**
  - (a) Renewable when its source is replenished in nature through fast natural cycle such as flowing water of river, biomass.  
Non-renewable when its source is being replenished through very slow natural cycles, *e.g.*, coal and petroleum.
  - (b) Exhaustible when its source may get over in nature due to overuse and mismanagement by us, *e.g.*, coal, wood.  
Inexhaustible when its source can never be over whatever amount we may use, *e.g.*, wind energy, ocean energy.

## WORKSHEET-24

1. Burning wood in traditional chulhas is considered disadvantageous as it does not yield much energy but lot of smoke to pollute the environment.
2. Turbine.
3. Solar energy of solar cell panels.

4. Fossil fuels are the non-renewable fuel formed due to burying of plants and animals under layers of earth, millions of years ago. Coal and petroleum.
5. Coal and oil are the fuels used to produce heat energy to convert water to steam which in turn rotates (mechanical energy) the turbines in power plant. Transmission of electricity is more efficient than transporting coal and petroleum over the same distance. Being near them, expense of transport can be reduced.
6. Biogas is considered as a clean fuel because it does not produce smoke or any harmful gases.
7. Digester in a biogas plant is a sealed chamber in which there is no oxygen. In this chamber anaerobic organisms break down complex compounds in cow dung slurry to gases like methane, carbon dioxide, hydrogen and hydrogen sulphide (Biogas).
8. The basis of nuclear energy is nuclear fission process. The nucleus of a heavy atom such as uranium, plutonium or thorium when bombarded with low energy neutrons, can be split apart into lighter nuclei. When this is done, a tremendous amount of energy is released. Fission of one atom of uranium releases 10 million times the energy produced by the combustion of an atom from coal.
9. Two advantages of classifying energy sources as renewable and non-renewable are:
  - (a) The non-renewable sources can be substituted by renewable once thus, decreasing the pollution caused by them.
  - (b) Enough resource and a pollution free environment can be left for the future generation ensuring sustainable development.
10. A good fuel is the one which is easily available at economical prices and gives enough energy without producing much pollution.
11. Fossil fuels are non-renewable and produce large amount of smoke, acidic and greenhouse gases.
12. We can reduce the pollution caused by fossil fuels increasing the efficiency of combustion processes and using various techniques to reduce the escape of harmful gases and ashes into the surroundings.

### WORKSHEET-25

1. Biomass is source of fuel obtained from plant or animal products, for example cow dung cakes, wood, biogas, etc.
2. Petroleum and natural gas.  
On refining petroleum, the products obtained from it can be used as fuels. Natural gas is another important fossil fuel that is found with petroleum in oil wells. There are, however, some oil wells, which yield only natural gas. Natural gas mainly contains methane and can be burnt easily to produce heat.
3. Fractional distillation.  
Products obtained are paraffin wax, fuel oil, petrol, kerosene, diesel and natural gas.
4. Turbine is a device made up of a rotor blade assembly. Moving turbine rotates the armature of the electric generators to produce electricity.
5. (a) **Windmills** are designed to convert wind energy into mechanical or electrical energy. A windmill essentially consists of a structure similar to a large electric fan that is erected at some height on a rigid support.  
(b) Energy of flowing water is utilised to produce electricity on a large scale at **hydroelectric power plants**.

- (c) The heat from inside of the earth can be utilized as a source of energy under certain favourable conditions that are created by natural processes. This is known as **geothermal energy**.

Ultimate source of these energy is solar energy of the sun.

6. Some ways which we can follow to address the problems of energy crisis:
- (a) Increasing efficiency of machines and gadgets so that they consume less energy but give more output such as fluorescent tubes.
  - (b) Using alternate forms of energy which is based on renewable sources like wind, oceans, nuclear or flowing water.
  - (c) Economizing use of gadgets by using carpools, walking more, wearing extra woollen in winters.
  - (d) Reducing stress on industries as they have less demand on them and save energy demand by them.
  - (e) Using less electricity by switching off lights and fans when not in use.
7. There are many controversies associated with the construction of hydroelectric power plants like Narmada dam. For example, when dams are built on rivers, large land areas get submerged. This may cause many problems like submergence of agricultural and residential land, destruction of large ecosystems, production of polluting gas methane from submerged vegetation, etc.

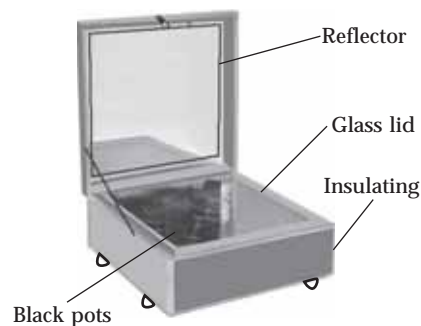
## WORKSHEET-26

1. Firewood should be replaced by alternative sources of energy as:
- (a) It does not yield much energy.
  - (b) It produces lot of smoke to pollute the environment.
  - (c) It can lead to deforestation and related problems.
  - (d) Other fuels like charcoal is better than wood as fuel because it burns without flame, is comparatively smokeless and has a higher heat generation efficiency.
2. Some of the criteria for selecting a good fuel
- (a) easy availability,
  - (b) low cost,
  - (c) no problem in storing and transport,
  - (d) a high calorific value,
  - (e) low content of non-combustibles (In other words, the residue left after combustion should be as low as possible.), and
  - (f) no combustion products that are poisonous or environmental pollutants.
3. (a) **Raw materials required:** Residues after crop harvest, vegetable waste, cow dung, sewage.
- (b) **Role of anaerobes:** Anaerobic organisms break down complex compounds in cow dung slurry to biogas in digester in a biogas plant.
- (c) **Composition of biogas:** Gases like methane, carbon dioxide, hydrogen and hydrogen sulphide.

- (d) **Advantages over other fuels:** As a fuel it has high heating capacity and does not produce ashes or polluting gases.
- (e) **Uses:** Fuel for heating, lighting and running machines. Slurry can be used as manure as it is rich in nitrogen and phosphorus. Safe and efficient method to dispose of waste.

4. A solar cooker is a device which utilises solar energy for cooking food material.

**Construction:** It consists of an insulated wooden box which is painted with black colour from inside. The lid of the box is provided with a plane mirror reflector and a glass sheet as shown in the figure. The food to be cooked is placed in a metal containers painted with black colour from outer side and kept in the box. The container is covered with the glass sheet. The box is then kept in direct sunlight and its reflector is adjusted in such a way that a strong beam of sun light falls over it. In this way a temperature of about  $100^{\circ}\text{C}$ – $140^{\circ}\text{C}$  can be achieved in about 2 hour time.



**Working:** The black surface of the box and the vessel absorbs it. When the inner black surface becomes quite hot, it also starts radiating heat energy in the form of infrared rays, but the upper glass sheet does not allow these rays to pass through it and go outside the box. As a result, these infrared rays get absorbed in the box, which increases its internal temperature.

## WORKSHEET-27

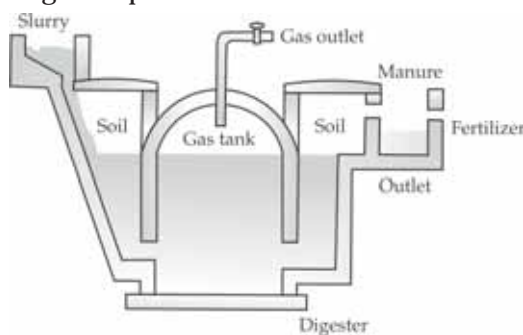
- (a) A solar cell is a device to convert solar energy to electricity.

(b) Silicon and silver.

(c) (i) Devices like solar lamp and solar cooker have solar cells which provide pollution free and environment friendly source of electricity.

(ii) These can be used anywhere as a self-generating source of electricity.

(d) Common good, love for society and environmental cleanliness.
- (a) In a biogas plant, biogas is produced by anaerobic fermentation of biomass (*e.g.*, cattle dung and agricultural wastes). Biogas is a mixture of methane (65%), carbon dioxide, hydrogen and hydrogen sulphide.



- (b) Awareness and environmental cleanliness.
- (a) There are many controversies associated with the construction of hydroelectric power plants like Narmada dam. For example, when dams are built on rivers, large land areas get submerged. This may cause many problems like submergence of agricultural and residential land, destruction of large ecosystems, production of polluting gas methane from submerged vegetation, etc.



- (b) Hydroelectric power plant is used to produce electricity with the energy of flowing water on large scale. In a hydroelectric plant potential energy of water of high rivers is converted into electrical energy.
- (c) Construction of dams causes a number of problem such as submergence of agricultural and residential land, destruction of large ecosystem, production of polluting gas methane from submerged vegetation, etc.
- So, to me, such dams should not be build, and government should look for other alternatives of energy sources.

## WORKSHEET-28

### 1. The advantages of using solar energy:

- (i) Solar cells provide a clean, pollution-free and environment-friendly source of electricity.
- (ii) These can be used anywhere as a self-generating source of electricity.

### Disadvantages of using solar energy:

- (a) High cost for their installation. Availability of special grade silicon required for making solar cells is only limited.
- (b) The technology to obtain silicon in pure form, too, is quite expensive.
2. Conventional sources like coal, petroleum, wood (biomass).

Alternate sources like solar, nuclear, geothermal, etc.

Air pollution is caused due to excessive use of fossil fuels. The amount of greenhouse gases like methane, carbon dioxide and carbon monoxide increase in air. They trap the heat energy of sun during the day, not letting it escape even at night. It leads to gradual increase in temperature of earth; it is known as global warming. Due to this, ice will melt at pole and increase the level of water in oceans and seas.

Alternate sources do not cause so much of pollution but they need maintenance and infrastructure. Some of the sources are unpredictable like wind energy, ocean energy. Based on their merits, solar energy is one of the best.

## CHAPTER TEST

- In a cloudy day.
- Excess use of  $\text{CO}_2$  in the atmosphere causes greenhouse effect, global warming, and acid rain.
- (a) It should be able to do large amount of work per unit volume. (b) It should be easily accessible.
- The role of plane mirror is to reflect mass of sunlight towards the centre of box.  
The role of glass sheet is to trap sun's rays inside the box so as to increase the temperature.

### 5. Advantage: Wind energy does not produce any type of pollution.

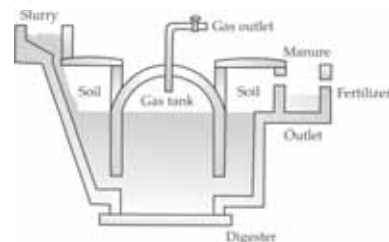
**Disadvantage:** Establishment of wind energy farm requires large area of land, besides a high cost of construction.

### 7. Paraffin wax and asphalt are not used as fuel.

**Disadvantages.** (a) Release of harmful radioactive radiation. (b) Release of radioactive wastes.

### 8. Use of fossil fuels may lead to an pollution exhaustion of fossil fuel. Steps to minimise the pollution are: (a) change to clean fuel like CNG. (b) promote use of solar cells hence, solar energy.

### 9. Biomass is fuel obtained form animal and plant products. Its principle is conversion of biomass in absence of oxygen to obtain biogas and slurry.



## 4

## LIGHT-REFLECTION AND REFRACTION

## WORKSHEET-30

1. Between pole and focus, behind the convex mirror.
2. Between pole and principal focus.
3. Angle of reflection = 0.
4. Bends towards the normal.
5. Image is real.
6. Optical centre.
7. Lens of short focal length.
8. Concave lens.
9. One diopetre is the power of a lens of focal length one meter.
10. The bouncing back of light by a surface to the same medium is called reflection of light.
11. (a) The incident ray, reflected ray and the normal all must lie at the same point in same plane.  
(b) Angle of incidence is always equal to angle of reflection.
12. When rays of light fall on a perfectly smooth highly polished surface such that reflected rays and incident rays are similar, *e.g.*, image formation by concave, convex, plane mirrors.
13. When reflection of light takes place from uneven, rough surface such that reflected rays are not similar to incident rays.
14. Yes, at the point of incidence both laws of reflection hold true.
15. Regular reflection — in mirrors, to produce glare.  
Irregular reflection — from walls, ground for general illumination.
16. First law, which states incident ray, reflected ray and normal must lie at same point in same plane.
17. Angle of incidence =  $90^\circ - 30^\circ = 60^\circ$   
Angle of incidence = Angle of reflection  
 $\therefore$  Angle of reflection =  $60^\circ$ .
18. A highly polished surface capable of showing regular reflection.
19. The property shown by plane mirror due to which left of object appears right in the image and vice versa.
20. It means image is of same size as object and +ve sign means it is erect and hence, virtual.
21. It is infinite.
22. Focal length =  $\frac{\text{Radius of curvature}}{2}$   
So,  $f = \frac{25}{2} = 12.5 \text{ cm.}$
23. An electromagnetic wave which has dual nature and gives us sensation of sight.

24. Ability of light to travel in straight lines is called rectilinear propagation of light.
25. Ability to cast shadows and formation of eclipses.
26. Cinematography, sensation of sight, optical fibre communication.

### WORKSHEET-31

1.  $\mu_{aa} = \frac{c_a}{c_{al}} = 1.36 \quad \dots(i)$

$\mu_{da} = \frac{c_a}{c_d} = 1.63 \quad \dots(ii)$

$$\mu_{ald} = \frac{c_d}{c_{al}} = \frac{\text{eqn (i)}}{\text{eqn (ii)}} = \frac{\frac{c_a}{c_{al}}}{\frac{c_a}{c_d}}$$

$$= \frac{1.36}{1.63} = 0.83.$$

2. Given, Refractive index of diamond  $\mu_{da} = 2.47$

Speed of light in air,  $c_a = 3 \times 10^8 \text{ ms}^{-1}$

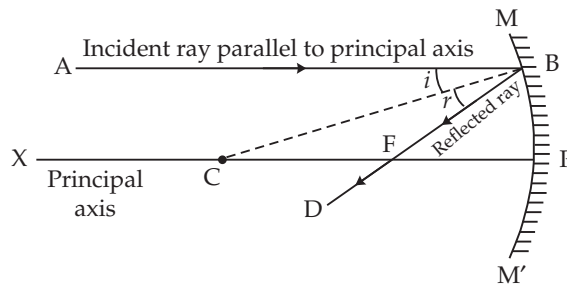
Speed of light in diamond,  $c_d = ?$

Since  $\mu_{da} = \frac{C_a}{C_d}$

$$2.47 = \frac{3 \times 10^8}{C_d}$$

$\therefore C_d = 1.21 \times 10^8 \text{ ms}^{-1}.$

3. In the given ray diagram, CB is the normal and  $\angle i = \angle r$ , AB is the incident ray and BD is the reflected ray.



4. Power of a lens (in D) =  $\frac{1}{\text{focal length (m)}}$

$$-2.5 D = \frac{1}{f(m)}$$

$$\Rightarrow f = -\frac{1}{2.5} = -0.4 \text{ m}$$

$$\Rightarrow f = -0.4 \text{ m} = -40 \text{ cm}$$

Since power is -ve

$\therefore f = -\text{ve}$  hence, lens is concave lens.

5. A concave mirror can produce a magnified image of an object when:

(a) Object is placed between C and F.

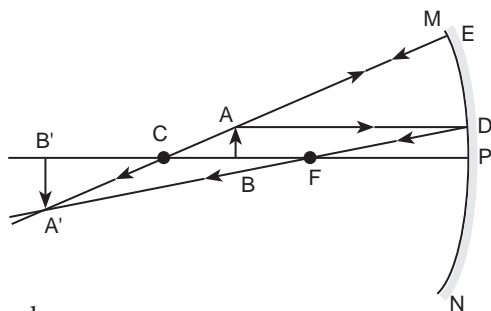
(b) Object is placed between P and F.

Image in case of (a) is real and inverted while in case of (b) It is virtual and erect.

6. (a) An incident ray that incidents parallel to principal axis passes through focus after reflection or vice versa.

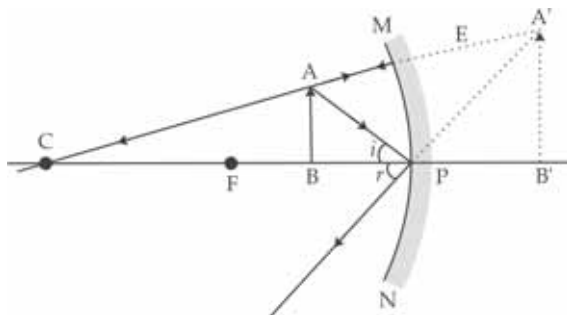
(b) A ray incident along the centre of curvature retraces its path after reflection.

(c)



7. Two rays are required.

Virtual image by concave mirror.

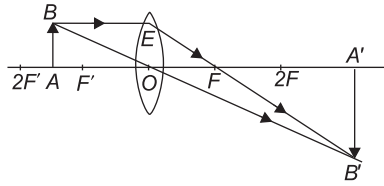


8. Rules for drawing ray diagram:

(a) A ray passing through optical centre of a convex lens goes undeviated.

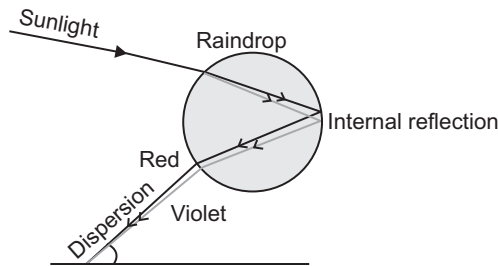
(b) A ray parallel to the principal axis after getting refracted from a convex lens always passes through the principal focus.

(c) A ray passing through the principal focus becomes parallel to the principal axis.

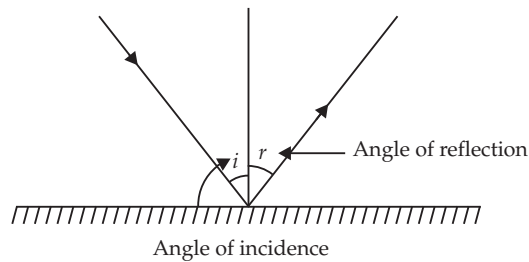


### WORKSHEET-32

1.



2. Laws of reflection



Angle of incidence = Angle of reflection

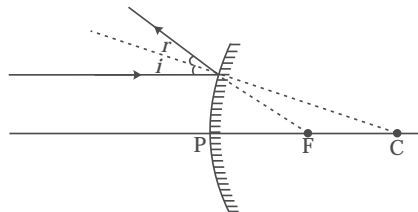
$$\angle i = 32.5^\circ$$

$\therefore$

$$\angle r = 32.5^\circ$$

3. It can form a magnified image if object is placed between F and C. This image is real and inverted. Whereas if object is between P and F, image is magnified but erect.

4.



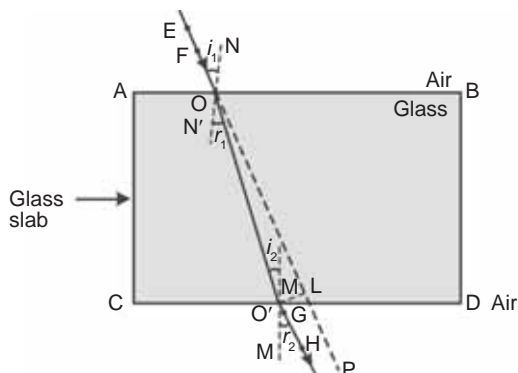
5. (a) More in turpentine because its refractive index is more than that of water therefore, more refraction take place in turpentine.

$$(b) \text{ Absolute Refractive index} = \frac{\text{Velocity of light in vacuum}}{\text{Velocity of light in medium}}$$

Refractive index is ratio of velocity in two media.

## WORKSHEET-33

1. The perpendicular separation between incident ray and the emergent ray is called lateral displacement in glass slab.



2. Refractive index is defined as the ratio of speed of light in medium 1 to the speed in medium 2 and is represented as  $n_{21}$  and is read as refractive index of medium 2 with respect to medium 1.

$$n_{21} = \frac{\text{Speed of light in medium 1}}{\text{Speed of light in medium 2}}$$

It has no unit.

Glass (1.5) has higher refractive index than water (1.33).

3.  $f = 20 \text{ cm}$ ,  $v = +24 \text{ cm}$ ,  $u = ?$

Since, 
$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$\Rightarrow$  
$$\frac{1}{20} = \frac{1}{24} - \frac{1}{u}$$

$\Rightarrow$  
$$\frac{6-5}{120} = \frac{-1}{u}$$

$\therefore$  
$$u = -120 \text{ cm.}$$

4. Given, speed of light in glass  $c_g = 2 \times 10^8 \text{ ms}^{-1}$

Refractive index of water with respect air  $\mu_{wa} = \frac{4}{3}$

Refractive index of glass with respect to air  $\mu_{ga} = \frac{3}{2}$

(i) 
$$\mu_{ga} = \frac{c_a}{c_g}$$

or 
$$\frac{3}{2} = \frac{c_a}{2 \times 10^8}$$

or 
$$c_a = \frac{3}{2} \times 2 \times 10^8$$

$\therefore$  
$$c_a = 3 \times 10^8 \text{ ms}^{-1}$$

(ii) 
$$\mu_{wa} = \frac{c_a}{c_w}$$

$$\text{or } \frac{4}{3} = \frac{3 \times 10^8}{c_w}$$

$$\text{or } c_w = 3 \times 10^8 \times \frac{3}{4}$$

$$\therefore c_w = 2.25 \times 10^8 \text{ ms}^{-1}.$$

5. (a) Concave mirror is used in headlights of car, as it converges rays to maximum distance.  
 (b) Convex mirror is used as rear-view mirror of a vehicle, because it gives wider view range.  
 (c) Concave mirror is used in solar furnace, as it converges rays to a single point.

### WORKSHEET-34

1.  $u = -45 \text{ cm}, \quad v = 90 \text{ cm}.$

$$\begin{aligned} \frac{1}{f} &= \frac{1}{v} - \frac{1}{u} \\ &= \frac{1}{90} - \left( \frac{-1}{45} \right) = \frac{1}{30} \end{aligned}$$

$$\Rightarrow f = +30$$

Convex lens of focal length 30 cm.

$$\frac{h'}{h} = \frac{v}{u}$$

$$\Rightarrow h' = \frac{-2 \times 90}{-45} = 4 \text{ cm}.$$

Height of image = 4 cm.

2. (a) When the object is placed at 22 cm, the image is formed beyond 36 cm, which is real, inverted and magnified.  
 (b) When the object is at 14 cm then the image formed is virtual, behind the mirror and magnified.  
 (c) When the object is placed beyond 40 cm, then the image is formed between 18 cm and 36 cm, and it is real inverted and diminished image.
3.  $h_o = 4 \text{ cm}, f = 24 \text{ cm}, u = -16 \text{ cm}$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{24} = \frac{1}{v} + \frac{1}{16}$$

$$\Rightarrow \frac{2-3}{48} = \frac{1}{v}$$

$$\Rightarrow \frac{-1}{48} = \frac{1}{v} \quad \Rightarrow v = -48 \text{ cm}$$

$$\frac{h'}{h} = \frac{v}{u}$$

$$\Rightarrow \frac{h'}{h} = \frac{-48}{-16}$$

$$\Rightarrow h' = \frac{48 \times 4}{16} = 12 \text{ cm}$$

The image is formed on the same side of the lens and is bigger, erect and virtual.

4.  $h_o = ?$                        $f = -5 \text{ cm}$        $u = -10 \text{ cm}$

Lens formula

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{-1}{5} = \frac{1}{v} + \frac{1}{10}$$

$$\Rightarrow \frac{-1}{5} = \frac{1}{10} + \frac{1}{v}$$

$$\Rightarrow \frac{-2-1}{10} = \frac{1}{v} \Rightarrow v = -\frac{10}{3} \text{ cm}$$

$$m = \frac{v}{u} = \frac{h_i}{h_o}$$

$$= \frac{-10}{-10} \times \frac{h_i}{6} = 2 \text{ cm.}$$

Height of image = 2 cm

Image is virtual and diminished.

5.  $f = -10 \text{ cm}$ ,  $u = -15 \text{ cm}$

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u} = \frac{-1}{10} + \frac{1}{15} = -\frac{1}{30}$$

$$\therefore v = -30 \text{ cm}$$

Height of image,  $\frac{h'}{h} = \frac{-v}{u} = \frac{30}{-15} = -2$  (size two times)

### WORKSHEET-35

1. (a) (i) **Optical centre:** The central point of lens is known as its optical centre (O).  
(ii) **Centre of curvature:** The point about which the given spherical refracting surface can be made is centre of curvature (C).



(iii) **Principal axis:** A line passing through the optical centre of the lens and perpendicular to both the faces of the lens is known as principal axis.

(iv) **Aperture:** The effective diameter of the circular outline of a spherical lens is called its aperture.

(v) **Principal focus:** The point on the principal axis where all parallel rays meet (in case of convex lens) or appear to meet (in case of concave lens) after passing through the lens is called principal focus.

(vi) **Focal length:** The focal length of a lens is the distance between optical centre and principal focus of the lens. It is denoted by  $f$ .

(b) Given,  $f = 12$  cm,  $v = 48$  cm,  $u = ?$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

or  $\frac{1}{12} = \frac{1}{48} - \frac{1}{u}$

or  $\frac{1}{u} = \frac{1}{48} - \frac{1}{12}$

or  $\frac{1}{u} = \frac{1-4}{48} = \frac{-3}{48}$

$\therefore u = -16$  cm.

2. (a) The mirror is concave.

(b) Real and inverted

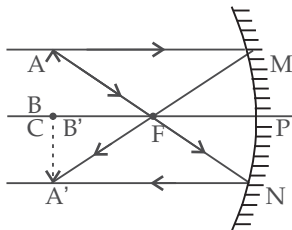
(c)  $m = \frac{-v}{u}$

or  $-1 = \frac{-(-40)}{u}$

$\therefore u = -40$  cm

*i.e.*, object is located 40 cm from the mirror.

(d)

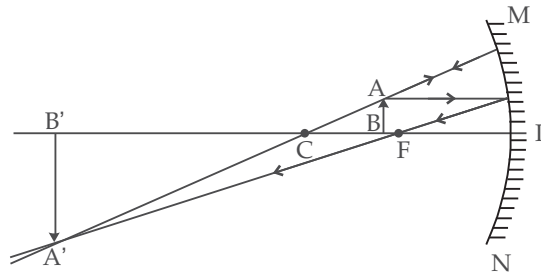


3. (a) Concave mirror

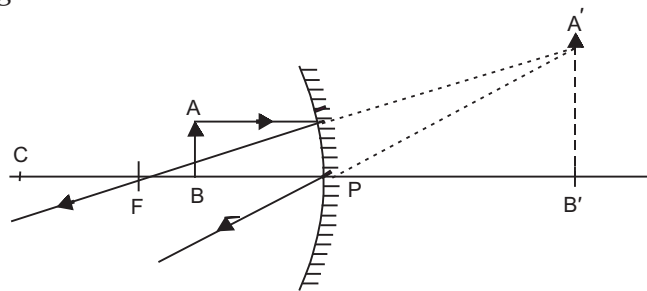
(b)  $m = \frac{v}{u} = \frac{60}{15} = 4$

(c) Distance between the object and its image =  $60 - 15 = 45$  cm.

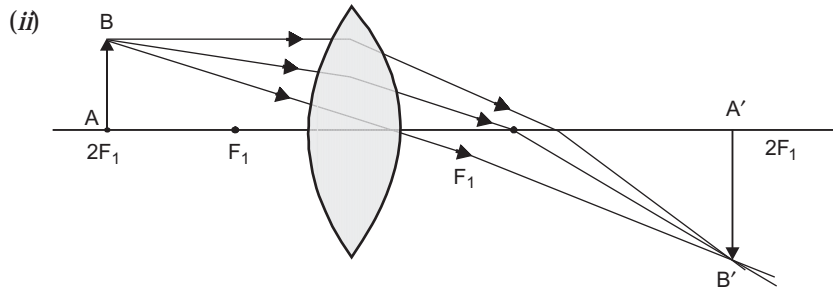
(d)



4. (a) (i) Range of the object distance is 0 to 20 cm from the pole.  
 (ii) Image will be bigger than the object.  
 (iii) Ray diagram:



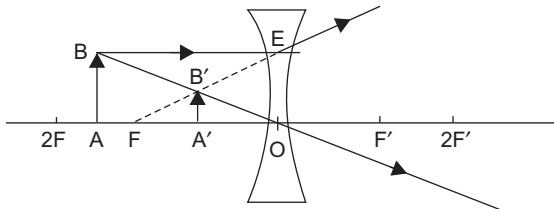
- (b) (i) Yes, complete image will be formed.



- (iii) Intensity will be reduced as the light falling on the lower (covered) portion will not reach the position of image.

### WORKSHEET-36

1. (a)



- (b) (i) Given  $f = -15$  cm,  $v = -10$  cm,  $u = ?$

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u} \quad \Rightarrow \quad \frac{1}{-15} = \frac{1}{-10} - \frac{1}{u}$$

$$\Rightarrow \quad \frac{1}{u} = -\frac{1}{10} + \frac{1}{15} \quad \Rightarrow \quad \frac{1}{u} = \frac{-1}{30}, \quad \therefore u = -30 \text{ cm}$$

$$(ii) \quad m = \frac{h_i}{h_o} = \frac{v}{u} \quad \Rightarrow \quad m = \frac{-10}{-30} = 0.33$$

(iii) Image will be real and diminished.

2. Given,  $f = -10 \text{ cm}$ ,  $u = -5 \text{ cm}$

According to mirror formula

$$\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$$

or

$$\frac{1}{v} = \frac{1}{f} - \frac{1}{u}$$

$$= \frac{1}{-10} - \frac{1}{(-5)}$$

or

$$\frac{1}{v} = \frac{1}{5} - \frac{1}{10}$$

or

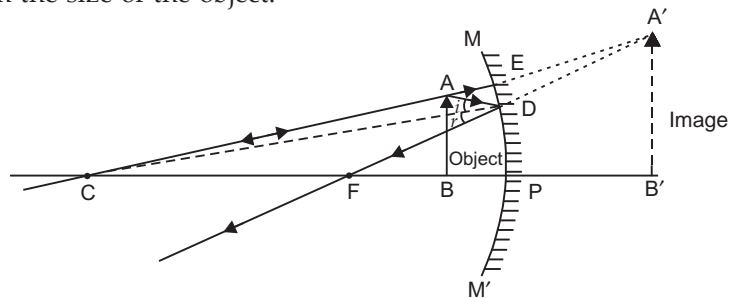
$$v = \frac{10 \times 5}{10 - 5} = 10 \text{ cm}$$

or

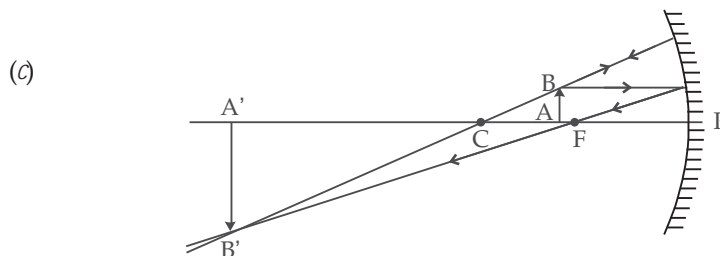
$$v = +10 \text{ cm}.$$

Hence, we conclude that image is:

- (a) formed behind the mirror
- (b) virtual and erect
- (c) larger than the size of the object.



3. (a) As we know only real image can be projected on the screen or wall, and a concave mirror forms the real images of an object, the student should use concave mirror.
- (b) The candles should be placed between  $f$  and  $2f$ .



(d) Yes. If he keeps the candle beyond a distance equal to  $2f$  from the mirror, he can get an inverted, real but diminished image on screen.

### WORKSHEET-37

1. (a) 2. (a) 3. (b) 4. (b) 5. (a) 6. (d) 7. (a) 8. (b) 9. (b) 10. (d)  
11. (b) 12. (d)

### WORKSHEET-38

1. (b) 2. (b) 3. (b) 4. (c) 5. (a) 6. (c)
1. When a parallel beam of light coming from a distant object incident on a reflecting surface of a mirror, after reflection, the rays converge at a point called principal focus of the mirror. The distance between the pole and principal focus is called focal length of the mirror. It is equal to the half the radius of curvature of the mirror, *i.e.*

$$f = \frac{R}{2}$$

2. Sharp image of a distant object is obtained on a screen by a concave mirror. The distance between the mirror and screen is measured with the help of meter scale. This distance gives the focal length of the concave mirror.
3. Following precautions should be taken:
- Distant object should be clearly visible.
  - The image on the screen should be well defined and sharp.
  - While measuring the distance meter scale should be held parallel to the ground.
4. To find the focal length of a convex lens by obtaining the image of a distant object, one needs the following apparatus:
- A stand with the given convex lens fitted in it.
  - A thick cardboard white screen.
  - A meter scale.
  - A distant object.

### WORKSHEET-39

1. The distance between the pole and principal focus of a mirror is called focal length of the mirror. Focal length of concave mirror in given set-up is

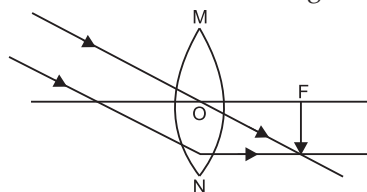
$$f = 15.6 - 4.6 = 11 \text{ cm}$$

S. No.	Distant object	Position of mirror (A)	Position of screen (B)	Difference between mirror & screen (A-B)	Position of screen (B)
1.	Tree	24.5 cm	10.1 cm	14.4 cm	14.4 cm
2.	Pole	22.4 cm	7.6 cm	14.8 cm	14.8 cm
3.	Classroom window	20.5 cm	6.2 cm	14.3 cm	14.3 cm

$$\begin{aligned}\text{Mean focal length} &= \frac{14.4 + 14.8 + 14.3}{3} \\ &= \frac{43.5}{3} = 14.5 \text{ cm}\end{aligned}$$

According to sign conventions the focal length of concave mirror = -14.5 cm

3. To perform the experiment following apparatus are necessary:
- A thin convex lens.
  - A lens holder fitted in a stand with centred mark.
  - A piece of a semi-transparent sheet as a screen fixed to a stand with centered mark.
  - A small candle.
  - A meter scale or a ruler.
  - A matchbox.
4. Real, diminished and inverted image is formed at the focus.



5. The student should take following steps:
- Select a suitable distant object.
  - Hold the lens between the object and the screen with its faces parallel to the screen.
  - Adjust the position of the lens to form a sharp image.
  - Measure the distance between the lens and the screen.

S.No.	Distant object	Position of lens (L)	Position of screen (S)	Difference between Lens & screen (L-S)	Focal length (f)
1.	Candle	3.5 cm	13 cm	9.5 cm	9.5 cm
2.	Tree	5 cm	14 cm	9 cm	9 cm
3.	Window	4 cm	13.5 cm	9.5 cm	9.5 cm

$$\text{Mean focal length} = \frac{\Sigma f}{3} = \frac{9.5 + 9 + 9.5}{3} = \frac{28}{3} = 9.33 \text{ cm}$$

7. (a) A-object, B-convex lens, C-image  
(b) Same size

#### WORKSHEET-40

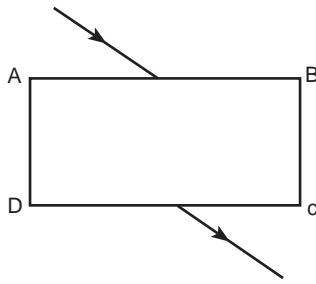
1. (a)    2. (b)    3. (a)    4. (a)    5. (b)    6. (d)    7. (c)

#### WORKSHEET-41

1. (a)    2. (b)    3. (c)    4. (b)    5. (c)    6. (c)

#### WORKSHEET-42

1. The emergent ray is not parallel to incident ray. Hence the diagram is wrong. The correct diagram would be as follows:



- After measuring the distance between produced incident ray and emergent ray, he will observe that distance ' $d$ ' keeps on increasing with increase in angle of incidence.  
 Since  $d \propto \sin (i - r)$ , (where  $r$  is angle of refraction)  
 Therefore,  $d$  increases with increase in  $\angle i$ .
- The angle between incident ray and the normal is known as angle of incidence. It is equal to angle of emergence.  
 Since  $\angle e = \angle i$   
 Therefore,  $\angle e = 30^\circ$
- None of the two observations is correct. In observation table A angles of incidence ( $\angle i$ ) are not equal to angles of emergence ( $\angle e$ ). Hence observations of student A are incorrect.  
 In observation table B angles of incidence ( $\angle i$ ) are equal to angles of emergence ( $\angle e$ ), but angles of refraction ( $\angle r$ ) are not less than angles of incidence ( $\angle i$ ). Hence observations of student B are also incorrect.
- Glass slab should be placed well within the outline marked.
  - Pins should be fixed exactly vertically.
  - The foot of all the pins should be placed in straight line.
  - Angles should be fixed between  $30^\circ$  and  $60^\circ$ .
  - While observing the image and fixing the pins eyes should be kept along the plane of paper and in line.

#### WORKSHEET-43

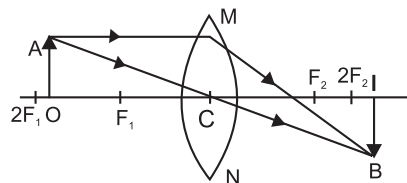
1. (d)   2. (a)   3. (a)   4. (d)   5. (c)   6. (c)   7. (c)   8. (d)   9. (a)   10. (a)  
 11. (c)   12. (d)

#### WORKSHEET-44

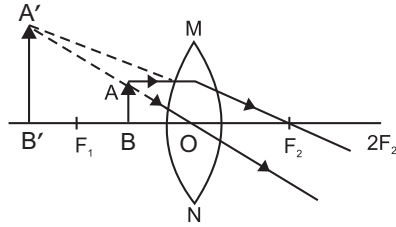
1. (a)   2. (d)   3. (d)   4. (b)   5. (c)

#### WORKSHEET-45

1. A real, inverted and enlarged image will be formed beyond  $2F_2$ .



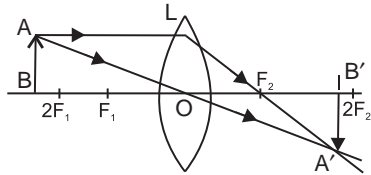
2. Virtual, erect and enlarged image is formed on the same side of the lens as the object.



3. To perform the experiment he needs following apparatus:

- (a) A thin convex lens.
- (b) A lens holder fitted in a stand with centred mark.
- (c) A piece of a semi-transparent sheet as a screen fixed to a stand with centred mark.
- (d) A small candle.
- (e) A meter scale or a ruler.
- (f) A matchbox.

4. Real, inverted and smaller image will be formed between  $F_2$  and  $2F_2$ .



5.  $u = -10$  cm  
 $f = 4$  cm  
 $v = ?$

By lens formula:

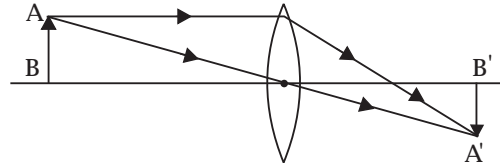
Since  $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$

$\Rightarrow \frac{1}{v} = \frac{1}{f} + \frac{1}{u}$

$\Rightarrow \frac{1}{v} = \frac{1}{4} - \frac{1}{10}$

$\Rightarrow \frac{1}{v} = \frac{5-2}{20} = \frac{3}{20}$

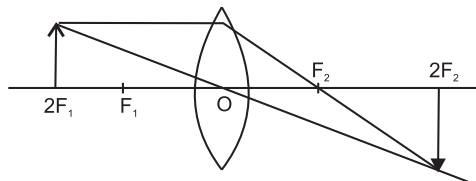
$v = 6.66$  cm



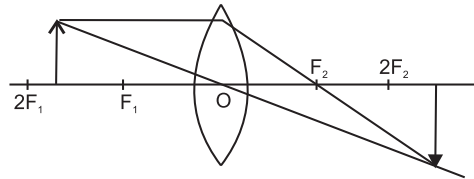
The image will be real, inverted and 6.66 cm right of the lens.

6. Both the diagrams are incorrect.

In diagram (a) object is placed at  $2F_1$ . Hence the image would be formed at  $2F_2$ . The correct ray diagram would be as follows:

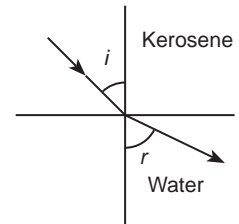
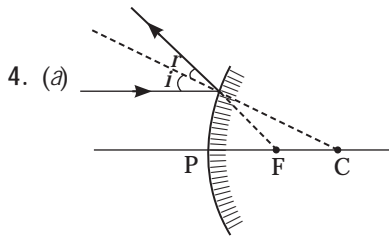


In diagram (b) object is placed between  $F_1$  and  $2F_1$ . Hence image would be formed beyond  $2F_2$ . The correct ray diagram is as follows:



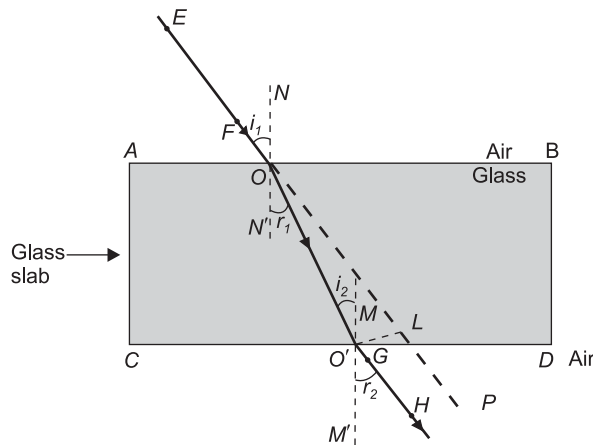
### CHAPTER TEST

1. Angle of emergence.
2. Virtual, erect and equal to the object.
3. (a) +ve                      (b) -ve



(b) Rays coming from kerosene to water will bend away from the normal as refractive index of water, (1.33) is less than that of kerosene (1.44).

5. The perpendicular separation between incident ray and the emergent ray is called lateral displacement in glass slab.



6. Given,  $f = -10$  cm,     $v = -35$  cm,     $u = ?$

We have,     $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$

or             $\frac{1}{u} = \frac{-1}{10} + \frac{1}{35}$

or             $\frac{1}{u} = \frac{-7+2}{70}$



$$\therefore u = \frac{-70}{5} = -14 \text{ cm.}$$

7. Given,  $f = -20 \text{ cm}$ ,  $u = ?$   $h_o = 5 \text{ cm}$ ,  $v = -15 \text{ cm}$

$$\therefore \frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow -\frac{1}{20} = \frac{1}{-15} - \frac{1}{u}$$

$$\Rightarrow \frac{-3+4}{60} = -\frac{1}{u}$$

$$\therefore u = -60 \text{ cm}$$

As we know,  $\frac{v}{u} = \frac{h_i}{h_o}$

$$\Rightarrow \frac{-15}{-60} = \frac{h_i}{5}$$

or  $\frac{1}{4} = \frac{h_i}{5} \Rightarrow \frac{5}{4} = h_i$

$$\therefore h_i = \frac{5}{4} \text{ cm.}$$

8. • **Spherical mirror:** A reflecting surface is a part of a hollow sphere in which inner or outer curved surface is reflecting.

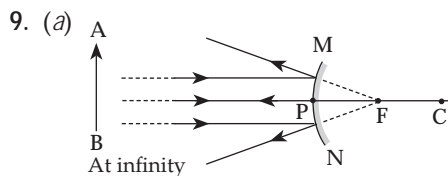
• **Types of spherical mirrors:** There are two types of spherical mirrors such as,

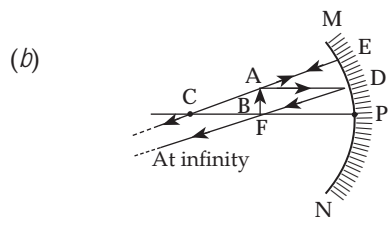
(i) **Concave mirror:** It is a type of spherical mirror whose inner part is reflecting. It is a converging, mirror.

**Uses:** (a) It is used by dentist, (b) As a concentrator, (c) In searchlights, headlights, etc.

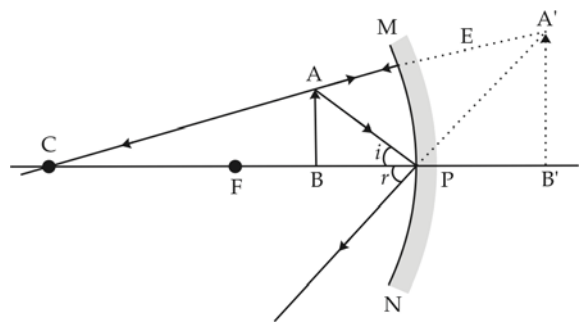
(ii) **Convex mirror:** It is a type of spherical mirror whose outer curved part is reflecting. It is a diverging mirror.

**Uses:** (a) As a rear-view mirror in automobiles, (b) As a device to check thefts or for surveillance at malls.





(c) It is used by dentist and in searchlights.



# 5

## HUMAN EYE AND COLOURFUL WORLD

### WORKSHEET-47

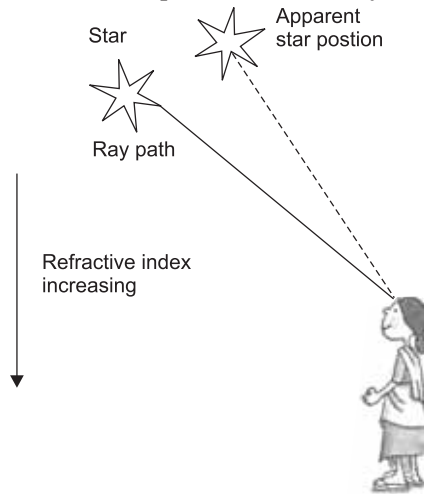
1. Ciliary muscle.
2. Cataract.
3. Tyndall effect.
4. Convex lens.
5. Sir Isaac Newton.
6. Optic nerve carries the image formed on the retina to the brain in the form of electrical signals.
7. Because pupil adjusts to allow light energy to enter the eye and hence, enable us to see.
8. We respond to colours with the help of cones.
9. Chickens have very few rod cells and therefore, cannot differentiate in dim light.
10. Ability of human eye to accommodate all objects placed between 25 cm and infinity.
11. Rods and cones cells, optic nerves.
12. Image formed at retina is real, inverted and diminished.
13. Absence of certain cone cells.
14. When a beam of light enters a smoke-filled room through a small hole, then its path becomes visible to us.
15. Iris regulates opening and closing of pupil.
16. The crystalline lens provides the proper focal length required to focus objects at different distances on the retina.
17. Black
18. It occurs due to deposition of unwanted opaque material on the transparent eye lens due to inability of eye in old age. It can be rectified by removing that material in minor surgery and restoring normal sight.
19. Red colour has maximum wavelength and undergoes least scattering, so at the time of sunset and sunrise, the colour of sky is red near and around sun.
20. The scattering of light by particles that come in its path is known as Tyndall effect.
21. It appears to be blue to us due to scattering of light by atmospheric gases, suspended particles etc. Blue colour has minimum wavelength hence, scatters maximum.
22. Splitting of white light into its constituent colours due to refraction by prism is called dispersion of light.
23. (a) A glass slab may be considered to be made up of two prism kept inverted to each other, so effect cancels.  
(b) In a slab opposite sides are parallel, therefore,  $\angle i = \angle e$ .

## WORKSHEET-48

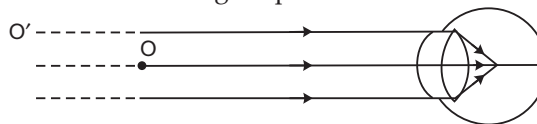
1. Stars are very far from us, so act as point source of light. Light rays from these undergo atmospheric refraction, whereas planets are near, so act as extended object hence, light rays reaching undeviated are more.
2. Density, temperature, humidity and pressure.
3. Due to refraction by smoke which is in motion also.
4. It is caused due to phenomenon of refraction and total internal reflection of light by water molecules suspended in air.
5. Ability of retina to retain image for  $\frac{1}{10}$  of a second even after removal of object is persistence of vision. It is applied in motion picture or cinematography.
6. Because deviation is inversely proportional to wavelength,  $d \propto \frac{1}{\lambda}$ .
7. The ability of the eye to adjust its focal length.

Change in curvature of the eye lens can thus change its focal length, muscle relaxed, eye lens becomes thin or thick which helps to see objects clearly.

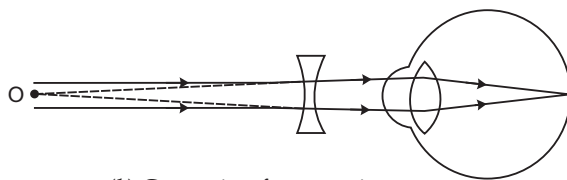
8. It is the inability of human eye to focus simultaneously for horizontal and vertical lines. It can be corrected using cylindrical lenses.
9. The light of star when enters earth's atmosphere undergoes, refraction and the light bends towards the normal as light travels from rarer to denser medium. So the position of star appears slightly higher than its actual position in the sky.



10. Myopia, because  $-1D = -1 \text{ m}$  focal length spectacles of concave lens.



(a) Myopic eye



(b) Correction for myopia

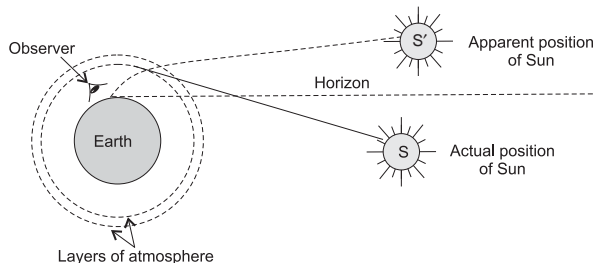
(a) The myopic eye, and (b) correction for myopia with a concave lens.

## WORKSHEET-49

- Due to atmospheric refraction, the sun is visible to us much before actual sunrise and much after the sun has set. The density of air is higher near the surface of the earth, so when rays are entering the atmosphere they bend towards the normal and appear to come from  $S'$  (as shown in figure), which is apparent position of the sun.

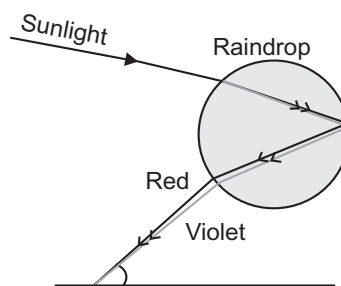
That is why the sun is visible to us, even if it is below the horizon.

Similarly, the sun is visible even when it is actually set. This time difference is about 2 minutes during sunrise and 2 minutes during sunset.

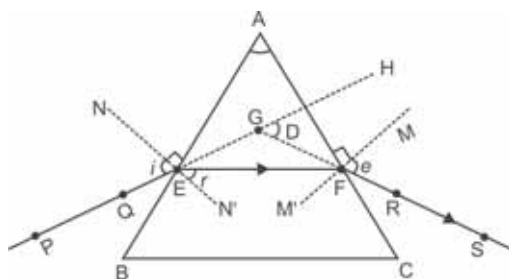


- The rainbow is formed due to the dispersion of sunlight by water droplets suspended in the atmosphere after rainfall. This phenomena is due to the combination of the refraction of sunlight by spherical water droplets which act as prisms and internal reflection occurs.

Parallel beams of light coming from sun getting dispersed at different angles of deviation produce a cone of rays at the observer's eye. The rainbow, therefore, appears as an arc of a circle for an observer on the earth.



- (a) PE—Incident ray      (b) FS—Emergent ray  
(c)  $\angle D$ —Angle of deviation



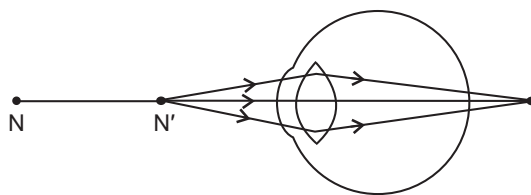
4. **Power of accommodation:** It is the ability of an eye to focus near and the far objects clearly on the retina by adjusting its focal length. Ciliary muscles help in doing so.

**Near point:** It is the nearest point up to which eye can see objects clearly. Its value is 25 cm for a normal eye.

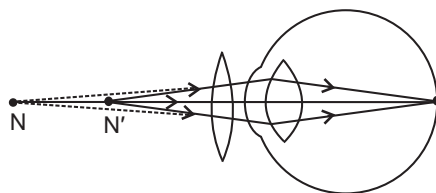
**Far point:** It is the farthest distance upto which an eye can see clearly. Its value is infinity for a normal eye.

### WORKSHEET-50

1. He is suffering from hypermetropia. It can be corrected by using convex lens of suitable focal length.

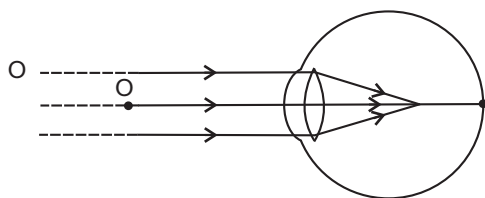


Hypermetropic eye

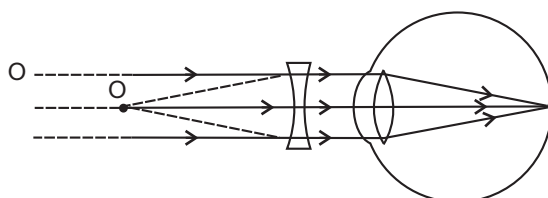


Correction of hypermetropic eye

2. He is suffering from myopia which can be corrected by using concave lens of suitable focal length.



Myopic eye

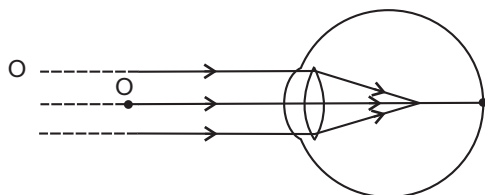


Correction of myopic eye

3. Reasons of myopia:

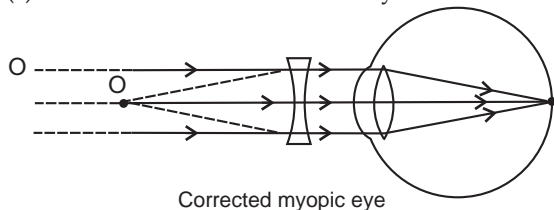
(a) Elongation of eyeball.

Concave lens is used to correct myopia.

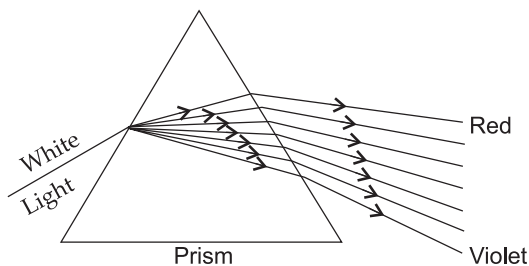


Myopic eye

(b) Exclusive curvature of the eye lens



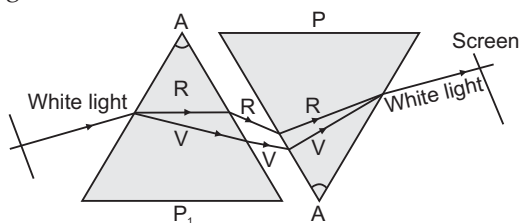
4. **Dispersion of light:** The splitting of white light into seven colours on passing through a transparent medium like glass prism is called dispersion of light.



Refraction is the cause of dispersion. As a ray of light passes through a prism, the different wavelengths comprising white light undergo different deviations and hence emerge separately as seven colours.

## WORKSHEET-51

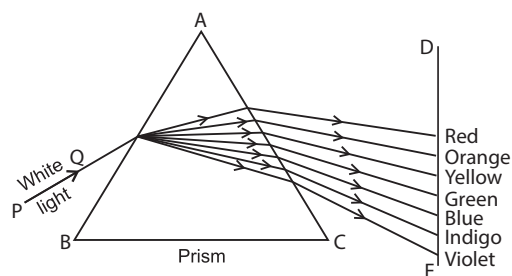
1. As white light passes through a prism, it splits into seven colours due to dispersion of light depending upon the wavelength of each constituent colour. When these colours go through second prism kept inverted, they again get refracted but in opposite direction. Hence finally emerge out, as white light.



2. At sunrise/sunset the sun looks reddish whereas at noon it appears white.

At the time of sunrise/sunset the sun rays have to travel through a larger atmospheric distance. Most of the blue light and shorter wavelengths are removed by scattering. Only red colour, which is least scattered is received by our eyes and appears to come from the sun. Hence, sun appears reddish. But at noon, the rays of sun do not have to travel a longer atmospheric distance. So no colour of light is removed by scattering, and all the seven colours of light are received by our eyes. Hence the sun appears white.

3.



- (a) This phenomenon is called dispersion of white light. It occurs because different colours of light bend through different angles with respect to the incident ray, as they pass through the prism.
- (b) In nature this phenomenon is observed in rainbow.
- (c) White light comprises of light of seven different colours, *i.e.*, violet, indigo, blue, green, yellow, orange and red.

### WORKSHEET-52

1. (i) **Myopia** is short sightedness, the image is formed in front of retina due to the elongation of the eye ball or due to decrease of focal length.

**Correction:** Using concave lens.

- (ii) **Hypermetropia** is long sightedness, the image is formed behind the retina due to shortening of eyeball or due to increase in the focal length of the lens of eye.

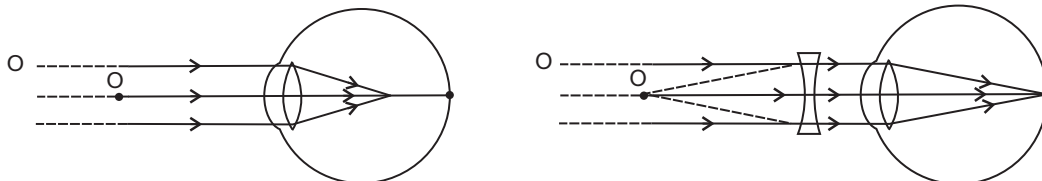
**Correction:** Using convex lens.

- (iii) **Presbyopia:** It is the defect of an eye in which the power of accommodation of the eye usually decreases with ageing. Near point changes as well as the far off objects are also not visible clearly. It is caused due to the weakening of ciliary muscles and the reduced flexibility of eye lens.

Such a defect in which a person suffers from both myopia and hypermetropia is called presbyopia. It is corrected by using bifocal lens.

2. Myopia is an eye defect also called short sightedness – person can see nearby objects clearly but cannot see far off objects clearly. It may be caused by increase in the size of eyeball or due to the decrease in the focal length of the eye lens.

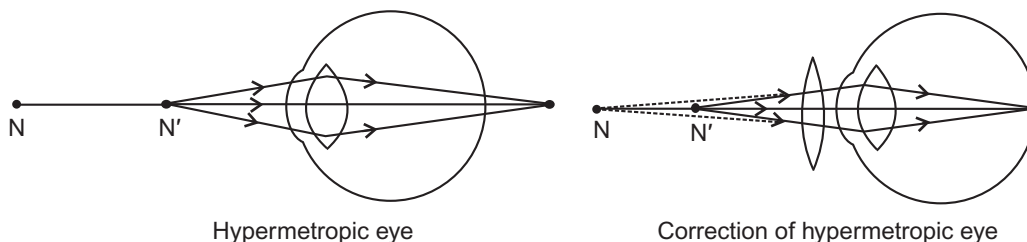
**Correction:** It can be corrected by using concave lens of appropriate focal length.



3. **Hypermetropia:** It is also called long sightedness. The person with this eye defect can see far off objects but cannot see nearby objects clearly. The image is formed beyond retina.

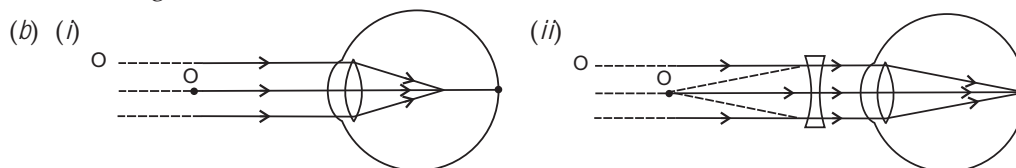
**Correction:** It can be corrected by using a convex lens. It is a converging lens which shifts the image of the object on the retina.





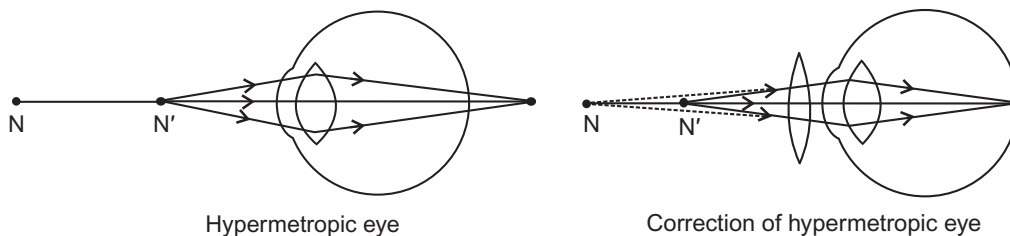
### WORKSHEET-53

1. (a) He is suffering from myopia. This defect can be rectified by using a concave lens of suitable focal length.



(c) Helping others.

2. (a) The person is suffering from hypermetropia



(b) Such advertisements make us aware of the fact that cornea and retina can be easily transplanted which can help another blind to see.

3. (a) Myopia, short sightedness

(b) Lens defect (increased thickness), eye ball defect (shortening).

(c) Friendship and concern for each other.

### WORKSHEET-54

1. (a) The air just above the fire becomes hotter than the air further up. The hotter air is less dense than the cooler air. Since the physical conditions of the refracting medium are not stationary, the apparent position of the object as seen through the hot air fluctuates.

(b) When white light passes through a triangular glass prism at an angle, the light beam is bent or refracted. The speed of light through the prism varies slightly with the wavelength of colours. Thus each colour is refracted at a slightly different angle.

(c) The maximum wavelength is of red colour.

2. (a) (i) **Myopia:** It is short sightedness, the image is formed in front of retina due to the elongation of the eye ball or due to decrease of focal length of eye lens.

**Correction:** Using concave lens.

(ii) **Hypermetropia:** It is long sightedness, the image is formed behind the retina due to shortening of eyeball or due to increase in the focal length of the lens of eye.

**Correction:** Using convex lens.

(iii) **Presbyopia:** It is the defect of an eye in which the power of accommodation of the eye usually decreases with ageing. Near point changes as well as the far off objects are also not visible clearly. It is caused due to the weakening of ciliary muscles and the reduced flexibility of eye lens.

Such a defect in which a person suffers from both myopia and hypermetropia is called presbyopia.

**Correction:** It is corrected by using bifocal lens.

(b) (i) Students can talk to different people to make them aware about donation of cornea after death.

(ii) These defects can be minimised by removing vitamin A deficiency.

Hence, students can talk about it.

3. (a) (i) **Cornea:** The transparent spherical membrane covering the front of the eye is known as cornea. The light coming from objects enters into eye through cornea. The outer surface of cornea is bulging out. Most of the refraction of light rays entering the eye occurs at the out surface of the cornea.

(ii) **Iris:** The coloured diaphragm between cornea and the lens is iris. It controls the size of the pupil.

(iii) **Pupil:** The middle point of iris has a hole, which is called pupil. Pupil regulates and controls the amount of light entering the eye.

(iv) **Crystalline lens:** It merely provides the finer adjustment of focal length require to focus objects at different distances on the retina.

(b) Retina is the screen of the eye on which image is formed. It consists of lot of light sensitive cells called rods and cones. These cells get activated on illumination and produce electrical signals.

(c) We should increase the awareness in people and motivate them to donate their eyes after death. We should ask our parents and friends to make a commitment to donate the eyes after death. Doing this one can help the blind to see.

#### WORKSHEET-55

1. (b)   2. (c)   3. (d)   4. (d)   5. (b)   6. (a)   7. (d)   8. (c)   9. (d)   10. (d)  
11. (b)   12. (c)   13. (a)

#### WORKSHEET-56

1. (c)   2. (a)   3. (c)   4. (d)  
1. (a) It is the angle of inclination between the two rectangular refracting faces of the prism.  
(b) To perform the experiment to trace the path of rays of light through a glass prism following materials are required:

A drawing board, few drawing pins or sellotape, a glass prism, a few sharp pointed alpins, three white paper sheets, a measuring scale, a pencil and a protractor.

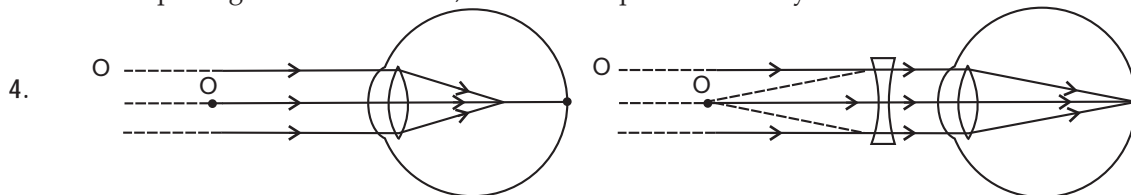
- PQ – incident ray,                      RS – emergent ray  
 QR – refracted ray,                       $\angle A$  – angle of prism  
 $\angle MQP$  – angle of incidence           $\angle NRS$  – angle of emergence  
 $\angle RQN'$  and  $\angle QRM'$  – angle of refraction
- Following precautions should be taken:

  - Prism should be within the boundary made all through the experimentation.
  - Pins should be fixed vertically to the plane of the paper.
  - The distance between the pins should be at least 5 cm.
  - Protractor should be used correctly to measure the angles.
  - Angle of incidence should be taken between  $30^\circ$  and  $60^\circ$  to observe the refraction clearly.
- The angle between emergent ray and the normal at the second refracting surface of prism is called angle of emergence.

$$\angle e = 90^\circ - 45^\circ = 45^\circ$$

### CHAPTER TEST

- Persistence of vision.
- Blue and green.
- The near point greater than 25 cm, whereas far point is infinity.



- No, because formation of rainbow is due to atmospheric refraction, and the atmosphere at moon is negligible.
- Reasons of myopia:
  - Elongation of eyeball.
  - Excessive curvature of the eye lens.
 Concave lens is used to correct myopia.
- Colour of sky is blue due to scattering of light. Blue has minimum wavelength so scattered maximum.
  - Sun can be seen 2 minutes before actual sunrise due to atmospheric refraction.
  - We cannot see objects clearly if it is placed very close to eyes because our near point is 25 cm.
- $v = -1.5 \text{ cm}$ ,  $u = -\infty$

As we know,

$$\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$$

$$\Rightarrow \frac{1}{f} = -\frac{1}{1.5} + \frac{1}{\infty}$$

$$\Rightarrow \frac{1}{f} = \frac{-1}{1.5} + 0$$

$$\therefore f = -1.5 \text{ cm}$$

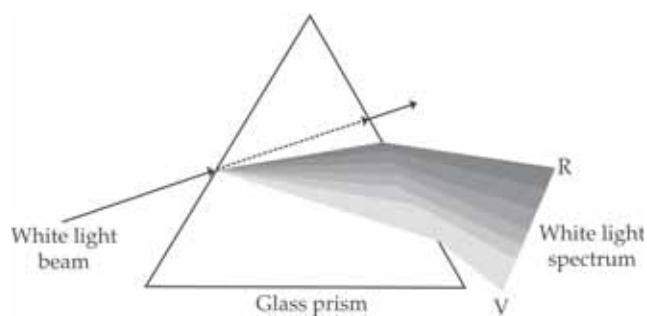
$$\therefore P = -\frac{1}{1.5} = -\frac{10}{15}$$

$$\therefore P = -0.66 \text{ D.}$$

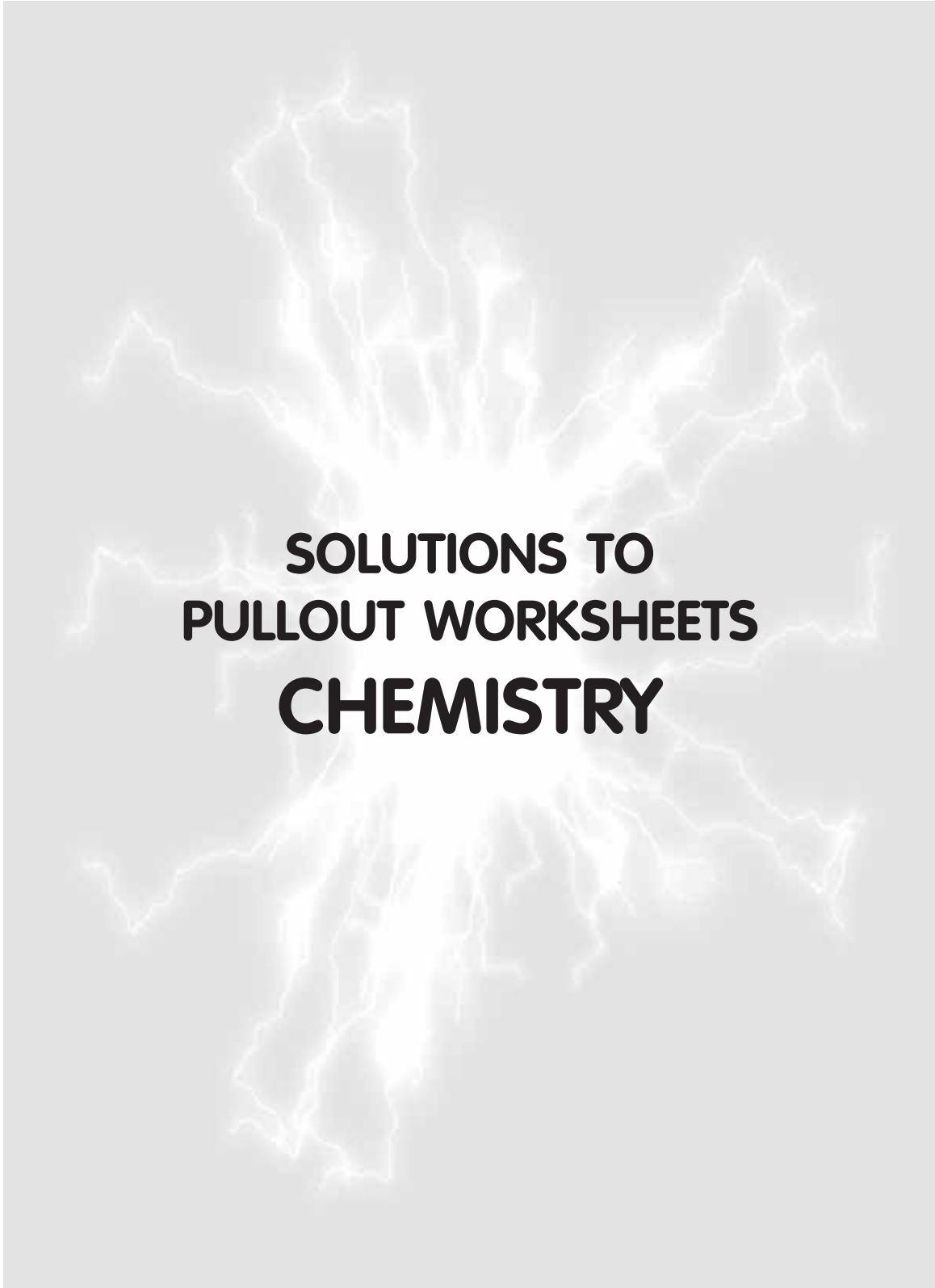
Concave lens should be used.

9. Splitting of white light into seven constituent colours due to refraction is called dispersion of light.

(a)



(b) Scattering of light by suspended colloidal particles is called Tyndall effect.



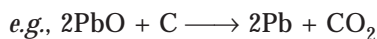
**SOLUTIONS TO  
PULLOUT WORKSHEETS  
CHEMISTRY**

## 1

## CHEMICAL REACTIONS AND EQUATIONS

## WORKSHEET-58

1. These reactions in which process of oxidation and reduction takes place simultaneously are called redox reactions,



2. Thermal decomposition reaction



3. This is because gold and silver are noble metals. Thus they don't react with air, water and acids.

4. The reaction between slaked lime and carbon dioxide to form calcium carbonate and water is used for white washing.



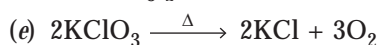
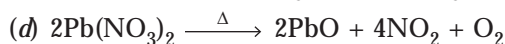
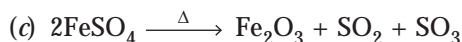
5.  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$

6. Reaction between sodium chloride and silver nitrite to form insoluble silver chloride.

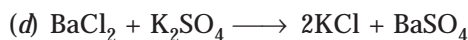
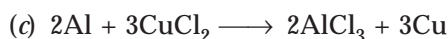


7. An equation is balanced in order to satisfy law of conservation of mass according to which total mass of the reactants is equal to the total mass of the products, *i.e.*, mass can neither be created nor be destroyed during any chemical change.

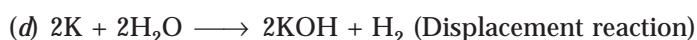
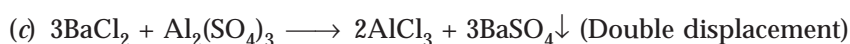
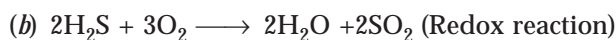
8. (a)  $\text{BaCl}_2 + \text{H}_2\text{SO}_4 \longrightarrow \text{BaSO}_4 + 2\text{HCl}$



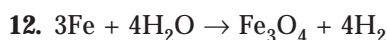
9. (a)  $\text{Ca}(\text{OH})_2 + \text{CO}_2 \longrightarrow \text{CaCO}_3 + \text{H}_2\text{O}$



10. (a)  $3\text{H}_2 + \text{N}_2 \longrightarrow 2\text{NH}_3$  (Combination reaction)



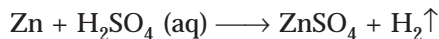
11. It is based on law of conservation of mass.



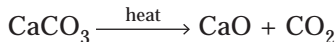
## WORKSHEET-59

- $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2$ . It is already balanced. Type of reaction: combination reaction.
- (i) Substance getting oxidised is Al, as it involves gain of oxygen.  
Substance getting reduced is  $\text{Fe}_2\text{O}_3$ , as it involves loss of oxygen.  
(ii) Substance getting oxidised is C, as it involves gain of oxygen.  
Substance getting reduced is PbO, as it involves loss of oxygen.
- Those reactions in which a more reactive metal displaces a less reactive metal from its salt solution is called displacement reaction,  
*e.g.*,  $\text{Fe}(\text{s}) + \text{CuSO}_4(\text{aq}) \longrightarrow \text{FeSO}_4(\text{aq}) + \text{Cu}(\text{s})$   
While those reactions that involve exchange of ions are called double displacement reactions,  
*e.g.*,  $\text{NaCl}(\text{aq}) + \text{AgNO}_3(\text{aq}) \longrightarrow \text{AgCl} \downarrow + \text{NaNO}_3(\text{aq})$
- (a) Decomposition reaction.  
(b) 
$$2\text{FeSO}_4(\text{s}) \xrightarrow{\text{heat}} \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$$

Ferrous sulphate                  Ferric oxide          Sulphur dioxide          Sulphur trioxide
- The food we eat contains carbohydrates. On digestion, these carbohydrates breakdown into glucose. During respiration this glucose combines with oxygen in the cells of our body and converts it into carbon dioxide and water with release of heat energy. Hence, respiration is an exothermic process.
- When dilute sulphuric acid is poured on zinc granules, bubbles of hydrogen gas are evolved from the surface of zinc metal and the reaction mixture becomes hot.



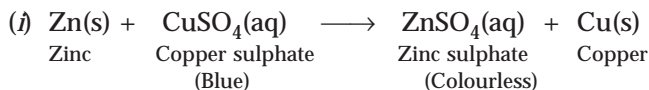
- The process of decomposition carried out under the effect of heat is called thermal decomposition. Here, a single reactant breaks down to form simpler products, *e.g.*



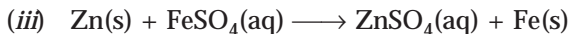
## WORKSHEET-60

- Iron which is coated with molten zinc by dipping iron in molten zinc is called galvanised iron. Zinc is more reactive than iron. On coating zinc over iron which has a better tendency to get oxidised as compared to iron easily gets oxidised on exposure to moist air and saving iron from being rusted.
- Exothermic reactions.** Those reactions which proceed with the evolution of heat energy are called exothermic reactions, *e.g.*, burning of fuels, respiration.  
**Endothermic reactions.** Those reactions which proceed with the absorption of heat energy are called endothermic reactions, *e.g.*, decomposition of calcium carbonate using heat energy.
- Decomposition of calcium carbonate gives calcium oxide and carbon dioxide. Calcium oxide obtained is used in the manufacture of cement.
- The oxidation of oil and fats present in food materials to form products that have bad odour and taste is called rancidity.
- Oil and fat containing food items are generally flushed with nitrogen to prevent the oxidation of oil and fats. Nitrogen being an inert gas does not react with oils and fats, prevents the oxidation of oils and fats and thus, they last longer without turning rancid.

6. Reaction (i) and (iii) are possible



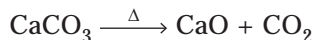
Zinc is more reactive than copper, therefore, it can displace copper from copper sulphate solution.



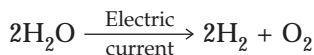
Zn is more reactive than Fe, therefore, it can displace iron from ferrous sulphate solution.

Reaction (ii) is not possible as iron is less reactive than zinc, hence, it cannot displace Zn.

7. Decomposition of calcium carbonate using heat energy.



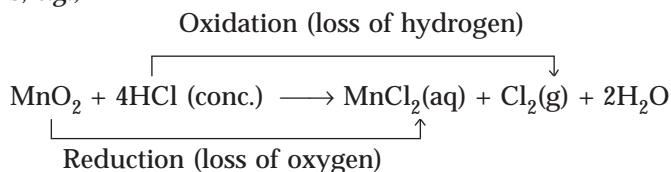
Electrolysis of water using electric current.



Decomposition of silver chloride using light.



8. Those reactions in which oxidation and reduction take place simultaneously are called redox reactions, e.g.,

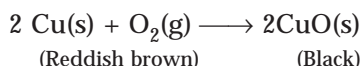


MnO<sub>2</sub> is getting reduced to MnCl<sub>2</sub>.

HCl is getting oxidised to Cl<sub>2</sub>.

## WORKSHEET-61

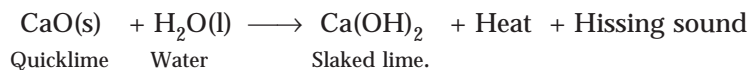
1. A brown coloured element 'X' is copper. On heating in air it turns black due to the oxidation of copper into copper oxide.



2. Reddish brown copper metal will get deposited over iron and solution will become pale green.



3. Quicklime reacts with water to form slaked lime.



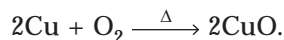
4. It becomes grey. It is photochemical decomposition reaction.

Substance oxidized	:	HCl
Substance reduced	:	MnO <sub>2</sub>
Oxidizing agent	:	MnO <sub>2</sub>
Reducing agent	:	HCl.



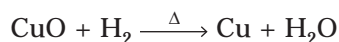
## WORKSHEET-62

1. (a) Oxidation is a process of addition of oxygen to a substance or removal of hydrogen from a substance, *e.g.*,



Copper is getting oxidised to CuO, as oxygen is added to copper.

- (b) It is the process of removal of oxygen from a substance or addition of hydrogen to a substance, *e.g.*,



Copper oxide is reduced to copper as it involves removal of oxygen.

2. (a) Substance getting oxidised —  $\text{H}_2$  to  $\text{H}_2\text{O}$   
Substance getting reduced —  $\text{CuO}$  to  $\text{Cu}$
- (b) Substance getting oxidised —  $\text{HCl}$  to  $\text{Cl}_2$   
Substance getting reduced —  $\text{MnO}_2$  to  $\text{MnCl}_2$
- (c) Substance getting oxidised —  $\text{H}_2\text{S}$  to  $\text{S}$   
Substance getting reduced —  $\text{SO}_2$  to  $\text{S}$
- (d) Substance getting oxidised —  $\text{Na}$  to  $\text{Na}^+$   
Substance getting reduced —  $\text{O}_2$  to  $\text{O}^{2-}$
3. (a) Green to white, then brown  
(b) Water  
(c) As of burning sulphur  
(d) Ferric oxide, sulphur dioxide, sulphur trioxide  
(e) Decomposition reaction.
4. (a) When the fat and oil containing food materials are left for a long time, fats and oils are oxidised, they become rancid and their smell and taste change.  
(b) To prevent spoilage of food, special type of substances, called antioxidants are added to fatty foods, *e.g.*, chips are packed into nitrogen gas which prevents spoilage of chips by oxidation. Oxidation process can be slowed down by reducing the temperature. The food is kept in refrigerator to slow down the process of oxidation.  
(c) Concern for health, awareness.

## WORKSHEET-63

1. (a) Decomposition reaction of a single reactant. Iron sulphate decomposes under the effect of heat to form more than one product.  
(b)  $2\text{FeSO}_4(\text{s}) \longrightarrow \text{Fe}_2\text{O}_3(\text{s}) + \text{SO}_2(\text{g}) + \text{SO}_3(\text{g})$   
(c) The colour of ferrous sulphate changes from green to reddish brown as it undergoes decomposition on heating and changes into ferric oxide which is reddish brown in colour.  
(d) The pungent smelling gases formed are sulphur dioxide and sulphur trioxide. Odour of burning sulphur is experienced.
2. (a) Avik has better eating habit.

- (b) Nitrogen gas is filled in packets of chips to prevent spoilage of chips by oxidation.  
 (c) Concern for health.

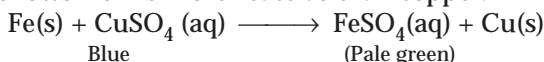
### WORKSHEET-64

1. (b) 2. (c) 3. (d) 4. (d) 5. (a) 6. (a) 7. (a) 8. (c) 9. (c) 10. (d) 11. (c) 12. (b) 13. (a)

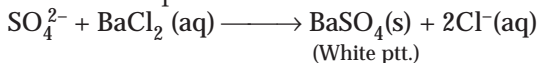
### WORKSHEET-65

- It is because iron container will be very hot as the reaction is exothermic
- The colour of solution will change from blue to pale green due to formation of  $\text{FeSO}_4$  and reddish brown copper metal will get deposited.

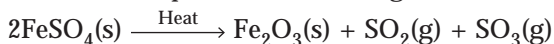
It shows iron is more reactive than copper.



- Add barium chloride solution. If white precipitate is formed, presence of  $\text{SO}_4^{2-}$  ion is confirmed. The product formed is soluble in conc. HCl.

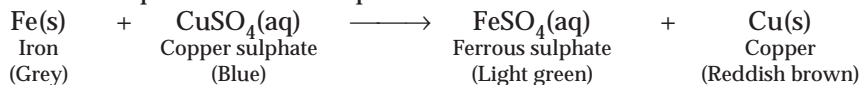


- When ferrous sulphate is heated, it gives ferric oxide, sulphur dioxide and sulphur trioxide.



It is a decomposition reaction.

- Crystals of ferrous sulphate are green in colour. On heating, the colour of crystals changes to brown and a colourless gas with a smell of burning sulphur is evolved.
- A new substance  $\text{Ca(OH)}_2$  is formed with hissing sound. Outer surface of beaker is hot as heat is evolved during the reaction. It is a combination reaction.
- When iron nails are immersed in copper sulphate solution, iron ions displace copper ions and a new compound ferrous sulphate is formed.



It is a displacement reaction.

- On mixing the solutions of sodium sulphate and barium chloride, a white precipitate of barium sulphate is obtained.



It is a double displacement reaction.

### CHAPTER TEST

- Vigorous bubbling with evolution of heat and hissing sound.
- $\text{MnO}_2$  is reduced whereas HCl is oxidised.
- Silver chloride turns grey in sunlight because silver chloride decomposes in the presence of sunlight to form grey-silver.
- This is because iron is a more reactive metal than copper. Iron thus displaces copper from its salt solution due to which iron metal gets used up leading to holes in the vessel.

5. (a) The oxidation of oil and fats present in food materials to form products that have bad odour and taste is called rancidity.
- (b) Three different methods used to prevent the food from getting rancid are:
1. Keep food in airtight containers.
  2. Addition of antioxidants to foods containing fats and oil.
  3. Flushing of food items with nitrogen or refrigeration of food items.
6. Combination reaction: Those reactions in which two or more than two substances (elements or compounds) combine to form a single product are called combination reactions.
- e.g.*,  $\text{CaO} + \text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2$
- The reaction between quicklime (CaO) and water to form slaked lime,  $\text{Ca(OH)}_2$  is a highly vigorous and an exothermic reaction.
7. (a) When lead nitrate crystals are heated strongly, it decomposes to form lead oxide, and gases oxygen and nitrogen dioxide are evolved.
- Observation.** (a) Reddish-brown fumes of  $\text{NO}_2$  gas are evolved. (b) Yellow residue of lead oxide is left behind. (c) Crackling sound is heard.
- (b)  $2\text{Pb(NO}_3)_2 \xrightarrow{\Delta} 2\text{PbO(s)} + 4\text{NO}_2(\text{g}) + 2\text{O}_2(\text{g})$
- (c) Decomposition reaction.
8. (a) 'X' is magnesium and Y is magnesium oxide.
- (b)  $\text{MgO} + \text{H}_2\text{O} \longrightarrow \text{Mg(OH)}_2$
- (c) Mg is cleaned with a sand paper before burning to evolve the oxide layer formed on its surface due to its contact with air. This oxide layer slows down the process of combustion.
9. (a) A is zinc, B is iron and C is copper sulphate solution.
- (b)  $\text{Zn(s)} + \text{CuSO}_4(\text{aq}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Cu(s)}$   
 $\text{Fe(s)} + \text{CuSO}_4(\text{aq}) \longrightarrow \text{FeSO}_4(\text{aq}) + \text{Cu(s)}$
- (c) Single displacement reaction.
- (d) Redox reaction.

## 2

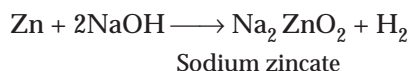
## ACIDS, BASES AND SALTS

## WORKSHEET-67

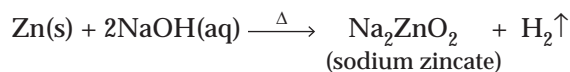
- Solution with pH 8 will be basic in nature.
- Universal indicator is a mixture of number of indicators which shows different colours over the range of pH value from 1 to 14.
- Sodium carbonate.
- Dry slaked lime  $[\text{Ca}(\text{OH})_2]$ .
- Plaster of Paris. The chemical name of the compound is calcium sulphate hemihydrate.  
Formula is  $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ .
- Acids change blue litmus paper to red. Bases have no effect.
- Hydrogen gas.
- Strong acid: Hydrochloric acid  
Weak acid : Acetic acid
- The salts of sulphuric acid are called sulphates, *e.g.*, calcium sulphate.
- For the healthy growth of the plant the pH of the soil should be neither too alkaline nor highly acidic.
- Higher is the concentration of  $\text{H}^+$  ions, greater is the acidic nature of the solution.
- Bleaching power.
- It is a mixture of baking soda and tartaric acid.
- When pH of rain water is less than 5.6, it is called acid rain.
- On dilution of an acid solution, the concentration of  $\text{H}^+$  ions decreases per unit volume.
- Methyl orange gives yellow colour in basic medium while phenolphthalein gives pink colour.
- HCl solution shows acidic properties as it contains  $\text{H}^+$  ions, which is responsible for the acidic nature.
- Calcium oxychloride commonly known as bleaching power. Formula is :  $\text{CaOCl}_2$ .
- Water of crystallisation is the fixed number of water molecules chemically attached to each formula unit of a salt in its crystalline form, *e.g.*, copper sulphate has five water molecules of crystallisation.
- Alkali, *e.g.*, sodium hydroxide (NaOH).
- On electrolysis of brine, chlorine gas is released at anode and hydrogen gas at cathode.
- Acidic salt : Ammonium chloride  
Basic salt : Sodium acetate

## WORKSHEET-68

- Zinc being amphoteric in nature can react with NaOH.



2. (a) Olfactory indicators.  
 (b) For example, clove oil. It gives different odour in different medium, *i.e.*, acidic and basic medium.
3. On adding methyl orange to test tubes A and C containing NaOH and Mg(OH)<sub>2</sub>, **yellow colour** is produced while **pink colour** is produced in test tube B containing acetic acid.
4. (a) Hydrogen gas.  
 (b) Bring a burning splinter near the mouth of the test tube containing hydrogen gas. It burns with a pop sound.  
 (c) It is lighter than air.  
 (d) The above gas is collected by downward displacement of water, as it is insoluble in water.
5. If few pieces of granulated zinc is warmed with 5 ml of NaOH solution, hydrogen gas is evolved along with the formation of sodium zincate.



6. The black colour of copper oxide changes to bluish green because copper oxide reacts with dilute hydrochloric acid to form copper (II) chloride which is bluish green.  
 A neutralisation reaction takes place between copper oxide and dilute hydrochloric acid.



7. Curd and sour substances are not stored in brass and copper vessels as they are acidic in nature. The acids present in them may react with metals to form toxic compounds which are unfit for human consumption.
8. Although alcohol and glucose contain hydrogen but they do not ionise in solution to produce H<sup>+</sup> ions, which are responsible for the acidic properties of a substance. On the other hand, HCl and HNO<sub>3</sub> furnish H<sup>+</sup> ions in solution and thus, show acidic property.
9. (a) Concentration of solution with pH 6 = 10<sup>-6</sup> M and

$$\text{pH } 8 = 10^{-8} \text{ M}$$

The solution containing pH of 6 has higher hydrogen ion concentration than the solution with pH 8.

- (b) Solution of pH 6 is acidic in nature.
10. The solution is basic in nature as it turns red litmus blue. The pH of this solution will be more than 7.

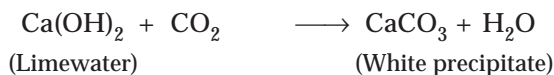
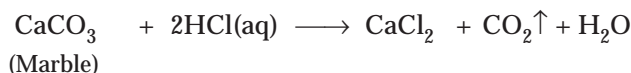
### WORKSHEET-69

1. Compound is bleaching powder, CaOCl<sub>2</sub>. Chlorine gas is released as it reacts with CO<sub>2</sub> present in air according to the following equation,



2. The formation of H<sup>+</sup> ions is responsible for the acidic properties of the substance. Since acids cannot furnish H<sup>+</sup> ions in the absence of water, they cannot show acidic properties.

3. When dilute hydrochloric acid is added in a test tube containing few pieces of marble, a colourless gas with brisk effervescence is evolved. The gas evolved is carbon dioxide. On passing the evolved gas through limewater, it turns milky due to the formation of insoluble calcium carbonate.



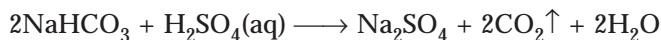
4. Plaster of Paris ( $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ ) has a strong tendency to absorb moisture and gets converted into gypsum ( $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ ) which sets into a hard mass. Thus, to prevent its contact with moisture, it is stored in moisture proof container.
5. Distilled water is pure water which does not contain any dissolved salts or gases. Rainwater contains dissolved gases like  $\text{CO}_2$  and  $\text{SO}_2$  which, in turn, produce acids like carbonic acid ( $\text{H}_2\text{CO}_3$ ), sulphurous acid ( $\text{H}_2\text{SO}_3$ ) and dissociate into ions. Formation of ions in rain is responsible for the conduction of electricity in rain water while due to absence of ions in distilled water, it does not conduct electricity.
6. Lower is the pH of the substance, higher is its acidic strength. Therefore, a substance having pH of 2.4 has higher acidic strength while pH of 6.8 has lowest acidic strength. Thus, the increasing acidic strength is : B > A > C.
7. Antacids are mild non-corrosive bases which are used to neutralise the excess acidity in the stomach, *e.g.*, sodium hydrogen carbonate ( $\text{NaHCO}_3$ ) and milk of magnesia ( $\text{Mg}(\text{OH})_2$ ).
8. Soluble bases are called alkalis, *e.g.*, sodium hydroxide ( $\text{NaOH}$ ).
9.  $\text{Ca}(\text{OH})_2(\text{s}) + \text{Cl}_2(\text{g}) \longrightarrow \text{CaOCl}_2(\text{s}) + \text{H}_2\text{O}$   
 Slaked lime Chlorine (Bleaching powder)
10.  $2\text{NaHCO}_3 \xrightarrow{\Delta} \text{Na}_2\text{CO}_3 + \text{CO}_2 + \text{H}_2\text{O}$   
 Sodium Carbon Water  
 carbonate dioxide

## WORKSHEET-70

1. pH is a number which indicates the acidic or basic nature of the solution. The pH of a solution is expressed in terms of hydrogen ion concentration. Higher is the hydrogen ion concentration, lower is the pH.

pH of a neutral solution is 7. pH of an acidic solution is less than 7 and lies between 1-7 while pH of a basic solution is greater than 7 and lies between 7-14.

2. (a) When baking soda is used for baking purposes, on heating at high temperature it decomposes and evolves carbon dioxide gas. This carbon dioxide gas evolved helps the cake to rise and makes it soft and spongy.
- (b) Sodium bicarbonate is used in soda-acid fire extinguisher. It reacts with acid to evolve, carbon dioxide gas which is a non-supporter of combustion and is heavier than air. Thus, it settles on the burning substance and cuts off the supply of oxygen and extinguishes it.

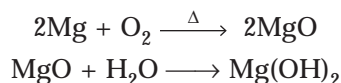


- (c) Its pH is more than 7.

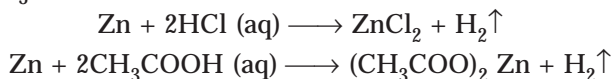
3. The strength of an acidic or basic solution depends on the number of  $H^+$  ions and  $OH^-$  ions produced. Higher is the concentration of the  $H^+$  ions, more acidic is the solution and vice versa. Similarly higher is the concentration of  $OH^-$  ions, more basic is the solution. This can be done by measuring the pH of the solution. If the pH of the solution is less than 7, it is acidic in nature and if the pH of the solution is more than 7 it is basic in nature.

4. Metallic oxide is basic in nature.

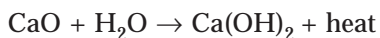
Take a small piece of magnesium ribbon and burn it in air. White powder of magnesium oxide is formed. Dissolve this white powder in water by heating. Now check it with both red and blue litmus papers. We will observe that red litmus turns blue indicating that metallic oxides are basic oxides.



5. The reaction of granulated zinc with dilute HCl will be faster than that with dilute acetic acid. This is because HCl being a stronger acid will furnish greater concentration of  $H^+$  ions as compared to  $CH_3COOH$  which is a weaker acid.



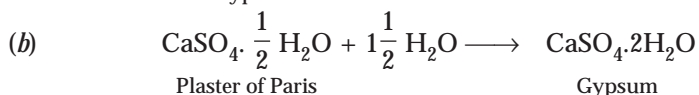
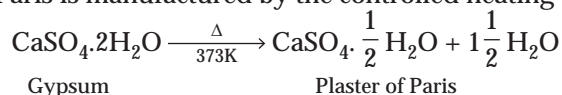
6. Calcium oxide/Quicklime/ $CaO$



Product : Calcium hydroxide/slaked lime

## WORKSHEET-71

1. (a) Plaster of Paris is manufactured by the controlled heating of gypsum at 373 K.



Mixing of plaster of Paris with appropriate quantities of water results into formation of hard mass called gypsum.

(c) 1. It is used to set the fractured bones in right position.

2. It is used for making toys.

(d) In plaster of Paris, there are two formula units of calcium sulphate that share one molecule of water, *i.e.*,  $(CaSO_4)_2 \cdot H_2O$ . Hence, one formula unit will have  $\frac{1}{2}$  molecule of water and is written as  $CaSO_4 \cdot \frac{1}{2} H_2O$ .

2. Baking soda/ $NaHCO_3$

Tartaric acid (a mild edible acid)

Baking soda releases  $CO_2$  on heating and causes the cake to rise/ make it soft and spongy.

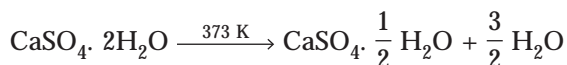
Tartaric acid neutralizes the effect of (bitter taste) of the sodium salt of the acid formed.

3. (a) On conversion of milk into curd, its pH will decrease and will become less than 6. The pH decreases as curd is more acidic than milk due to the presence of lactic acid. More acidic is the substance, lesser is its pH.

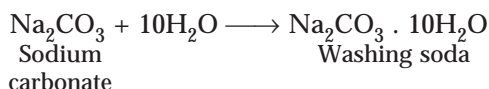
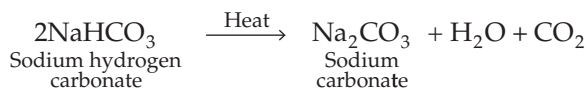
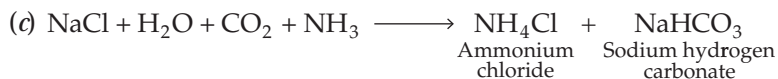
- (b) (i) Milk is acidic in nature and turns more acidic and is sour to taste if kept for few hours, due to the formation of lactic acid. To prevent the formation of lactic acid and spoiling of milk, baking soda is added. Baking soda being alkaline in nature prevents it to become more acidic.
- (ii) This is due to the presence of baking soda in milk which is alkaline in nature and prevent the milk from turning into lactic acid which is present in curd and thus, delays its setting.
- (c) (i) It is used as an ingredient in antacids.
- (ii) It is used in soda-acid fire extinguishers.
- (d) Sodium hydrogen carbonate is an essential ingredient in antacids due to its alkaline nature. Being alkaline, it neutralizes excess acid in the stomach and provide relief.

### WORKSHEET-72

- (a) Oily and spicy food items like *pani-puri*, *papri chat*, etc. are when consumed, they increase the pH of our stomach leading acidity and indigestion.
  - (b) Antacid, e.g., milk of magnesia.
  - (c) Love for health.
- (a) Chemically, plaster of Paris is calcium sulphate hemihydrate ( $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$ ). Plaster of Paris is obtained by heating gypsum ( $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ ) at 373 K in a kiln.



- (b) Love for environment, environmental cleanliness.
- (a) Tooth enamel is made up of calcium phosphate. Chocolates and sweets produce acids in our mouth which react with enamel (calcium phosphate) and leads to cavities.
  - (b) We should brush our teeth after every meal as well as after eating sweets.
  - (c) Concern for health, obedience.
- (a) Compound X is washing soda. Its chemical formula is  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ .
  - (b) There are 10 molecules of water of crystallization present in washing soda.



### WORKSHEET-73

- (a) Solution D with pH 7 is neutral.
- (b) Solution C with pH 11 is strongly alkaline.
- (c) Solution B with pH 1 is strongly acidic.
- (d) Solution A with pH 4 is weakly acidic.
- (e) Solution E with pH 9 is weakly alkaline.

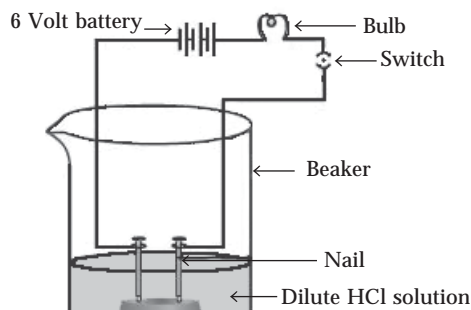


**2. Aim:** To show that hydrochloric acid solution conducts electric current.

**Materials Required:** 100 ml beaker, 6 volt battery, bulb, switch, rubber corks, dilute hydrochloric acid.

**Procedure:** Fix two nails on the corks and connect the nails to the two terminals of the 6 V battery through a bulb and a switch as shown in the figure.

- Now pour about 50 ml of dilute hydrochloric acid in the beaker and switch on the current.
- We will observe that bulb starts glowing indicating that the solution conducts electric current.



### WORKSHEET-74

1. (a) 2. (d) 3. (a) 4. (c) 5. (b) 6. (d) 7. (a) 8. (b) 9. (a) 10. (a) 11. (a)  
12. (d) 13. (c) 14. (b) 15. (b) 16. (b) 17. (b)

### WORKSHEET-75

1. (d) 2. (c) 3. (d) 4. (b)

1. Take a pH paper. Add a drop of lemon juice on it. Observe the change in colour. It will turn light red. It shows lemon juice is acidic in nature. Its pH is 2.2.
2. The colour at the top of pH paper is red and at the bottom is violet. The pH of  $10^{-2}$  M HCl is 2.

$$\text{pH} = -\log [\text{H}^+] = -\log 10^{-2} = 2.$$

3. Milk of magnesia is  $\text{Mg}(\text{OH})_2$ . It is used as antacid. Its pH will be equal to 10 because it is basic in nature.
4. Take NaOH solution in a clean test tube. Add two drops of NaOH solution on pH paper with the help of glass rod. Observe the colour change and compare it with colour chart.  
pH of NaOH is greater than 7. It is a strong base.
5. We can draw following inference:  
The pH of solution A is 5–6, hence it is a weak acid.  
The pH of solution B is 0–2, hence it is a strong acid.  
The pH of solution C is 12–14, hence it is a strong base.  
The sequence of increasing order of the pH value of samples is  $B < A < C$ .
6. Following precautions should be taken while finding the pH of lemon juice:
  1. Fresh juice from the lemon should be extracted in a clean test tube.
  2. Dilute solution of lemon juice should be used.
  3. pH paper should not be touched with unclean and wet hands.

### WORKSHEET-76

1. (b) 2. (b) 3. (d) 4. (c) 5. (c) 6. (b) 7. (b) 8. (d) 9. (c) 10. (b) 11. (c) 12. (a)

### WORKSHEET-77

1. (d) 2. (b) 3. (b) 4. (b) 5. (d) 6. (b) 7. (a) 8. (a) 9. (c) 10. (c)

## WORKSHEET-78

- (i) Take small amount of Zn and HCl, otherwise large amount of H<sub>2</sub> will be formed which may cause explosion.

(ii) H<sub>2</sub> should be burnt very carefully.
- (i) Touching NaOH may cause burns and tasting any chemical is harmful.

(ii) Red litmus will turn blue with NaOH solution whereas blue litmus will remain as it is.
- CO<sub>2</sub> gas is formed. On passing the gas through lime water, it becomes milky.
- When zinc granules are added to dil. HCl acid, hydrogen gas is formed. To test the gas formed, a lighted matchstick is brought near the mouth of the fine jet. If the gas burns with pop sound, it is hydrogen gas.
- Zn reacts with dil. NaOH and liberates hydrogen gas.  
$$\text{Zn(s)} + 2\text{NaOH(aq)} \longrightarrow \text{Na}_2\text{ZnO}_2\text{(aq)} + \text{H}_2\text{(g)}$$
- The compound X could be Na<sub>2</sub>CO<sub>3</sub>. The gas evolved is CO<sub>2</sub> which turns lime water milky. On passing the gas in excess of lime water the milkiness disappears.

### CHAPTER TEST

- Turned blue.
- Litmus paper is not required to find pH of a solution.
- The concentration of OH<sup>-</sup> ions increases in the solution.
- (a) Water of crystallisation is the fixed number of water molecules present in one formula unit of the salt, e.g., ferrous sulphate (FeSO<sub>4</sub> · 7H<sub>2</sub>O) has 7 molecules of water of crystallisation.

(b) Copper sulphate crystals are associated with 5 molecules of water of crystallisation and are blue in colour. On heating, they lose 5 molecules of water of crystallisation and thus turn white.
- (a) NH<sub>4</sub>Cl, (NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, MgCl<sub>2</sub>.

(b) Zinc being more reactive than hydrogen can displace hydrogen from acids but nitric acid is a strong oxidising agent and thus the hydrogen gas evolved is oxidised to water.
- Acetic acid is a common preservative, which is used to stop bacterial and fungal growth in dressings, sauces, cheese and pickles.
- Take solutions of glucose, alcohol, HCl and H<sub>2</sub>SO<sub>4</sub>. Place the cork with fixed two nails in 100 ml beaker. Connect the nails to the two terminals of a 6 volts battery through a bulb and a switch. On pouring dil. HCl and H<sub>2</sub>SO<sub>4</sub> in the beaker in the state of flowing current, we see bulb will start glowing. On the other hand, glucose and alcohols do not conduct electricity when above process would be applied with both of them.
- (a) Gas evolved at cathode is hydrogen and at anode is chlorine.

(b) **Uses:** Hydrogen is used in the manufacture of fertilizer such as ammonia. Chlorine is used in the manufacture of PVC.

(c)  $2\text{NaCl (aq)} + 2\text{H}_2\text{O (l)} \longrightarrow 2\text{NaOH (aq)} + \text{Cl}_2\text{(g)} + \text{H}_2\text{(g)}$
- (a) Sodium bicarbonate (NaHCO<sub>3</sub>) and its common name is baking soda.

(b) This is because it is a mild base and can thus neutralise excess acid in the stomach.

(c) 'X' can react with sulphuric acid in the fire extinguisher and release carbon dioxide gas which is heavier than air and non-supporter of combustion and thus can extinguish fire.

(d) No, we cannot make use of baking soda, because decomposition of it. On heating, it produces sodium carbonate which will make the cake taste bitter.

# 3

## METALS AND NON-METALS

### WORKSHEET-80

1. Gallium and caesium.
2. Chromium and nickel.
3. Gold and platinum.
4. Reduction.
5. Metals which are placed at the bottom of the reactivity series like gold, platinum don't corrode easily.
6.  $\text{CO}_2$  and  $\text{SO}_2$
7. The process of removing of gangue from the ore is called concentration of ore.
8. When iron is exposed to air and moisture, it combines with oxygen and  $\text{H}_2\text{O}$  and forms hydrated iron oxide  $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ . This is known as rust.
9. Sodium and potassium.
10. Gold and silver.
11. Gold and silver.
12. The property of the metal by virtue of which it can be beaten into thin sheets upon hammering is called malleability.
13. It is the ability of the metals to be drawn into thin wires.
14. Acidic oxide: carbon dioxide, sulphur dioxide  
Basic oxide: calcium oxide, magnesium oxide  
Amphoteric: aluminium oxide, zinc oxide
15. An alkali is a highly soluble base in water. Those bases that dissolve easily in water form alkalies.  
Examples: Sodium hydroxide ( $\text{NaOH}$ ), potassium hydroxide ( $\text{KOH}$ ).
16. Sodium and potassium.
17. Hydrogen
18. Hydrogen
19. A mineral is a naturally occurring inorganic substance with a definite chemical composition whereas, an ore is a mineral from which a metal is extracted profitably and economically.
20. Gold and platinum

### WORKSHEET-81

1. The important methods to prevent rusting of iron are:  
Painting, oiling, greasing, galvanising, chrome plating and alloying.
2. An amalgam is an alloy in which one of the metals is mercury.
3.  $3\text{Fe}(\text{s}) + 4\text{H}_2\text{O}(\text{g}) \longrightarrow \text{Fe}_3\text{O}_4(\text{s}) + 4\text{H}_2(\text{g})$ .
4. Alloys are homogeneous mixture of a metal with a metal or a non-metal.
5. Metals which displace hydrogen from dilute acids are: calcium, magnesium.  
Metals which do not displace hydrogen from dilute acids are: copper, silver.

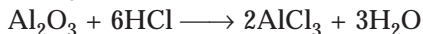
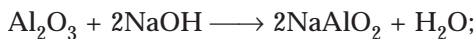
6. Sodium and potassium.
7. Zinc.
8. Gold and platinum.
9. A reaction between aluminium and iron oxide to produce aluminium oxide and iron with the liberation of heat energy and producing iron in molten state is called thermite reaction.



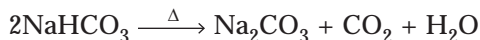
10. Bauxite,  $\text{Al}_2\text{O}_3$
11. Alloys do not get oxidised or burn readily at high temperature. Thus, they are used in electrical heating devices.
12. Large amount of unwanted impurities such as soil, sand, etc., associated with the ore are collectively called gangue.
13. 24 carat gold is extremely soft gold and is thus, not suitable for making jewellery. 22 carat gold is used, as it is hard. Gold is alloyed with Ag or Cu to make it hard.
14. Pure iron is extremely soft and stretches easily when hot. On mixing smaller amount of carbon (0.05%), it becomes hard and strong.
15. Magnesium and manganese.
16. Mercury(Hg) is the only metal that exists in liquid state at room temperature.
17. (a)  $3\text{Fe} + 4\text{H}_2\text{O} \longrightarrow \text{Fe}_3\text{O}_4 + 4\text{H}_2\uparrow$   
 (b)  $\text{Ca} + 2\text{H}_2\text{O} \longrightarrow \text{Ca(OH)}_2 + \text{H}_2\uparrow$   
 $2\text{K} + 2\text{H}_2\text{O} \longrightarrow 2\text{KOH} + \text{H}_2\uparrow$   
 (c)  $\text{Na}_2\text{O} + \text{H}_2\text{O} \longrightarrow 2\text{NaOH}$   
 (d)  $2\text{Cu} + \text{O}_2 \xrightarrow{\Delta} 2\text{CuO}$

## WORKSHEET-82

1. Alloys are made by mixing the metals in their molten state. It is prepared by first melting the primary metal and then dissolving the other metal in definite proportions. It is then cooled to room temperature.
2. Electric wires are made up of metals, which are good conductors of electricity. To prevent electric shock on touching them, they are coated with polyvinyl chloride which is a bad conductor of electricity.
3. Those metal oxides which can react with both acids as well as bases to produce salt and water are called amphoteric oxide, *e.g.*,  $\text{Al}_2\text{O}_3$  and  $\text{ZnO}$ .  $\text{Al}_2\text{O}_3$  can react with both acid (HCl) and base (NaOH) as shown below:



4. Baking powder is a mixture of baking soda and tartaric acid. When cake is baked in a oven, due to the high temperature in the oven baking soda ( $\text{NaHCO}_3$ ) decomposes and carbon dioxide gas is evolved. This gas evolved makes the cake soft and spongy.



5. Sodium metal is a highly reactive metal which vigorously reacts with oxygen present in air if kept in open and catches fire. Thus, to prevent its reactivity and prevent accidental fires it is kept immersed in kerosene oil.

- Aluminium and zinc are reactive metals which on exposure to air form an oxide layer on its surface. This oxide layer acts as a protective layer and prevents the metal beneath its surface from oxidation.
- Hydrogen gas is evolved when dilute hydrochloric acid is added to a reactive metal.
 
$$\text{Fe} + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{FeSO}_4 + \text{H}_2\uparrow$$
- Copper metal is used for making electric wires as it is:
  - good conductor of electricity.
  - highly ductile, so it can be drawn into wires.
- Calcium and magnesium. Calcium and magnesium react with hot and cold water to evolve hydrogen gas. The bubbles of the gas evolved stick to the surface of the metal and thus, being lighter floats on the surface.
- Sodium and potassium. Sodium and potassium are highly reactive metal which react vigorously with cold water to evolve hydrogen gas. The reaction is highly violent and exothermic and the evolved gas catches fire.
- Nitric acid is a strong oxidising agent. Thus, when a metal reacts with nitric acid, the  $\text{H}_2$  gas produced is oxidised to water by nitric acid and it itself gets reduced to any of the oxides of nitrogen ( $\text{NO}_2$ ,  $\text{N}_2\text{O}$ ).

### WORKSHEET-83

- When zinc is added to iron (II) sulphate solution, the green colour of the solution disappears due to occurring displacement reaction in the solution.



- Roasting is a process of heating an ore in sufficient supply of oxygen to convert into their oxide form. Sulphide ores are roasted to convert into their oxide form, *e.g.*,



- Reaction between aluminium metal and iron oxide producing aluminium oxide and iron metal in molten state due to exothermic nature of the reaction is called thermite reaction.

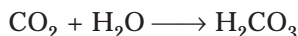
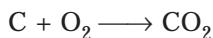


**Application:** Molten iron obtained is used to join railway tracks or cracked machine parts.

- Metal sulphides and carbonates are converted into metal oxide prior to reduction because it is easier to extract metal from its oxide form than from any other form of the ore.

Roasting	Calcination
1. Roasting is a process of heating an ore in the presence of oxygen. 2. It is used to convert the sulphide ore to their oxide form, <i>e.g.</i> , $2\text{ZnS} + 3\text{O}_2 \longrightarrow 2\text{ZnO} + 2\text{SO}_2$	1. Calcination is a process of heating an ore in the absence of oxygen. 2. It is used to convert carbonate ore into their oxide form, <i>e.g.</i> , $\text{ZnCO}_3 \xrightarrow{\Delta} \text{ZnO} + \text{CO}_2$

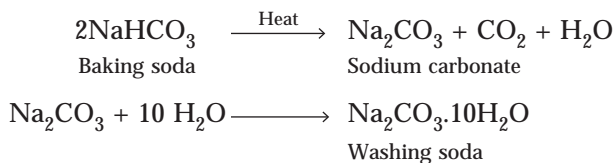
- Acidic oxides are formed by the combination of non-metal with oxygen. A non-metallic oxide on dissolution in water forms acid that turns blue litmus red indicating its acidic nature, *e.g.*,



(Carbonic acid)  $\longrightarrow$  turns blue litmus red.

7. Platinum, gold and silver are used to make jewellery because of the following reasons:
- They are highly lustrous metals which are resistant to corrosion.
  - They are highly malleable and ductile, so can be transformed into any shape/design.
8. Aluminium metal although a highly reactive metal is used for making cooking utensils because aluminium on exposure to air forms a thin layer of oxide ( $\text{Al}_2\text{O}_3$ ) on its surface which acts as a protective layer and prevents the metal beneath its surface from further oxidation.
9. Copper is used to make hot water tanks and not steel because copper is a better conductor of heat than steel.
10. Chemical formula of washing soda is  $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ .

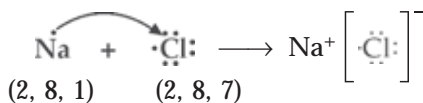
It is obtained from baking soda by first heating it strongly which gives sodium carbonate and then followed by the recrystallization of sodium carbonate which gives washing soda.



Industrial use: It is used for softening of hard water.

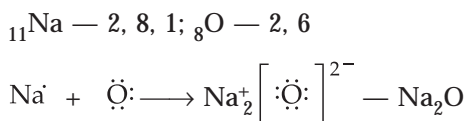
## WORKSHEET-84

- Bronze metal is an alloy of copper and tin.
  - It is because of the corrosion of copper metal that it turns green. The green colour is due to the formation of basic copper carbonate.
- The electrostatic force of attraction that holds the oppositely charged ions together in a compound is called ionic bond, *e.g.*, ionic bond is formed between sodium ion and chloride ion in sodium chloride.

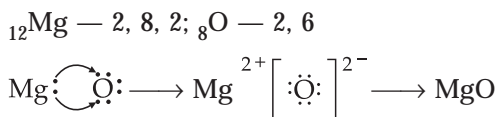


- |                |                              |                        |
|----------------|------------------------------|------------------------|
| Sodium (Na)    | ${}_{11}\text{Na} - 2, 8, 1$ | $\text{Na}^{\cdot}$    |
| Oxygen (O)     | ${}_{8}\text{O} - 2, 6$      | $\ddot{\text{O}}\cdot$ |
| Magnesium (Mg) | ${}_{12}\text{Mg} - 2, 8, 2$ | $\ddot{\text{Mg}}$     |

4. (a) **Sodium oxide:**



**Magnesium oxide:**



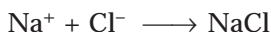
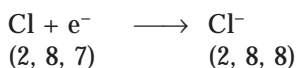
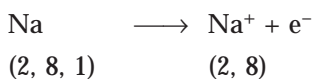
(b) The ions present in sodium oxide are:

(Na<sup>+</sup>) and (O<sup>2-</sup>)  
Sodium ion    Oxide ion

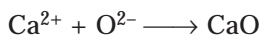
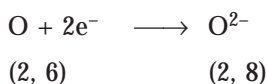
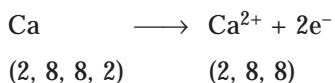
The ions present in magnesium oxide are:

(Mg<sup>2+</sup>) and (O<sup>2-</sup>)  
Magnesium ion    Oxide ion

**5. Sodium chloride:**  ${}_{11}\text{Na} - 2, 8, 1$



**Calcium oxide:**  ${}_{20}\text{Ca} - 2, 8, 8, 2$

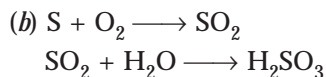


- 6.** In the electrolytic refining of metal 'M', impure metal 'M' acts as an anode, pure metal 'M' acts as a cathode while the soluble salt of metal 'M' acts as an electrolyte.
- 7.** Sodium, potassium and lithium are highly reactive metals which react vigorously with oxygen and water to evolve hydrogen gas. The reaction is highly violent and exothermic and so the evolved gas catches fire. Thus, to prevent its reactivity with oxygen and water, it is stored under oil.
- 8.** Copper metal slowly reacts with water, carbon dioxide and oxygen present in air to form basic copper carbonate which is green in colour and gets deposited on the surface of metal. Lemon juice and tamarind contain weak acids which reacts with basic copper carbonate to form soluble salts. The salts gets removed and the metal restores its shine.

### WORKSHEET-85

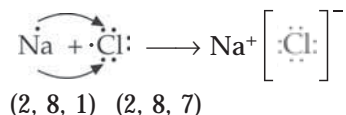
**1. (a) (i)** There will be no effect on dry litmus paper.

(ii) Moist litmus paper will turn red due to the formation of sulphurous acid.



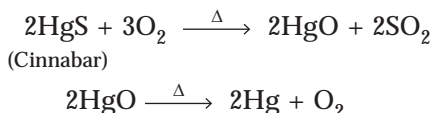
**2. Sodium**  $\longrightarrow \text{Na}^{\cdot}$                       Chlorine  $\longrightarrow \cdot\ddot{\text{Cl}}\cdot$   
( ${}_{11}\text{Na} - 2, 8, 1$ )                              ( ${}_{17}\text{Cl} - 2, 8, 7$ )

They form a bond by a complete transfer of electron from sodium to chlorine atom as shown below:



The bond formed is called ionic/electrovalent bond. The compound formed has high melting point as it consists of sodium ion and chloride ion which are held strongly by the electrostatic forces of attraction. Thus, a large amount of heat energy is required to break the inter-ionic attraction resulting in high melting point.

3. (a) By heating alone, *e.g.*,

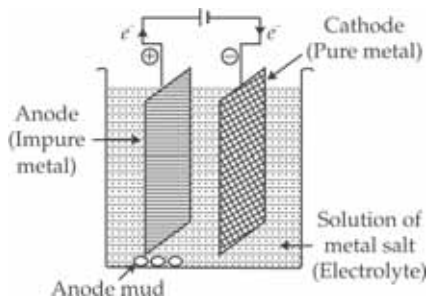


(b) By using coke as reducing agent. Sometimes reactive metals such as Na, Mg and Al can also be used.

(c) Oxides of highly reactive metals are subjected to process of electrolytic reduction.

Metals	Non-metals
1. Metals react with oxygen to form oxides which are basic in nature.	1. Non-metals react with oxygen to form oxides which are neutral or acidic.
2. Active metals displace hydrogen from dilute acids.	2. Non-metals do not displace hydrogen from dilute acids.
3. Active metals displace hydrogen from water.	3. Non-metals do not displace hydrogen from water.
4. Metals are electropositive in nature (electron donors).	4. Non-metals are electronegative in nature (electron acceptors).

5.



For an electrolytic refining of metal 'M'

Anode : Impure metal 'M'

Cathode : Pure metal 'M'

Electrolyte : Solution of soluble salt of metal 'M'

6. Alloys are homogeneous mixture of a metal with a metal or a non-metal.

An alloy is generally preferred to pure metal because of the following properties:

- (1) Alloys are generally harder than the pure metal, *e.g.*, gold is extremely soft metal but when alloyed with Ag/Cu becomes hard.
- (2) They are corrosion resistant, *e.g.* stainless steel an alloy of iron, carbon, chromium and nickel does not get corroded and the lustre lasts longer.
- (3) They have low melting points than the pure metals, *e.g.*, solder an alloy of lead and tin has a much lower melting point than pure metals.

## WORKSHEET-86

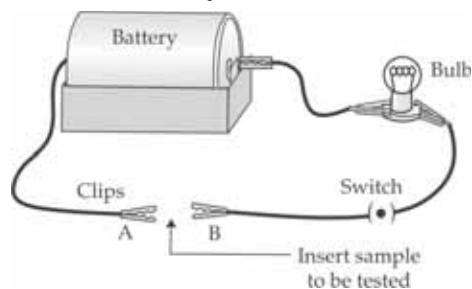
1. (a) Distinction between metals and non-metals:

(i) **Using a hammer.** We can distinguish between metals and non-metals as metals will form thin sheets upon hammering while non-metals do not.



- (ii) **Using a bulb, wire, battery and switch.** Set up the apparatus as shown in the figure. On inserting a metal wire (say copper) between the clips A and B the bulb glows while inserting a non-metal (sulphur powder) the bulb does not glow.

**Conclusion.** Metals conduct electricity while non-metals do not.

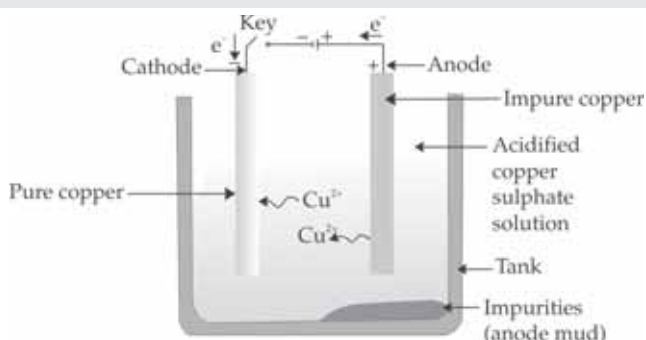


- (b) The above tests can be used to distinguish between metals and non-metals exception: Hammering can not be used for soft metals like Na and K. Also, graphite a non-metal conducts electricity.

- |    |                              |                  |
|----|------------------------------|------------------|
| 2. | <b>Use</b>                   | <b>Alloy</b>     |
|    | (i) For soldering joint      | solder           |
|    | (ii) For cutlery             | Stainless steel  |
|    | (iii) For aircraft parts     | Duralumin        |
|    | (iv) For making statues      | Bronze           |
|    | (v) For surgical instruments | Stainless steel. |
3. (a) No, we cannot store copper sulphate solution in a vessel made up of zinc, as zinc is a more reactive metal than copper and will displace copper from its salt solution. This will result into the formation of holes into the container.
- (b) On adding zinc to ferrous sulphate solution, we will observe that after sometime the light green colour of ferrous sulphate solution fades away and the surface of zinc become dull and black. A more reactive metal zinc displaces iron from its salt solution.
- $$\text{Zn} + \text{FeSO}_4(\text{aq}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{Fe}$$
4. The solution used was aqua regia which consists of 3 parts of concentrated hydrochloric acid and one part of conc. nitric acid. It is able to dissolve gold and thus the weight of the gold ornaments decreases. Since the outer layer of gold gets dissolved, the bangles sparkle like new but the weight decreases.
5. (a) Those metal oxides which show both acidic as well as basic behaviour are called amphoteric oxides. They react with both acids as well as bases to produce salt and water.  
Amphoteric oxides:  $\text{Al}_2\text{O}_3$ ,  $\text{ZnO}$ .
- (b) Non-metals do not displace hydrogen from dilute acids as they have 5, 6 or 7 valence electrons and are themselves electron acceptors. Thus, they cannot provide electron to  $\text{H}^+$  of acid to convert it into hydrogen gas.
6. (i) This is because zinc is more reactive than copper and thus, will displace copper from its salt solution.
- (ii) This occurs due to phenomenon of corrosion. Silver metal reacts with sulphur compounds present in air to form silver sulphide which is black.
- (iii) A metal sulphide is converted to its oxide form as it is easy to extract metal from its oxide form than from its sulphide ore.

## WORKSHEET-87

1. (a)



In this method the impure copper metal is made the anode and a thin strip of pure metal is made the cathode. A solution of the metal salt, *i.e.*, copper sulphate is used as an electrolyte. On passing electric current through the electrolyte,  $\text{Cu}^{2+}$  ions from the anode dissolves into the electrolyte and an equivalent amount of Cu from the electrolyte is deposited on the cathode.

Reaction at cathode:  $\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}$

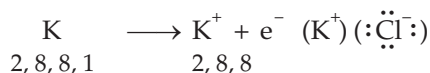
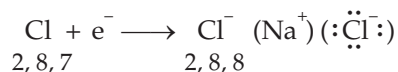
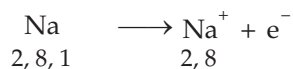
Reaction at anode:  $\text{Cu} \longrightarrow \text{Cu}^{2+} + 2\text{e}^-$  (Oxidation)

(b) It is the insoluble impurities which settles at the bottom of the anode during electrolytic refining.

(c) (i) It is used for making electrical wires as it is highly ductile and good conductor of heat.

(ii) Being good conductor of heat, it can be used for making utensils.

2. Sodium and potassium are most reactive metals belonging to group I.



The bond formed is ionic bond. These compounds are called ionic compounds.

### Properties:

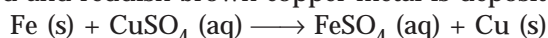
(i) The compound formed is solid.

(ii) It does not conduct electricity in solid state but conducts electricity in molten state or in aqueous solution.

(iii) It has high melting and boiling points.

(iv) It is soluble in water.

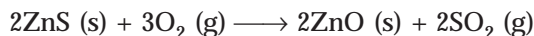
3. When Fe (iron) is put into copper sulphate solution, pale green colour solutions of  $\text{FeSO}_4$  will be formed and reddish brown copper metal is deposited.



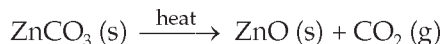
When Fe (s) is dipped in  $\text{ZnSO}_4$  (aq), no reaction takes place. Iron is kept in between zinc and copper in activity series of metals. It is below zinc but above copper.

### Extraction of Zn from ZnS

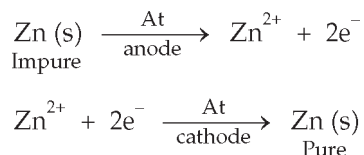
- (i) **Concentration.** The ore is concentrated by froth floatation process.
- (ii) **Roasting.** The concentrated ore is heated in presence of oxygen to convert sulphide ore to oxide.



- (iii) **Reduction.** Zinc oxide is reduced with the help of carbon to get zinc.

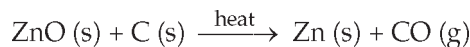


- (iv) Impure Zn is purified by electrolytic refining using Zn (pure) as cathode and impure zinc as anode.  $\text{ZnSO}_4$  solution acts as electrolyte.



### Extraction of Zn from $\text{ZnCO}_3$

- (i) **Concentration.** Ore is concentrated by hydraulic washing.
- (ii) **Calcination.** The concentrated ore is heated strongly to convert carbonate ore into oxide.



- (iii) **Reduction.** All electrolytic refining is done as explained above.

## WORKSHEET-88

- (a) The solution was aqua regia. The gold got dissolved in it.

(b) The lady lacked wisdom and awareness.
- (a) When iron comes in contact with moisture present in atmosphere, it forms a reddish brown coating of hydrated ferric oxide ( $\text{Fe}_2\text{O}_3 \cdot x\text{H}_2\text{O}$ ). The reddish brown coating is called rust and this phenomenon is known as rusting of iron.

(b) (i) **Painting:** Iron articles are painted so that surface does not come in contact with air and water and it does not get rusted.

(ii) **Galvanisation:** It is the process in which iron articles are coated with zinc metal so as to prevent them from rusting.

(c) Rahul's father should have painted the window frames to prevent them from rusting.

(d) Rahul's father lacked awareness.
- (a) We can remove deficiency of iodine in our body by using iodised salt in our foods.

(b) Non-metal

(c) Iodine is a dark-violet solid element.

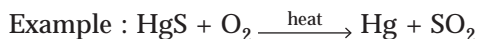
(d) Common good and social responsibility.
- (a) Large amount of heat energy is required to break the inter-ionic attractive forces.

(b) A thin but strong layer of aluminium oxide is formed on its surface which protects aluminium atoms underneath.

- (c) Solder has a low melting point.  
 (d) It is easier to extract a metal from its oxide by the process of reduction than from its sulphide.  
 (e) Tamarind juice is acidic and neutralizes the basic layer of copper carbonate on tarnished copper vessels.

### WORKSHEET-89

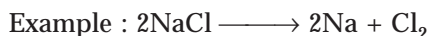
1. (a) (i) By heating



- (ii) By reduction of its oxide with carbon/carbon monoxide



- (iii) By electrolysis of fused compounds of the metal



- (b) Removal of impurities from the crude metal.

Cathode : Pure M

Anode : Impure (crude) M

Electrolyte : A water soluble salt of M.

### WORKSHEET-90

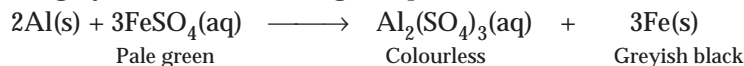
1. (d)      2. (b)      3. (c)      4. (d)      5. (d)      6. (d)  
 7. (c)      8. (d)      9. (b)      10. (d)      11. (d)

### WORKSHEET-91

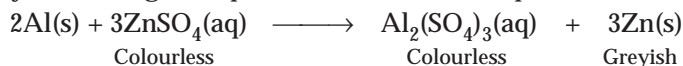
1. (a)      2. (c)      3. (b)      4. (b)      5. (b)      6. (d)  
 7. (c)      8. (a)

### WORKSHEET-92

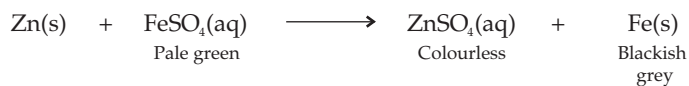
1. (i) Clean the metal with sand paper.  
 (ii) Do not touch or taste the chemicals.  
 2. The pale green solution will become colourless due to the formation of aluminium sulphate and the greyish black iron will get deposited.



3. Take zinc sulphate solution. Add aluminium metal into it. Observe the change carefully. If greyish metal gets deposited, it shows Al displaced Zn from zinc sulphate solution.



4. When zinc metal is added to FeSO<sub>4</sub> solution, the pale green solution becomes colourless and Fe gets deposited on zinc metal. It happens because Zn displaces Fe from its salt solution.



5. Metal X is zinc and Y is  $\text{CuSO}_4$  solution. When zinc is dipped in  $\text{CuSO}_4$  solution, Zn displaces Cu from the salt solution and a new compound  $\text{ZnSO}_4$  is formed which is colourless, and displaced Cu metal gets deposited on Zn metal
6. **Test tube A:** Colour of solution in test tube-A is blue. Hence it is copper sulphate solution. If Zn is added to this solution, it would become colourless and a reddish brown layer of Cu would get deposited on Zn granules.
- Test tube B:** The salt solution in test tube B is colourless. Hence it is either  $\text{ZnSO}_4$  or  $\text{Al}_2(\text{SO}_4)_3$ . If Zn metal is added to this solution, no change would take place because Zn is less reactive than Al.
- Test tube C:** The colour of salt solution of test tube C is pale green. Hence it is  $\text{FeSO}_4$ . If the Zn metal is added to the solution, it would become colourless and Fe would get deposited on Zn granules.

### CHAPTER TEST

1. Zinc and aluminium.    2. Blue and light-green.
3. For an electrolytic refining of metal 'M'
- Anode : Impure metal 'M'
- Cathode : Pure metal 'M'
- Electrolyte : Solution of soluble salt of metal 'M'.
4. (a) On adding zinc to ferrous sulphate solution, we will observe that after sometime the light green colour of ferrous sulphate solution fades away and the surface of zinc become dull and black. A more reactive metal zinc displaces iron from its salt solution.
- (b) Single displacement reaction.
5. (a) Reaction between aluminium metal and iron oxide producing aluminium oxide and iron metal in molten state due to exothermic nature of the reaction is called thermite reaction.



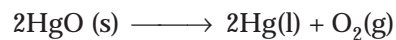
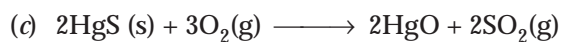
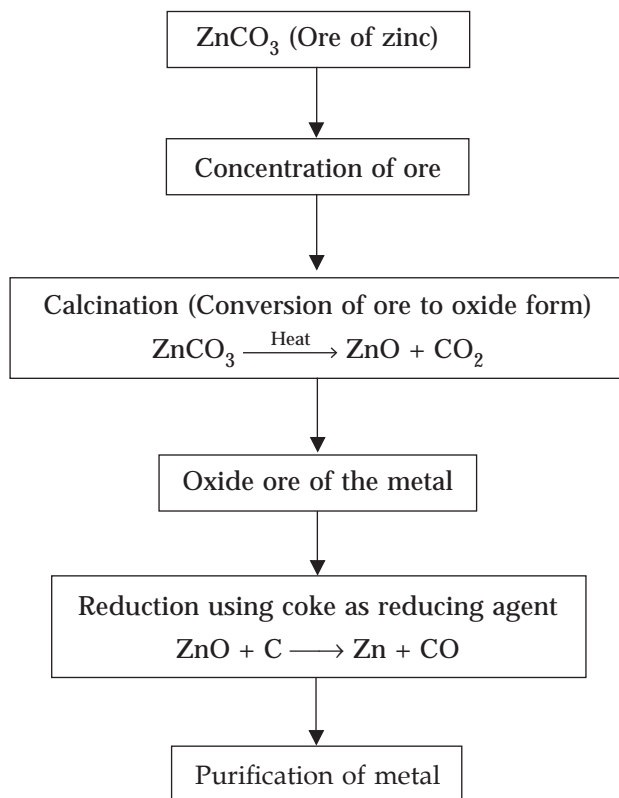
- (b) **Application.** Molten iron obtained is used to join railway tracks or cracked machine parts.
6. 'X' is Cu. It does not liberate hydrogen with dilute acid as it is less reactive than hydrogen gas.
7. (a) Although, silver is a noble metal, yet it reacts with sulphur compounds present in air to form silver sulphide which is black in colour and gets tarnished.
- (b) Carbonates and sulphide ores are usually converted into metal oxide prior to reduction because it is easier to extract metal from its oxide form than from any other form of the ore.
- (c) The presence of free ions/electrons shows the property of conduction of electricity. In solid state, ions are held tightly result in not move freely and also not conduct electricity.
8. (a) Metal M is reduced using coke, *e.g.*, haematite, an ore of iron, is reduced using coke.



(b) Metal N which is high up in the reactivity series, is separated from its chlorides by electrolytic reduction, *e.g.*, sodium is obtained at cathode by the electrolytic reduction of molten sodium chloride.

9. (a) Carbonate ore.

(b)



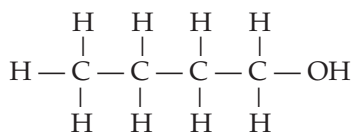
## 4

## CARBON AND ITS COMPOUNDS

## WORKSHEET-94

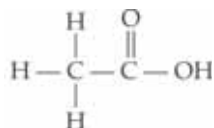
1. Methane,  $\text{CH}_4$
2. Cyclohexane
3.  $\text{C}_n\text{H}_{2n-2}$
4. Ethanoic acid has a low melting point of 290 K. Thus, in cold weather ethanoic acid freezes to form glacier like crystals. That is why pure ethanoic acid is called glacial acetic acid.

5. Butanol

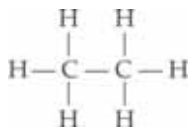


6. (a) Catenation (b) Tetravalency of carbon

- 7.

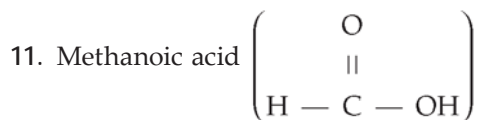


8. There are seven covalent bonds in a molecule of ethane.



9. Ketone.

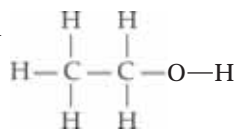
10. Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ )



12. Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ )

13. (i) cycloalkane (ii) cycloalkene (iii) cycloalkyne

14. Structure of ethyl alcohol



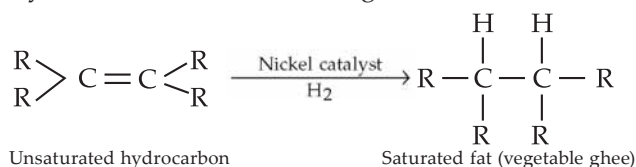
15. Three allotropes of carbon: diamond graphite, buckminster fullerene (buckyball).

## WORKSHEET-95

- The stability of carbon compounds is attributed to the small size of carbon atom. Due to the small size of carbon atom, the nucleus holds the shared pair of electron more effectively. Thus, making the bond stronger.
- A series of compounds having same functional group, similar chemical properties and the successive members of which differ by  $-\text{CH}_2-$  unit is called homologous series.  $\text{C}_2\text{H}_6\text{O}$  and  $\text{CH}_4\text{O}$  belong to same homologous series.
- Silicon also exhibits property of catenation. Compounds of silicon are not stable.
- This is because carbon tetrachloride is a covalent compound and doesn't produce ions responsible for the conduction of electricity.
- The reaction that involves the addition of hydrogen across an unsaturated hydrocarbon (double/triple bond) in the presence of nickel catalyst is called hydrogenation.

**Industrial application:** Hydrogenation of vegetable oils in the presence of nickel catalyst converts them into *vanaspati ghee*.

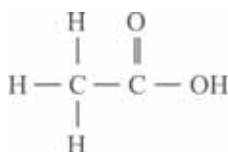
- Unsaturated hydrocarbons undergo addition reactions. Since  $\text{C}_3\text{H}_6$  is an alkene, *i.e.*, an unsaturated hydrocarbon, it would undergo addition reaction.



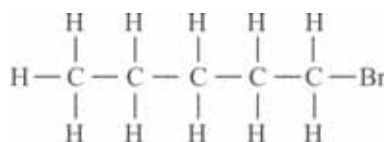
On adding hydrogen to an alkene in the presence of nickel catalyst, the addition of hydrogen takes place across the double bond and forms saturated fat called *vanaspati ghee*.

- This is due to the high percentage of carbon in them that they undergo incomplete combustion. Unburnt carbon particles left behind impart yellow colour to the flame.

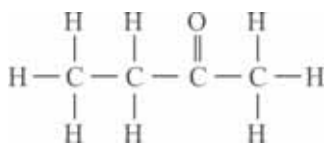
8. (a)



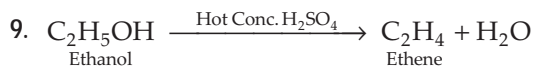
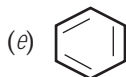
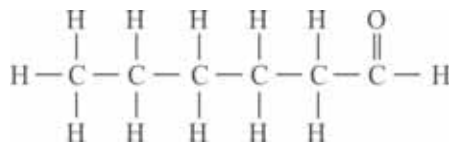
(b)



(c)



(d)

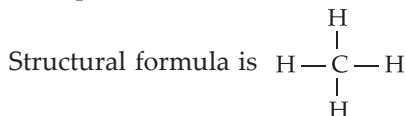


Product formed is ethene.

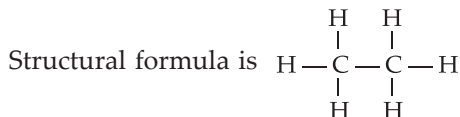
**Role played by conc.  $\text{H}_2\text{SO}_4$ :** It acts as a catalyst and strong dehydrating agent that removes  $\text{H}_2\text{O}$  from ethanol.



10. (a) Example of alkanes is methane (CH<sub>4</sub>).



- (b) Example of alkenes is ethene (C<sub>2</sub>H<sub>4</sub>).



- (c) Example of alkynes is ethyne (C<sub>2</sub>H<sub>2</sub>).

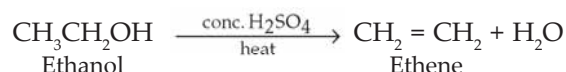


### WORKSHEET-96

1. (a) IUPAC name is ethanoic acid  
(b) A vigorous reaction takes place and a colourless, odourless gas is evolved with brisk effervescence.
2. (a) The gas/kerosene stoves are provided with air inlets so that oxygen rich mixture is burnt for the complete combustion and thus, it produces a clean flame.  
(b) If the air holes of the gas stove get blocked, then incomplete combustion of the fuel takes place due to limited supply of oxygen. This leads to the formation of soot that deposits on the vessel and thus, they get blackened.

3. CH<sub>3</sub>CH<sub>2</sub>OH is ethanol.

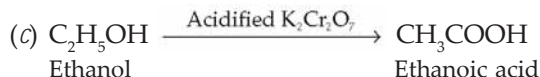
Ethanol forms ethene, when heated with conc. H<sub>2</sub>SO<sub>4</sub>



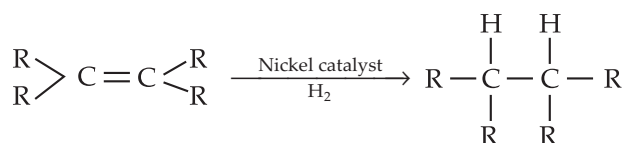
4. (a) The addition of chlorine to methane is called substitution reaction because in this reaction one atom of hydrogen is replaced by chlorine atom in methane.



- (b) Only unsaturated hydrocarbons undergo addition reactions. Therefore, C<sub>3</sub>H<sub>6</sub> and C<sub>2</sub>H<sub>2</sub> will undergo addition reaction.
5. (a) A series of compounds having the same functional group and the adjacent members of the series differ by -CH<sub>2</sub>- unit is called homologous series, *e.g.*, Alkanes, Alkenes.  
(b) The functional group present in the compound largely determines its physical and chemical properties.



6. Unsaturated hydrocarbons undergo addition reactions. Since C<sub>3</sub>H<sub>6</sub> is an alkene, *i.e.*, an unsaturated hydrocarbon, it would undergo addition reaction.



Unsaturated hydrocarbon

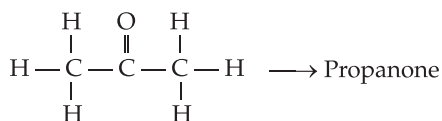
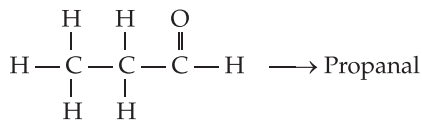
Saturated fat (vegetable *ghee*)

On adding hydrogen to an alkene in the presence of nickel catalyst, the addition of hydrogen takes place across the double bond and forms saturated fat called *vanaspati ghee*.

## WORKSHEET-97

1.	Soap	Detergent
	(a) Soaps are the sodium salts of the long chain carboxylic acids.	(a) Detergents are generally ammonium or sulphonate salts of long chains carboxylic acid.
	(b) Soaps are not suitable for washing with hard water as it forms insoluble scum.	(b) Detergents do not form insoluble scum with hard water.
	(c) Soaps are prepared from fats or vegetable oils.	(c) Detergents are not prepared from fats or vegetable oils.
	(d) Biodegradable.	(d) Non-biodegradable.

2. Aldehyde is propanal and ketone is propanone



Both are functional isomers of each other.

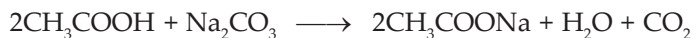
3. Take sodium carbonate in two test tubes.

Mark them as 1 and 2.

Pour some amount of acetic acid in test tube 1 and ethanol in 2.

Effervescence produced in test tube 1 confirms production of gas which can not be found in test tube 2.

Conclude that the reaction is taking place in with acetic acid and not with ethanol.



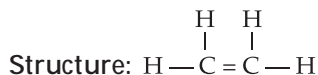
4. A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series. For example, methanal (HCHO) and ethanal

(CH<sub>3</sub>CHO) have functional group – CHO – and are members of aldehyde series.

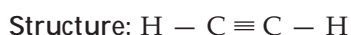
(a) General formulae of alkenes is C<sub>n</sub>H<sub>2n</sub>

(b) General formulae of alkynes is C<sub>n</sub>H<sub>2n-2</sub>

First member of alkenes is ethene (C<sub>2</sub>H<sub>4</sub>)

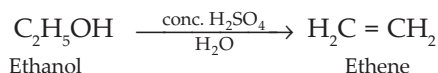


First member of alkynes → (C<sub>2</sub>H<sub>2</sub>) ethyne



5. When ethanol is heated at 443K in excess of conc. H<sub>2</sub>SO<sub>4</sub>, it gets dehydrated and results into the formation of ethene.

Structural formula of ethene is

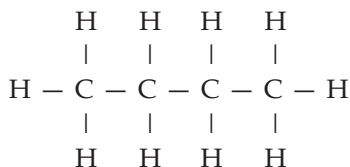
$$\begin{array}{c} \text{H} \quad \quad \text{H} \\ \diagdown \quad \diagup \\ \text{C} = \text{C} \\ \diagup \quad \diagdown \\ \text{H} \quad \quad \text{H} \end{array}$$


In the above reaction conc. H<sub>2</sub>SO<sub>4</sub> acts a dehydrating agent and removes water molecules from ethanol.

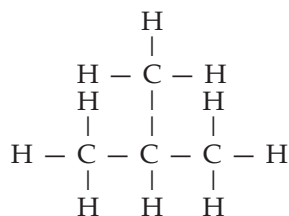
## WORKSHEET-98

1. Isomers are compounds having same molecular formula but different structural formula. Isomers of butane are *n*-butane and isobutane.

Structures of *n*-butane (C<sub>4</sub>H<sub>10</sub>)



Structures of isobutane



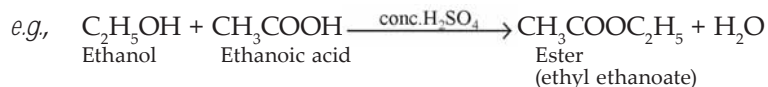
We can't have isomers of first three members of alkane series due to absence of branching in them.

2. An atom or group of atoms that is the site of reactivity in the organic compound and largely determines the properties of an organic compound is called functional group.

Name of the compound	Structural formula	Functional group
Ethanol	$\begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{H} - \text{C} - \text{C} - \text{OH} \\   \quad   \\ \text{H} \quad \text{H} \end{array}$	Alcohol (–OH)
Ethanoic acid	$\begin{array}{c} \text{H} \quad \text{O} \\   \quad    \\ \text{H} - \text{C} - \text{C} - \text{OH} \\   \\ \text{H} \end{array}$	Carboxylic acid (–COOH)

### 3. Esterification reaction

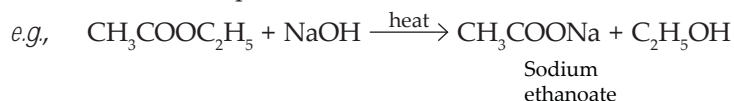
This reaction is used for the preparation of esters in which an alcohol is made to react with a carboxylic acid in the presence of conc.  $\text{H}_2\text{SO}_4$ .



Use: Esters are used in making perfumes.

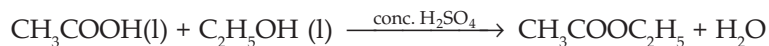
### Saponification reaction

The alkaline hydrolysis of esters (*i.e.*, breakdown of ester) to form sodium salt of ester and alcohol is called saponification reaction.



Use: It is used in the preparation of soaps.

#### 4. (a) Esterification



#### (b) Saponification



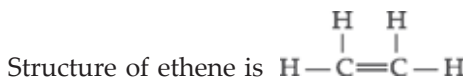
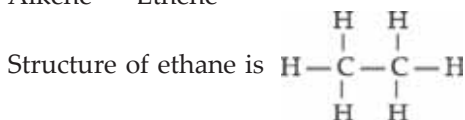
#### (c) Substitution



5. (a) In alkanes, all the carbon atoms in a compound are linked to other carbon atoms by single covalent bonds while in an alkenes, their is a presence of a double/triple covalent bond between the carbon atoms, *e.g.*, ethane is alkane while ethene is alkene.

Alkane — Ethane

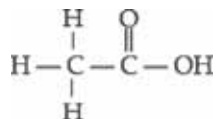
Alkene — Ethene



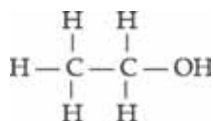
- (b) Alkanes generally give clean flame as they undergo complete combustion due to high percentage of hydrogen in them.

6. (a) The carboxylic acid is ethanoic acid ( $\text{CH}_3\text{COOH}$ )

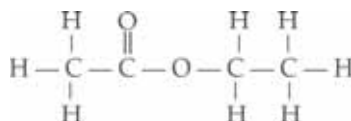
Structure:



(b) Alcohol is ethanol ( $C_2H_5OH$ )



(c) Compound X is ethyl ethanoate



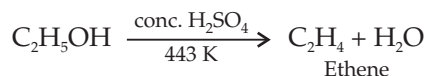
## WORKSHEET-99

1. 'X' is ethanol.

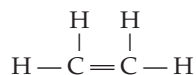
'Y' is hydrogen gas



upon heating 'X' with conc.  $H_2SO_4$ , it undergoes dehydration forming ethene.



Structure of ethene

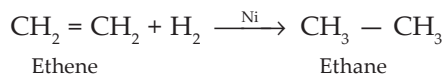


2. Addition reaction of hydrogen can take place in unsaturated hydrocarbon like alkenes and alkynes.

General formula of Alkenes:  $C_nH_{2n}$

General formula of Alkynes:  $C_nH_{2n-2}$

Condition: Addition of hydrogen can take place in the presence of nickel catalyst.



3. An atom or group of atoms that is the site of reactivity in organic compound and largely determines the properties of the organic compound is called functional group.

Alcohol:  $-\text{OH}$

Aldehyde:  $-\text{CHO}$

Ketone:  $-\text{CO}-$

Carboxylic acid:  $-\text{COOH}$

4. A series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called homologous series.

Acetaldehyde or ethanal  $-\text{CH}_3\text{CHO}$

Propanaldehyde or propanal  $-\text{C}_2\text{H}_5\text{CHO}$

(i) The hydrocarbon chain part (*i.e.*,  $\text{CH}_3-$ ,  $\text{C}_2\text{H}_5-$ ) determines the physical properties.

(ii) The functional group ( $-\text{CHO}$ ) determines the chemical properties.

5. (a) The advantages of using detergents are:

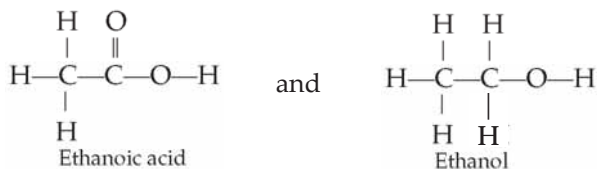
(i) They work effectively in hard water as they do not form insoluble precipitate with hard water.

(ii) They have a better cleansing action than soaps.

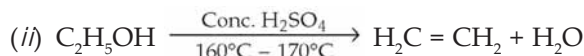
- (b) Ethyne is an unsaturated hydrocarbon that requires high temperature for welding. If we use a mixture of ethyne and air, then incomplete combustion of ethyne takes place with a sooty flame and high temperature is not achieved. Thus, a mixture of ethyne and oxygen is used for the complete combustion of ethyne and to acquire the desired temperature.
- (c) If an organic compound burns with a sooty flame then the compound formed is an unsaturated hydrocarbon. A saturated compound will produce sooty flame only when burnt in limited supply of oxygen.

### WORKSHEET-100

1. (a)

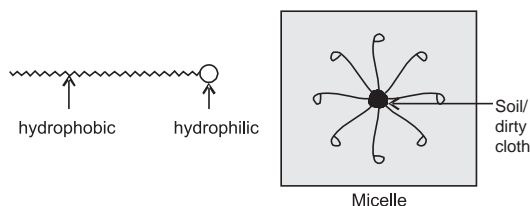


- (b) (i) Ethanol when heated in presence of conc.  $\text{H}_2\text{SO}_4$ , it gets dehydrated to form ethene at  $160^\circ\text{C} - 170^\circ\text{C}$ .



- (c) **Cleansing action of soap:** Soap consists of two ends, long chain of hydrocarbon is called hydrophobic which repels water and attracts dirt and grease. The other end is hydrophilic which attracts water.

When soap is added to water, it forms micelle structure as shown below.

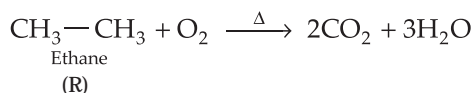
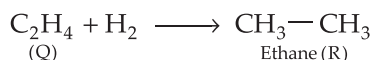
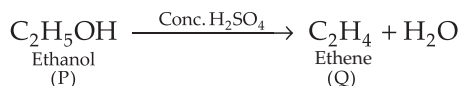


The tail of the soap sticks to the dirt inwards and the head points outward. When water is agitated, the dirt sticks to more number of soap molecules. On rinsing of cloth with water, the water washes away soap molecule with dirt attached to it.

2. 'P' is Ethanol ( $\text{C}_2\text{H}_5\text{OH}$ )

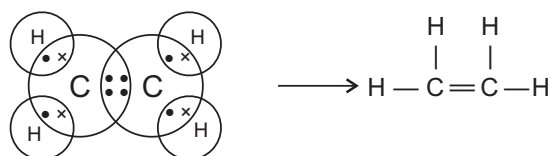
'Q' is Ethene ( $\text{C}_2\text{H}_4$ )

'R' is Ethane ( $\text{C}_2\text{H}_6$ )

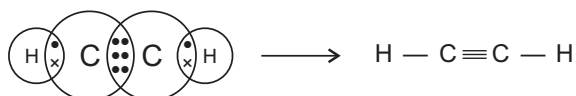




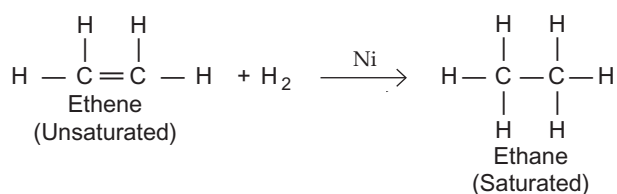
Structure of ethene (C<sub>2</sub>H<sub>4</sub>)



Structure of ethyne (C<sub>2</sub>H<sub>2</sub>)



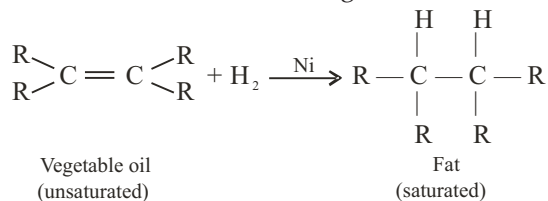
An unsaturated hydrocarbon can be converted to saturated by hydrogenation of unsaturated hydrocarbon in the presence of nickel or platinum as catalyst, *e.g.*,



3. • Detergents are chemically sodium or potassium salts of long chain sulphonic acid.
- Merits of using detergents for cleansing
  1. They can work effectively even in hard water.
  2. They have better cleansing action than soaps.
- Demerits of using detergents:
  1. They are non-biodegradable thus harm the aquatic life.
  2. They are prepared from petroleum hydrocarbons.

Detergents can work effectively even if calcium and magnesium ions are present in water as the charged ends of detergents don't form insoluble precipitate called scum with hard water and thus clean the clothes more effectively than soaps.

4. (a) Hydrogenation reaction involves the addition of hydrogen to an unsaturated hydrocarbon (alkene to alkyne) in the presence of nickel as catalyst to form saturated hydrocarbons. This reaction is used for the conversion of vegetable oils into fats (*vanaspati ghee*).



**Physical property:** Vegetable oil, a liquid gets converted into fat which is solid.

- (b) Saturated hydrocarbons, *i.e.*, alkanes react with chlorine in the presence of sunlight to form chloro derivatives of alkanes.





**Type of reaction:** substitution reaction.

It is so called as in the above reaction hydrogen atoms in methane are replaced by chlorine atoms.

## WORKSHEET-102

1. Soaps and detergents are sodium or potassium salts of long chain carboxylic acids or long chain sulphonic acid. [Refer to Ans. 1 (c) Worksheet-100]

Detergents can work effectively even if calcium and magnesium ions are present in water as the charged ends of detergents don't form insoluble precipitate called scum with hard water and thus clean the clothes more effectively than soaps.

2. Soaps are sodium or potassium salts of long chain fatty acids while detergents are sodium or potassium salts of benzene sulphonic acids.

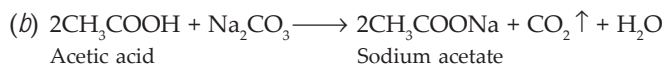
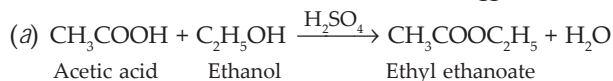
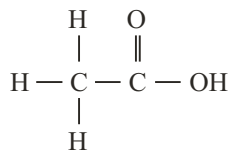
**Cleansing action of soap:** Ans. 1 (c) Worksheet-100.

Soaps are not considered suitable for washing with hard water as hard water contains chlorides, sulphates and bicarbonates of calcium and magnesium which react with soap to form insoluble precipitate called scum. This scum makes the cleaning difficult as it settles on the cloth and lot of soap gets wasted.

3.	Ethanol	Ethanoic acid
	<b>Physical properties</b> 1. Melting point of ethanol is 156 K. 2. Boiling point of ethanol is 351 K. 3. It has a peculiar smell.	1. Melting of ethanoic acid is 290 K. 2. Boiling point of ethanoic acid is 391 K. 3. It has vinegar-like smell.
	<b>Chemical properties</b> 1. No reaction takes place when a pinch of sodium bicarbonate is added to ethanol. $C_2H_5OH + NaHCO_3 \rightarrow$ No reaction  2. Hydrogen gas is evolved when sodium metal reacts with ethanol. $C_2H_5OH + Na \rightarrow C_2H_5ONa + H_2 \uparrow$	1. A highly vigorous reaction takes place when a pinch of sodium bicarbonate is added to ethanoic acid. A colourless and odourless gas is evolved $CH_3COOH + NaHCO_3 \rightarrow CH_3COONa + CO_2 + H_2O$  2. No hydrogen gas is evolved when sodium metal is dropped in ethanoic acid. $CH_3COOH + Na \rightarrow$ No reaction

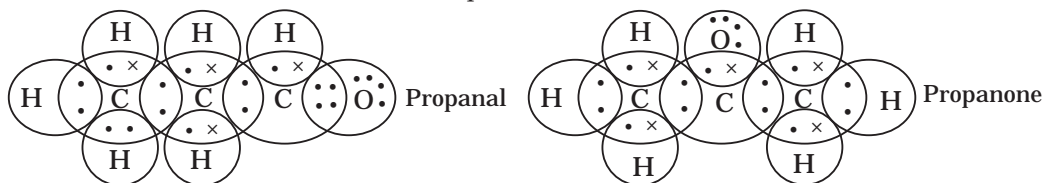
4. Compound X is acetic acid ( $CH_3COOH$ )

Its structure is as follows:



## WORKSHEET-103

1. (a) The phenomenon of existence of compounds having same molecular formula but different structural formula is called structural isomerism, *e.g.*, butane has two structural isomers.
- (b) The two possible isomers of the compound  $C_3H_6O$  are propanal ( $C_2H_5CHO$ ) and propanone ( $CH_3COCH_3$ )
- (c) The electron dot structures of the compound are:



2. (a) Homologous series is a series of compounds in which the same functional group substitutes for hydrogen in a carbon chain.  
**Characteristics:**
  1. All the members have similar chemical properties.
  2. There is a gradation in physical properties.
- (b) Ethene
- (c) Add solid  $NaHCO_3$ : An effervescence occurs with the evolution of  $CO_2$  in case of ethanoic acid while ethanol does not show any action.
3. Carbon is tetravalent in nature as it has 4 electrons in its valence shell. Thus to lose four electrons to form  $C^{4+}$  ion, it needs large amount of energy. For the formation of  $C^{4-}$  anion, it can gain 4 electrons but it will be difficult for the nucleus with 6 electrons to hold on to 10 electrons. Thus, formation of both  $C^{4+}$  and  $C^{4-}$  ions is not easily feasible. Hence, it forms compounds by sharing of electrons, *i.e.*, covalent bonds.
  - (a) Covalent compounds are formed by sharing of electrons. Thus they do not contain any free ions or charged particles responsible for the conduction of electricity. Hence, they are bad conductors of electricity.
  - (b) In covalent compounds molecules have strong bonds within the molecule, but intermolecular forces are small. Thus they are overcome at low temperature resulting in low melting and boiling point.
4. Carbon is tetravalent in nature. If it gains 4 electrons to form  $C^{4-}$  ions, then it will be difficult for 6 electrons to hold on to 10 electrons while formation of  $C^{4+}$  ions, *i.e.*, loss of 4 electrons require considerable amount of energy. Hence, it forms bond by sharing of electrons.

Ionic or electrovalent bonds are formed in ionic compounds whereas covalent bonds are formed in carbon compounds.

Carbon compounds are poor conductor of electricity because they do not form ions or have free electrons to act as charge carriers.

## WORKSHEET-104

1. It seems impossible to have life without use of fuels. Life would come to standstill without their use.
  - (a) I would suggest to look for alternative source of fuels like CNG which causes less pollution by not releasing  $\text{SO}_2$  into air.
  - (b) Make use of unleaded petrol to save ourselves from the harmful effects of lead.
  - (c) Use car pools or public transport system as far as possible to check pollution.
  - (d) Government should restrict the number of vehicles which can be bought by a family.
2. We can't stop using the detergents but we can definitely look for the alternative means:
  - (a) We should try to find out natural and eco-friendly laundry detergents, *i.e.*, biodegradable detergents and use of which will check water pollution.
  - (b) As a consumer to be aware of the chemicals that are toxic and banned.
  - (c) To look on the label of the detergent pack before buying and not to buy the one containing toxic chemicals.
3. (a) **In favour of positive response:**
  - (i) regulate production and supply
  - (ii) it is used in so many ways for medicines, ornamentation
  - (iii) it is used as disinfectant.**In favour of negative response:**
  - (i) cause of death of many people.
  - (ii) many adolescents get affected out of it and become addict.
  - (iii) is being misused even where it is of important use (for example, painting shops, industries).
- (b) **Initiatives:**
  - Drive to make aware
  - Article writing
  - Slogan writing.
  - Skit/Role plays/drama
  - Chart preparation

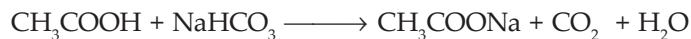
## WORKSHEET-105

1. (d)   2. (c)   3. (c)   4. (d)   5. (b)   6. (b)   7. (b)   8. (a)   9. (c)   10. (a)  
11. (b)   12. (c)   13. (c)   14. (a)   15. (a)   16. (c)   17. (d)

## WORKSHEET-106

1. Take acetic acid in a test tube. Add a pinch of sodium hydrogen carbonate. Brisk effervescence will be observed due to formation of  $\text{CO}_2(\text{g})$ .
$$\text{CH}_3\text{COOH} + \text{NaHCO}_3 \longrightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O} + \text{CO}_2$$
2. (a) Do not inhale vapour of pure acetic acid.  
(b) Keep acetic acid away from flame.
3. (a) Pass the gas through lime water. If it turns milky due to formation of  $\text{CaCO}_3(\text{s})$  it is  $\text{CO}_2$ .  
(b) Bring a burning matchstick near the gas. If it gets extinguished, it shows gas is  $\text{CO}_2$  as it does not support combustion.
4. (a) Acetic acid has an irritating and pungent smell.  
(b) It is soluble in water in all proportions.  
(c) It turns blue litmus red.

5. Acetic acid reacts with sodium bicarbonate and CO<sub>2</sub> gas is evolved.



6. A colourless and odourless gas would evolve with a brisk effervescence. The evolved gas is CO<sub>2</sub>.

Test of the gas evolved:

- (a) The gas extinguishes the burning splinter that is brought near it.  
(b) The gas turns lime water milky on passing through it.
7. When acetic acid reacts with washing soda, formation of sodium acetate, water and carbon dioxide take place. On passing CO<sub>2</sub> in lime water, it turns milky.



8. On adding acetic acid in water, it dissolves readily in water. When blue litmus paper is dipped in it, the colour of litmus paper changes red.

9. (a) Vigorous reaction takes place.

(b) Evolution of a colourless, odourless gas with brisk effervescence.

Chemical equation:



#### WORKSHEET-107

1. (b) 2. (c) 3. (b) 4. (b) 5. (d) 6. (a) 7. (b) 8. (c) 9. (b) 10. (a)  
11. (b) 12. (a) 13. (b) 14. (b) 15. (b) 16. (d)

#### WORKSHEET-108

1. (a) 2. (a) 3. (d) 4. (c) 5. (d)
1. (i) Take 20 ml of vegetable oil.  
(ii) Add 40 ml of 20% NaOH solution.  
(iii) Heat the contents till soaps starts forming.  
(iv) Cool the contents and cut it into desired shape.
2. Glycerol is obtained as by-product in manufacture of soap.  
Uses of glycerol:  
(i) It is used for making transparent soap.  
(ii) It is used in cold cream.
3. (a) Do not touch solid NaOH.  
(b) Stir the contents carefully so that it does not spill out.
4. (a) Saponification is an exothermic reaction.  
(b) (i) Soap solution turns red litmus blue (ii) It does not change the colour of blue litmus.  
The medium of soap solution is basic in nature.
5. Soap is a sodium or potassium salt of long fatty acid. By adding the common salt in reaction mixture, solubility of soap in reaction mixture decreases, so it curdles out

## WORKSHEET-109

1. (a)    2. (a)    3. (d)    4. (b)    5. (a)    6. (a)    7. (a)    8. (b)    9. (a)    10. (b)  
 11. (c)    12. (a)

1. Add soap solution into given sample of water.

Stir it well.

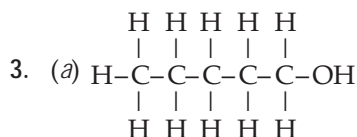
If enough lather is not formed, it means it is hard water.

2. (i) Calcium chloride,  $\text{CaCl}_2$ .                      (ii) Magnesium chloride,  $\text{MgCl}_2$ .  
 (iii) Calcium sulphate,  $\text{CaSO}_4$ .                      (iv) Magnesium sulphate,  $\text{MgSO}_4$ .
3. It is because  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ion react with soap to form calcium and magnesium salt of fatty acids called scum which is insoluble and soap goes waste.  
 Hard water can be converted into soft water by adding washing soda and on filtration we will get soft water.
4. Following precautions should be taken:  
 (a) Same amount of soap should be used for all the samples.  
 (b) Equal volume of water sample should be taken.  
 (c) Each test tube should be shaken equal number of time and in a similar manner.  
 (d) Length of foam should be measured immediately after shaking.

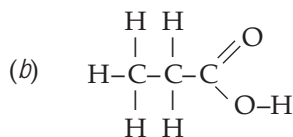
### CHAPTER TEST

1.  $-\text{OH}$

2.  $\begin{array}{c} \text{O} \\ || \\ -\text{C}- \end{array}$



Structure of pentanol

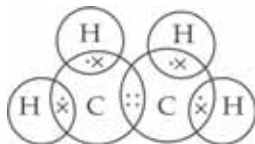
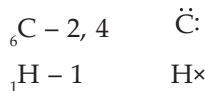


Structure of propanoic acid

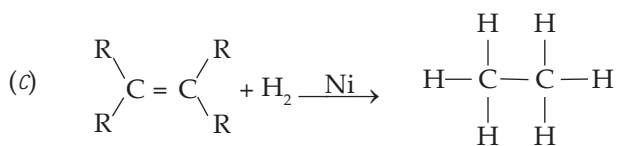
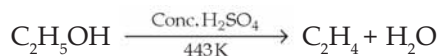
4.  $\text{C}_4\text{H}_{10}$  and  $\text{C}_5\text{H}_8$  as they are unsaturated hydrocarbons.
5. The stability of carbon compounds is attributed to the small size of carbon atom. Due to the small size of carbon atom, the nucleus holds the shared pair of electron more effectively. Thus, making the bond stronger.
6. (a) Hydrogen gas.  
 (b)  $2\text{C}_2\text{H}_5\text{OH} + 2\text{Na} \longrightarrow 2\text{C}_2\text{H}_5\text{ONa} + \text{H}_2$
7. (a) If the air holes of the gas stove get blocked, then incomplete combustion of the fuel takes place due to limited supply of oxygen. This leads to the formation of soot that deposits on the vessel and thus, they get blackened.  
 (b) The gas/kerosene stoves are provided with air inlets so that oxygen rich mixture is burnt for the complete combustion and thus, it produces a clean flame.

(c) Detergents are better cleansing agents than soaps because they can work effectively in hard water and have a stronger cleansing action than soaps.

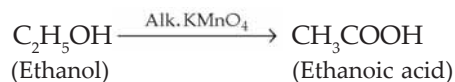
8. (a) Ethene ( $C_2H_4$ )



(b) By the dehydration of ethanol in the presence of conc.  $H_2SO_4$  at 443 K, ethene is formed.



9. (a) 'A' is ethanol.



(b) When ethanol reacts with ethanoic acid, a sweet smelling substance ester is formed.



**Use.** Ethyl ethanoate is used in perfumes.

(c) Take about 5 ml of ethanol and 5 ml of ethanoic acid in two separate test tubes. To each one of these, add a pinch of sodium bicarbonate. The test tube in which a brisk effervescence is observed is ethanoic acid while the other is ethanol.

# 5

## PERIODIC CLASSIFICATION OF ELEMENTS

### WORKSHEET-111

1. Lithium, sodium and potassium.
2. In Mendeleev's table there were 6 periods and VIII groups. In Modern periodic table there are 7 periods and 18 groups.
3. The Mendeleev's periodic table is based on increasing order of atomic masses and similarity in the chemical properties of elements.
4. It states that the physical and chemical properties of the elements are periodic function of their atomic mass.
5. The two anomalous pairs in Mendeleev's table are:
  - (a) Cobalt and Nickel
  - (b) Tellurium and Iodine.
6. Scandium, gallium and germanium.
7. Nobles gases were not known.
8. The basis of classification of Modern periodic table is the increasing order of atomic number of elements.
9. It states that the physical and chemical properties of the elements are periodic function of their atomic number.
10. (a) 7    (b) 1    (c) 6    (d) 3
11. Metals are placed on the extreme left of the periodic table whereas non-metals are placed on the extreme right of the periodic table.
12. Metalloids, *e.g.*, silicon and germanium.
13. Chlorine and bromine.
14. Helium and neon.
15. Atomic number of 'X' is 12.  
Atomic number of 'Y' is 16.
16. 63 elements.
17. (a) Elements belonging to group 1 are all metals and are highly reactive.  
(b) They have 1 valency electron and predict-valency of 1.
18. Element with atomic no. 12. Since element with atomic number 12 is a metal while element with atomic no. 17 is a non-metal. Hydride formed by metal with hydrogen is an ionic hydride which will have high melting point.
19. Element with atomic number 11 has larger size. Due to increase of atomic number, nuclear charge increases and thus, the valence electrons are pulled inwards more effectively. Thus, decreasing the size of the atom.

20.  $M_2O$ .
21. Boron and gallium. The basis is the presence of similar number of valence electrons due to similar electronic configuration.
22. 'X' is a metal. Elements having 1, 2 or 3 valence electrons (except hydrogen and helium) are metals. So element 'X' is a metal.
23. Hydrogen with atomic number 1 shows properties similar to both alkali metals in group 1 and also to halogens in group 17. Thus, its position in group 1 with alkali metals is controversial.

### WORKSHEET-112

1. Noble gases have been placed in a separate group in modern periodic table as they have completely filled outermost shell due to which they have complete octet.
2. Hydrogen gas, H : H.
3. There are 18 vertical columns in modern periodic table and they are called group.
4. There are seven rows in modern periodic table. These rows are called periods.
5. (a) The properties of the element depend upon the number of valence electrons. Since all elements in a group have similar electronic configuration and have same number of valence electrons thus they predict similar properties.  
(b) On moving across the period the atomic size of the element decreases.
6. (a) The electronic configuration of Li(3) and Na(11) is 2, 1 and 2, 8, 1.  
(b) Common property: They are all metals with one valence electrons and are highly reactive.
7. (a) **Position of hydrogen** in group 1A is not justified. Although, its properties resemble with both Alkali metals and Halogens.  
(b) No separate position was given to isotopes although they are atoms of same element with different atomic mass.
8. (a) Gaps were left for the undiscovered elements and their properties were also predicted. Later on when these elements were discovered, they could be easily accommodated in the table without disturbing it.  
(b) Noble gases which were discovered later could also be placed in a new groups without disturbing the existing order.
9. (a) On moving across the period, the atomic size decreases. This is because the number of shell remains same but the nuclear charge increases, which pulls the valence electrons inwards more effectively, thus decreasing its size.  
(b) On moving down the group the atomic size increases. Although, the nuclear charge increases but due to the addition of a new energy shell the valence electrons become far away from nucleus. Hence, they are not held effectively by the nucleus thus, increasing its size.
10. (a) On moving down the group, the valency of elements remains same in a particular group.  
(b) On moving across the period from left to right, the valency first increases from 1 to 4 and then decreases from 4 to zero.
11. Atomic number of an element is more important to a chemist than its atomic mass because knowing the atomic number, the electronic configuration of the element can be known. By knowing its valence electron, its chemical properties, nature of the element and reactivity can be predicted.
12. Knowing the electronic configuration, the valency of the element can be predicted. If an element has 1, 2 or 3 valence electrons, its valency is equal to the number of valence electrons.



If the number of valence electrons are more than 4 then valency = 8 – no. of valence electrons, *e.g.*, sodium (2, 8, 1), valency = 1; chlorine (2, 8, 7), valency = 8 – 7 = 1.

### WORKSHEET- 113

- (a) 'A' is non-metal as it belongs to group 17 with 7 valence electrons.  
(b) 'C' is more reactive than 'A' due to larger atomic size of 'C'.  
(c) 'C' will be smaller in size than 'B' due to greater nuclear charge.  
(d) Anion.
- The element is aluminium with atomic number 13 and valency 3.
- Three elements which have completely filled outermost shell are Helium, Neon and Argon.  
Common name: Inert gases/Noble gases  
Group number: 18.
- (a) Sodium, lithium, potassium.  
(b) Calcium, magnesium.
- (a) Aluminium (b) Carbon  
(c) Calcium (d) Germanium
- According to Mendeleev's periodic table Cl-35 and Cl-37 should be placed at different positions, as the basis of classification in increasing order of atomic masses but since their chemical properties are same, they should be placed in the same position in the periodic table.
- (a) Valency is equal to valence electrons in case of metals. In case of non-metals valency is equal to eight minus number of valence electrons.  
(b) X has electronic configuration 2, 7. Its valency is 1 because it can gain 1 electron to become stable.
- The group number of element depends upon number of valence electrons which is decided by electronic configuration. Period number is equal to number of shells used in electronic configuration, *e.g.*, Na (11) has electronic configuration 2, 8, 1. It belongs to group 1 and 3rd period because it has one valence electron and three shells.
- (a) It goes on decreasing. (b) It goes on increasing.
- The repetition of properties after a definite interval is called periodicity of properties.  
It is because elements of same group have same number of valence electrons and chemical properties depend upon number of valence electrons.

### WORKSHEET-114

- Ca(20)– 2, 8, 8, 2  
Mg(12)– 2, 8, 2  
K(19)– 2, 8, 8, 1  
Sr(38)– 2, 8, 18, 8, 2

Ca resembles in properties with Mg and Sr because all have same number of valence electrons.
- (a) Elements C(2, 4), O(2, 6), Ne(2, 8) belong to 2nd period as they have 2 shells while elements Na(2, 8, 1) and Si(2, 8, 4) belong to 3rd period as they have electrons filled in 3 shells.

- (b) No element belongs to the same group as none of them have same number of valence electrons.
3. As element belongs to 3rd period, it will have 3 energy shells. As the element belongs to 17th group it will have 7 electrons in its M shell. Therefore,
- (a) its electronic configuration is 2, 8, 7.  
 (b) its valency is 1, as it will gain 1 electron to complete its outermost shell.
4. (a) K (2, 8, 8, 1) has 1 electron in its outermost shell.  
 (b) Be (2, 2) and Ca (2, 8, 8, 2) belong to the same group as both of them have 2 electrons in their outermost shell.
5. (a) Element with atomic number 13 has electronic configuration 2, 8, 3.  
**Group:** It belongs to 3rd group as it has 3 valence electrons.  
**Period:** It belongs to 3rd period as it has 3 shells.  
 (b) It is a metal as it has 3 electrons in its outermost shell so it can behave like metals by losing 3 electrons and forming trivalent ions.
6. By knowing the electronic configuration we can know the number of valence electrons.
- (a) If the valence electrons are 1, 2 or 3 then the valency is equal to number of valence electrons.  
 (b) If valence electrons are 4 or greater than 4 then valency = 8 – number of valence electrons.  
 • The valency of an element with atomic number 9 is 1.
7. (a) 2, 8, 3  
 (b) It belongs to group 13.  
 (c) It is a metal as it has 3 valence electrons.  
 (d)  $\text{AlBr}_3$
8. Electronic configuration of

${}_7\text{X} \longrightarrow 2, 5$

${}_8\text{Y} \longrightarrow 2, 6$

${}_9\text{Z} \longrightarrow 2, 7$

(a) Position of 'X' — group – 15  
 period – 2

Position of 'Y' — group – 16  
 period – 2

Position of 'Z' — group – 17  
 period – 2

(b)  $X > Y > Z$

(c)  $\text{XZ}_3$

## WORKSHEET-115

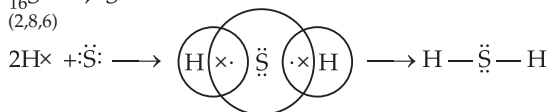
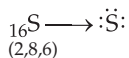
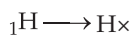
1. (a) Sodium (Na) has the largest atomic radii as on moving across the period, the number of protons increase due to increase in the atomic number. This results in the increase of

- nuclear charge but the electrons are added to the same shell. The increased nuclear charge then pulls the outer electrons more effectively thus decreasing the size of atoms.
- (b) Aluminium is least reactive due to its smallest atomic size and needs to lose 3 electrons to take part in chemical reaction.
2. (a) Modern periodic table has 7 periods.  
 (b) Atomic radii increases on moving down the group. Valency of the element remains same on moving down the group.  
 Metallic character of the elements increases on moving down the group.  
 (c) Atomic size of the elements decreases on moving from left to right in a period.  
 Metallic character of the element decreases on moving from left to right in a period.
3. (a) Out of F, Cl and Br element bromine has the largest atomic radii. They all belong to the same group and on moving down the group, the atomic size increases as the number of shells increases. Thus the valence electrons become far away from the nucleus and atomic size decreases.  
 (b) Fluorine is most reactive. Due to its small atomic size it accepts the incoming electron easily to complete its noble gas configuration.
4. (a) Fluorine, F =  $1s^2, 2s^2, 2p^5$  ( $5\bar{e}$  in 2p subshell)  
 (b) Calcium, Ca =  $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 4s^2$  (It can lose 2 electrons)  
 (c) Oxygen, O =  $1s^2, 2s^2, 2p^4$  (It can gain 2 electrons)
5. (a)  ${}_{19}\text{K}$ , its electronic configuration is 2, 8, 8, 1  
 (b)  ${}_4\text{Be}$  and  ${}_{20}\text{Ca}$  belong to the same group, *i.e.*, (group-2) as both of them have 2 electrons in their outermost shell.  
 (c)  ${}_{19}\text{K}$  and  ${}_{20}\text{Ca}$ , belong to the same period as both of them have 4 shells and belong to 4<sup>th</sup> period of the periodic table.
6. Vertical column in the periodic table is called group.  
 (a) Number of valence electrons remain same.  
 (b) A new energy shell is added on moving down the group from top to bottom.  
 (c) Size of atom increases on moving down the group.  
 (d) Metallic character of element increases as size increases and thus tendency to lose electrons increases.  
 (e) Increases.

## WORKSHEET-116

1. (a) Since X has 4 shells, therefore, it belongs to 4<sup>th</sup> period of modern periodic table.  
 (b) As element X has 2 electrons in its outermost shell, it belongs to group-2 of modern periodic table.  
 The element has 2 electrons in its outermost shell, so it will lose 2 electrons to complete its octet. Hence, its valency is 2.
2. (a) The valency of Q is 3  
 (b) Elements P and Q are metals as they have 2 and 3 valence electrons respectively while elements R and S are non-metals as they have 4 and 5 valence electrons respectively.  
 (c) Elements with atomic number 12 will form the most basic oxide.
3. (a) Since the element belongs to 3rd period and group 16, its electronic configuration is 2, 8, 6.  
 Valence electrons of 'X' = 6  
 Valency of 'X' is = 2

(b) 'X' is sulphur. On reaction with hydrogen it forms hydrogen sulphide, H<sub>2</sub>S



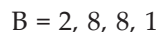
(c) Sulphur is non-metallic.

4. (a) (i) Valency is defined as the combining capacity of an atom of an element to acquire noble gas configuration. It is equal to the number of electrons lost, gained or shared during formation of a chemical compound.

(ii) Atomic size is defined as the distance from the centre of the nucleus to the outermost shell of the atom.

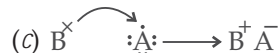
(b) On moving from left to right along the period, valency first increases and then decreased whereas atomic size decreases from left to right in a period in modern periodic table.

5. (a) Electronic configuration of element A = 2, 8, 7



'A' belongs to 3rd period and 17<sup>th</sup> group of periodic table. 'B' belongs to 4<sup>th</sup> period and group-1 of periodic table.

(b) Compound – BA



The bond formed between A and B is ionic.

## WORKSHEET-117

1. As the number of shells is 3, so these elements can be placed in 3<sup>rd</sup> period of modern periodic table.

Electronic configuration of element A = 2, 8, 1

Electronic configuration of element D = 2, 8, 7

Molecular formula of the compound formed by combination of elements A and D will be AD.

2. (i) Element E

(ii) Element D

(iii) Element B

(iv) Element D is bigger in size because atomic size decreases on moving left to right in a period.

(v) Noble gas

3. (a) Y

(b) 2 each

(c) False, same period—Y lies in group 2 and X in group 16.

4. (a) Atomic number	Name of the elements
8	Oxygen
6	Carbon
18	Argon
12	Magnesium
(b) Atomic number	Group number
8	16
6	14
18	18
12	2
(c) Atomic number	Period
8	2
6	2
18	3
12	3
(d) Atomic number	Electronic Configuration
8	2, 6
6	2, 4
18	2, 8, 8
12	2, 8, 2
(e) Atomic number	Valency
8	2
6	4
18	0
12	2

### WORKSHEET-118

- (a) Elements with configuration 2 and 2, 8 belong to same group (group-18), as they have completely filled valence shell. Also elements with configuration 2, 8, 2 and 2, 8, 8, 2 belong to same group (group-2).

(b) Elements with configuration 2, 8, 2 and 2, 8, 7 belong to same period, as they have same number of shells.

(c) (i) and (v) are metals (ii), (iii), (iv) and (vi) are non-metals.

(d) (ii) and (iii) are inert gases. (ii) Neon and (iii) Helium.

(e) (iv) will predict a valency of one, as it will gain one electron to acquire noble gas configurations.
- (a) (i) Mendeleev's classification helped the study of elements in a simpler way and easy to understand.

(ii) Mendeleev left gap in his periodic table for undiscovered elements and also predicted their properties.

(iii) Atomic masses of some of the elements were corrected based upon their position in the table.

Increasing order of atomic mass was the basis of classification of elements in it.

(b) The formula of the compounds formed are given below:



X belongs to 2nd group, as its electronic configuration is 2, 8, 2. It will form ionic compound by loss of electrons.

3. (a) The advantages of the Modern periodic table are:

(i) It is based on increasing order of atomic number which is a more fundamental property than atomic mass.

(ii) Metals and non-metals have been completely separated.

(iii) It explains the cause of periodicity, which is the repetition of similar electronic configuration.

(iv) It is easy to understand and to remember.

(b) The main points of differences in the Mendeleev's and Modern periodic table are as follows:

Mendeleev's Periodic Table	Modern Periodic Table
(a) The basis of classification is increasing order of atomic masses.	(a) The basis of classification is increasing order of atomic number.
(b) Position of elements Co (atomic mass 58.9u) before Ni (58.7u) and Te (127.6u) before I (126.9u) is not justified.	(b) No such discrepancy exists as the basis of classification is increasing order of atomic number.
(c) No separate position for isotopes exists although they have different atomic mass.	(c) No separate position is required for isotopes, as they have same atomic number.
(d) Cause of periodicity amongst the elements cannot be explained.	(d) Cause of periodicity is the repetition of similar electronic configuration.
(e) Each group except VIII has been subdivided into subgroup A and B.	(e) Each group has only one column of elements.
(f) No separate portion is allotted to transition and inner transition elements.	(f) Transition and inner transition elements have been completely separated.

4. The two major shortcomings of Mendeleev's periodic table are:

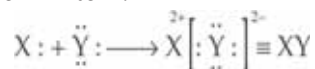
(a) (i) The position of hydrogen in group I-A is not justified although its properties resemble both with elements of group I-A and VII-A. No separate position has been given to isotopes, although they have different atomic masses.

(ii) Some elements have been wrongly placed, *i.e.*, not in the increasing order of atomic mass, *e.g.*, cobalt with higher atomic mass has been placed before nickel.

These shortcomings have been removed in the modern periodic table by taking the classification as increasing order of atomic number and not atomic mass.

(b) Elements	Atomic number	Electronic configuration
X	12	2, 8, 2
Y	16	2, 8, 6

X and Y belong to 3rd period, as they contain three energy shells. X is a metal belonging to second group while Y is a non-metal of sixteenth group, ionic bond is formed by the transfer of two electrons from X to Y.



## WORKSHEET-119

- (a) The vertical column in the periodic table are called 'groups', the horizontal rows in the table are called periods.

(b) (i) 'M' and 'N' belong to the same period but group I and II respectively. N is smaller than M as the atomic size decreases on moving from left to right in a period.

(ii) M is more metallic than 'N' because metallic character goes on decreasing from left to right as tendency to lose electrons decreases due to decrease in atomic size.

(iii) The valencies of M and N are 1 and 2 respectively. Valency across the period first increases then decreases.

(iv)  $MCl$ ,  $NCl_2$ .
- (a) Classification is done to study the properties of elements conveniently.

(b) Increasing order of atomic mass and similarity in chemical properties, *i.e.*, the nature of oxide formed.

(c) The gaps were left for undiscovered elements then.

(d) Noble gases were not invented at that time.

(e) Cl-35 and Cl-37 will be kept in the same slot as their chemical properties are same.
- (a) (i) Increasing order of atomic mass and similarities in chemical properties of elements.

(ii) The formula of oxides and hydroxides formed by elements.

(b) **Mendeleev's Periodic Law:** Properties of elements are periodic functions of their atomic masses.

(c) Hydrogen had no fixed position in Mendeleev's Periodic table because it resembles alkali metal by forming positive ions and resembles halogens by forming diatomic molecule.

(d) (i) Atomic size decreases from left to right, as the valence electrons are attracted by the nucleus due to increase in the nuclear force.

(ii) The atomic size increases from top to bottom in a group because the number of shells keep on increasing, therefore, distance between nucleus and valence electrons increases.
- (a) Atomic number of silicon is 14

(b) Electronic configuration of silicon is 2, 8, 4

(c) Valency is 4

(d) Carbon – Non-metal  
Silicon – Metalloid

(e)  $SiCl_4$

## WORKSHEET-120

- (a) A and B belong to groups 1 and 2 because they form basic oxides. C belongs to group 13 as it has three valence electrons, D to group 14 as it forms almost neutral oxide. E, F belong to groups 15 and 16 as they form acidic oxide G belongs to group 17 as it has 7 valence electrons and H belongs to group 18.

They belong to 3rd period of periodic table because in vegetable dishes NaCl is used and Na and Cl belong to 3rd period.

(b) Ionic compound will be formed because 'B' is metal and F is non-metal. 'B' can lose two electrons and 'F' can gain 2 electrons.







**SOLUTIONS TO  
PULLOUT WORKSHEETS  
BIOLOGY**

## 1

## LIFE PROCESSES

## WORKSHEET-122

1. Saliva contains enzyme amylase which breaks down starch to maltose.
2. Birds and mammals have high energy needs as they need energy to maintain a constant body temperature (warm blooded animals or endotherms).
3. Maintenance processes needed to sustain life by preventing damage and keeping the body in the healthy state is known as life processes.
4. Acid facilitates action of pepsin on protein.
5. Capillaries.
6. Haemoglobin.
7. 
$$\begin{array}{ccccccc} \text{C}_6\text{H}_{12}\text{O}_6 & \longrightarrow & \text{pyruvate} & \longrightarrow & 2\text{C}_2\text{H}_5\text{OH} & + & 2\text{CO}_2 & + & \text{Energy} \\ \text{Glucose} & & & & \text{Ethyl alcohol} & & \text{Carbon} & & \\ & & & & & & \text{dioxide} & & \end{array}$$
8. Leaves of green plants prepare the food which is needed in all parts of plants, including roots. This food has to be transported to all parts of the plants in the dissolved form—translocation.
9. Water, urea, uric acid, salts.
10. Glomerulus.
11. Water and minerals dissolved in it move up to leaves from root through tracheids and vessels which are two kinds of elements of xylem.
12. Xylem.
13. Transpiration: loss of water in vapour form from leaves of plants.  
Due to transpiration, deficit of water is created in the leaves pulling water and minerals upwards through xylem elements—ascend of sap.
14. Autotrophs obtain  $\text{CO}_2$  from atmosphere through diffusion. Plants have stomata to take it in.  $\text{N}_2$  cannot be taken in as by the autotrophs. Plants can absorb it in the form of nitrates and nitrites.
15. 
$$6\text{CO}_2 + 12\text{H}_2\text{O} \xrightarrow[\text{Chlorophyll}]{\text{light}} \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{H}_2\text{O} + 6\text{O}_2$$
  
Glucose
16. The breakdown of food in cells to release energy. All kind of food is broken down through oxidation-reduction reaction and its chemical energy is converted into a universal source of chemical energy—ATP, Adenosine Triphosphate.
17. Contraction and expansion of alimentary canal to push the food forward.
18. ATP, Adenosine triphosphate.
19. Glycolysis.
20. Digestive enzymes breakdown complex molecules of food into simpler ones so that they can be absorbed by blood.
21. Aerobic respiration and anaerobic respiration.
22. They are chemically proteinaceous biocatalysts, which increase or decrease the rate of a biochemical reaction.

23. Iodine in salt helps in making the hormone thyroxin by thyroid gland. It not only prevents the disease goitre but also helps in regulating metabolism of carbohydrates, fats and proteins.
24. Anaemia.
25. It occurs in chloroplasts in palisade cells or tissues in green parts of leaves in plants.
26. They show nutrition, respiration, growth, excretion and reproduction.

### WORKSHEET-123

1. Energy is needed to carry out all life processes. Living beings use carbon based (organic) molecules from their surroundings to derive energy, though some of them can prepare them from inorganic compounds. They also use them for growth, reproduction and repair in their body.
2. No, the plant will not stay healthy for a long time. The reasons are:
  - (a) It will not be able to exchange  $O_2$  and  $CO_2$ , hence respiration will be affected adversely.
  - (b) Photosynthesis will also be affected as  $CO_2$  will not be available.
  - (c) Transpiration will not take place hence, there will be no ascent of sap, hence no water absorption from the soil.
3. The transport system of an animal moves substances to where they are needed in the body. Even the smallest animal must have the means of transporting substances around its body. Oxygen and food molecules must move to all the cells, and the waste products must be removed from the cells and expelled into the environment. It occurs through diffusion mainly. In a multicellular organism, all cells are not in contact with the surroundings hence, diffusion will be insufficient for it. A variety of fluid systems, called vascular systems, help such transport in most members of the animal kingdom.
4. Amount of  $O_2$  dissolved in water is less than  $O_2$  present in air. Therefore, rate of breathing in aquatic animals is faster than that in terrestrial animals.
5. **Translocation.** Transport of organic food from the leaves to the other parts of the plants through the sieve tubes of phloem tissue is called translocation.
 

**Importance.** It is an essential process as every part of the plant requires food for energy, building and maintenance.

  - (a) Sugar is synthesized in the leaves.
  - (b) Hormones are synthesized in the growing parts of roots and shoots.
6.
  - (a) **Blood vessels** transport the blood between heart and various organs.
  - (b) **Blood platelets** help in blood clotting thus, saving its loss.
  - (c) **Lymph** carries digested fats, fights infection, drains excessive extracellular fluid back into the blood.
  - (d) **Heart** pumps blood with enough force into the major arteries so that it reaches every part of the body.
7. Small intestine receives bile juice from liver, which has bile salts. They emulsify them that break large fat drops to fine droplets. It also receives pancreatic juice from pancreas. Lipase enzyme from pancreas breaks down fats into fatty acids and glycerol. Thus, fats are digested in small intestine in our body.

8.	Respiration	Breathing
	<ol style="list-style-type: none"> <li>1. It is a biochemical process.</li> <li>2. <math>O_2</math> reacts with food and energy is released.</li> <li>3. Energy is released.</li> <li>4. It occurs in cytoplasm and mitochondria.</li> </ol>	<ol style="list-style-type: none"> <li>1. It is a physical process.</li> <li>2. Only exchange of gases.</li> <li>3. No energy released.</li> <li>4. Occur in respiratory organs.</li> </ol>

9.	Aerobic respiration	Anaerobic respiration
	1. Presence of air required. 2. Occur in two steps: 1st glycolysis in cytoplasm, 2nd in mitochondria. 3. Glucose completely oxidized to CO <sub>2</sub> and H <sub>2</sub> O. 4. Large amount of energy produced. 5. Examples—man, higher plants.	1. Presence of air not required. 2. Complete process occurs in cytoplasm. 3. Glucose incompletely oxidized to either an organic acid or alcohol with CO <sub>2</sub> . 4. Less energy produced. 5. Examples— yeast, <i>Lactobacillus</i> .

10. Respiration in plants works like this:

- (a) All parts of plants like roots, stem, leaves, etc. respire individually.
- (b) There is little transport of gases from one part to another.
- (c) Respiration occurs at much slower rate.

### WORKSHEET-124

1. All respiratory systems have some important features:

- (a) Large surface area.
  - (b) Thin and delicate surface for diffusion and exchange of gases. It is generally located in protected inner part of body.
  - (c) Rich blood supply to respiratory organ.
- Since all of them are present in alveoli, hence it is perfectly designed for exchange of gases.

2. Fats are first emulsified with the help of bile salts followed by their breakdown in fatty acids and glycerol due to the action of lipase. All these events take place in first part of small intestine—duodenum.

3. The food prepared by plant may be sucrose, amino acids or other materials. It is done with the help of living cells—sieve tubes and companion cell of phloem tissue—by utilizing energy of ATP. The movement occurs both upwards and downwards from the place of formation (leaves) to place of use (growing buds) depending upon the situation.

4. (a) Digestion of protein.  
 (b) Digestion of starch.  
 (c) Digestion of protein.  
 (d) Digestion of fat.

5. Blood is liquid connective tissue. It is chiefly formed of two components:

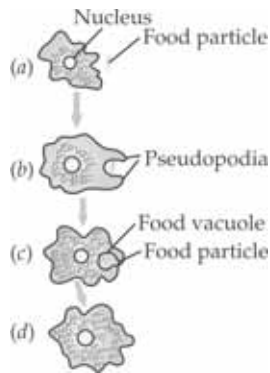
1. **Fluid matrix or plasma.** Which is pale in colour and transports substance like dissolved carbon dioxide, glucose, amino acids, urea, etc. has mainly water, some proteins like albumin, fibrinogen (blood clotting protein) and many other substances to be transported.

2. **Cellular elements are of three types:**

- (a) **Red blood corpuscles (RBC) or erythrocytes**, which transport O<sub>2</sub> and CO<sub>2</sub>. They are enucleated, disc shaped, full of a red coloured protein pigment, haemoglobin.
- (b) **White blood corpuscles (WBC) or leucocytes**, which fight disease-causing agent. They are larger, nucleated and are of different types.

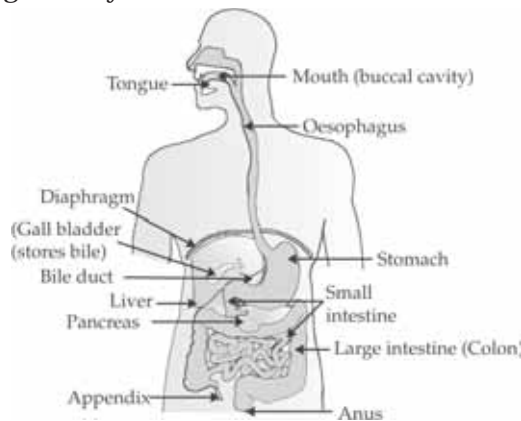
(c) **Blood platelets or thrombocytes**, which help in blood clotting. They are fragments of some larger cells hence, do not have nucleus.

**6. Nutrition in *Amoeba*.** It occurs through phagocytosis. It captures food by pseudopodia (ingestion) ingested food, enclosed in cell membrane is called food vacuole.



## WORKSHEET-125

1. Diagram—Human digestive system.



2. (a) Food is crushed into small pieces by the teeth.  
 (b) It mixes with saliva and the enzyme amylase (found in saliva) breaks down starch into sugars.  
 (c) Tongue helps in thorough mixing of food with saliva.
3. (a) The two vena cava (superior and inferior) bring deoxygenated blood to human heart.  
 (b) Right atrium receives this blood.  
 (c) When the right atrium contracts, this blood is poured into the right ventricle and when the right ventricle contracts, it pumps the blood into the pulmonary artery which carries it to the lungs for oxygenation.
4. Exchange of gases in tissues:
  - (a) Most of oxygen is carried by haemoglobin in blood. On reaching the tissues, it gets diffused into the cells as it is in higher concentration than in the cells.
  - (b) The carbon dioxide, which is formed in the cells, gets accumulated there in higher concentration as compared to in the blood, now diffused into the blood.

- (c) The  $\text{CO}_2$  mostly dissolved in blood plasma reaches the lungs, from where it is expelled during exhalation.
5. (a) At the roots, cells in contact with the soil actively take up the ions. This creates a difference in concentration of these ions between the roots and the soil.
- (b) Water, therefore, moves into the root to eliminate the difference.
- (c) There is a steady movement of water through a continuous system of water conducting channels from roots to leaves.
- (d) Transpirational pull is operational mainly during day as stomata are open. Though at night it is mainly root pressure which helps in pushing the water up. Transpiration also helps in cooling of plant tissues.
6. A circulatory system is a vascular system (*i.e.*, with tubes or vessels) in which the transport fluid moves rhythmically in a particular direction, since it is propelled by a muscular pumping structure.

The circulatory system is divided into two parts: the cardiovascular system, which includes the heart and blood vessels, and the lymphatic system, which consists of lymph nodes and lymph organs. Each component serves a specific purpose. For example, the cardiovascular system is responsible for the transportation of oxygen, hormones and waste material, while the lymphatic system protects the body against infections.

In the human being, many substances like nutrients, oxygen,  $\text{CO}_2$ , hormones, waste products are to be transported from one place to other. For example, materials like glucose, fatty acids and oxygen have to be transported to each and every cell of the body where energy is required. Similarly, hormones are to be transported to the target organs. Also the waste products like urea, etc. are to be transported to kidneys where they are thrown out of the body.

The most important part of the entire circulatory system is, of course, the heart. The heart is a four-chambered double pump that pumps deoxygenated blood into the lungs that then provide oxygen to the entire body starting from, once again, the heart.

### WORKSHEET-126

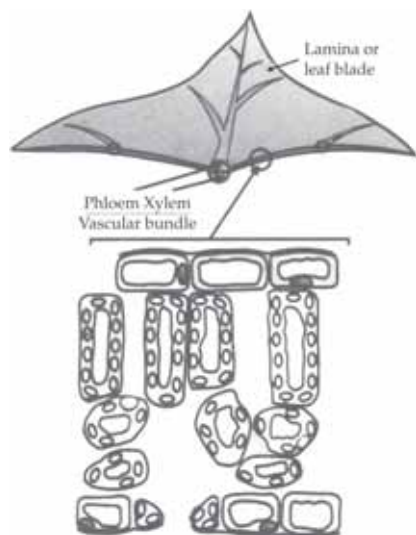
1. **Heart.** Heart lies in the middle of the chest cavity, between the lungs. It has four chambers, two upper, thin walled and small chambers—atria, while lower two are larger and thick walled—ventricles. The right atrium receives blood from the vena cava and pumps the blood into the right ventricle. Blood is sent to lungs, where it is oxygenated. Then, it is sent through the right and left pulmonary veins to the left atrium where it is pumped to the left ventricle. The blood then travels to the ascending aorta where it leaves the heart and delivers oxygen to different parts of the body.



Ventricles are thick walled as they have to generate pressure in the pumped blood. Valves are present between atria and ventricles to prevent backflow of blood.

2. (a) Transpiration is the process of removal of water vapours from the aerial parts of a plant, mainly through stomata in the leaves.

- (b) There are two conducting tissues of plants. First is xylem and second is phloem . Tracheids and vessels which are two kinds of elements of xylem.
- (c) Tracheids are found in all vascular plants. They are spindle shaped, have only pits and are not very efficient.
- (d) Vessels are found in flowering plants, are tube like, have perforation plates and pits making them more efficient.
- (e) When loss of water vapour occurs from leaves of plants due to transpiration, deficit of water is created in the leaves. Evaporation of water molecules from the cells of a leaf creates a suction force which pulls water from the xylem cells.
- (f) Water and minerals dissolved in it move up to leaves from root through tracheids and vessels, pulling water and minerals upwards through xylem elements—*ascent of sap*. Thus transpiration helps in upward movement of water from roots to leaves.
- (g) The roots of a plant absorb water and dissolve substances from the soil, which is needed by the aerial parts of the plants. As such these substances are to be transported from roots up to stem, leaves and flowers.
3. (a) **Autotrophic nutrition.** Organism makes its own food (organic compounds) from simple (inorganic) raw material *i.e.*, plants and some bacteria.  
**Heterotrophic nutrition.** Organisms depend on other living organisms for their food *i.e.*, fungi, animals.  
 Mode of heterotrophic nutrition depends upon type and availability of food.
- (b)



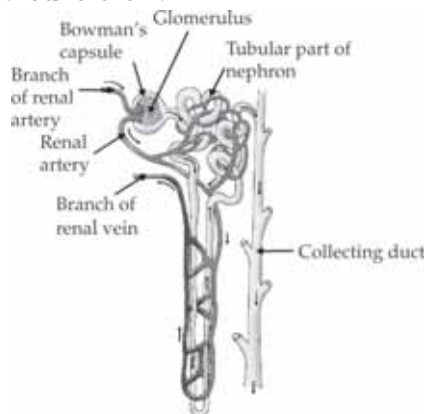
## WORKSHEET-127

1. Within the kidney are small functional units called **nephrons**, which are made up of glomerulus, Bowman's capsule, proximal convoluted tubule, loop of Henle's, distal convoluted tubule, and collecting duct.

### Steps of urine formation

Each kidney is made of millions of **nephron**. Each nephron has a hollow cup like **Bowman's capsule** and a long tubule system following it. Arteriole branching from renal artery make bunches of capillaries, one of which is called a **glomerulus**. The first step in the filtration process is when the blood enters the glomerulus, where it is then pumped through the porous walls into the Bowman's space. This filtered plasma is mainly water, various salts, urea and

glucose. The 'glomerular filtrate' then passes through the proximal convoluted tubule, loop of Henle, the distal convoluted tubule so that useful substances are reabsorbed by blood present in the capillaries around them.



The liquid is concentrated and collected in collecting duct. It is now called urine and poured in ureters to be carried to urinary bladder. Urine is passed out through urethra, when the urinary bladder is full and due to pressure there is an urge to do so. Sphincter muscles regulate this process.

Osmoregulation and excretion are intimately related, these processes together maintain homeostasis (*i.e.*, staying the same), and are performed by the same set of organs. The kidney is the major organ of osmoregulation and excretion in vertebrates.

- The kidneys (renal glands) lie high in the abdominal cavity on both sides of the vertebral column. The right kidney is slightly lower than the left to make room for the liver. Each kidney is bean shaped and the concave portion faces medially where the renal artery and vein and ureters attach. The kidney collects and transports urine from the kidney to ureters.

**The kidneys regulate:**

- The volume of blood plasma (blood pressure).
  - The concentration of waste products in the blood (excretion).
  - The concentration of electrolytes such as  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{HCO}_3^-$  and other ions (osmoregulation).
  - The pH of plasma.
- (a) Flower pots are shifted to sunshine so that plants can photosynthesise, *i.e.*, they get nutrition.  
(b) Care for plants and environment.

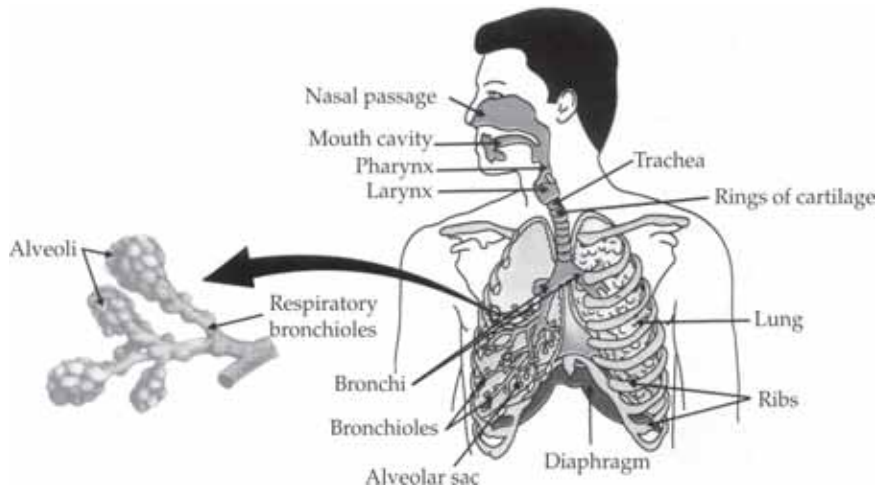
**WORKSHEET-128**

- (a) When both the kidneys of a person stop working for some reasons, it is called renal failure.  
(b) **The kidneys regulate:**
  - The volume of blood plasma (blood pressure).
  - The concentration of waste products in the blood (excretion).
  - The concentration of electrolytes such as  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{HCO}_3^-$  and other ions (osmoregulation).
  - The pH of plasma.



- (c) Love for life, love for family, kind-heartedness.  
 (d) Gratefulness.
2. (a) Blood is liquid connective tissue. It is chiefly formed of two components:
- 1. Fluid matrix or plasma:** It is pale in colour and transports substances like dissolved carbon dioxide, glucose, amino acids, urea, etc. and has mainly water. Some proteins like albumin, fibrinogen (blood clotting protein) and many other substances are also transported by it.
  - 2. Cellular elements:** These are of three types:
    - (i) Red blood corpuscles (RBC) or erythrocytes,** which transport  $O_2$  and  $CO_2$ . They are enucleated, disc shaped, full of a red coloured protein pigment, haemoglobin.
    - (ii) White blood corpuscles (WBC) or leucocytes,** which fight disease-causing agent. They are larger, nucleated and are of different types.
    - (iii) Blood platelets or thrombocytes,** which help in blood clotting. They are fragments of some larger cells hence, do not have nucleus.
- (b) Concern for lives of blood-needy patients/people, social responsibility.

3. (a)



Label :

- (i) Trachea  
 (ii) Larynx  
 (iii) Diaphragm  
 (iv) Pharynx
- (b) Thin walled (easy diffusion), greater surface area for diffusion, large number, highly elastic, surrounded by network of blood capillaries.

### WORKSHEET-129

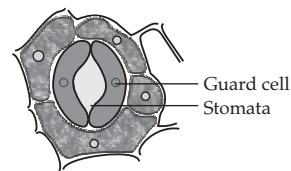
1. (b) 2. (c) 3. (b) 4. (b) 5. (a) 6. (d) 7. (c) 8. (b) 9. (b) 10. (b) 11. (c)

### WORKSHEET-130

1. Take a leaf preferably a lily leaf, fold the leaf to upper side and gently press the fold to break it. Then pull the upper part of leaf towards the end part of leaf to get a small part of transparent membrane—the leaf peel.
2. Leaf peel is a (transparent) membrane if kept as such it dries within 5-10 seconds and rolls up and it cannot be used to make a slide. Therefore, to keep it stretched and fresh, it is kept in water.

3. Leaf peel is transparent and the cells also will appear transparent under the microscope. To see the cells clearly, Safranin (red stain) is used in the preparation of the leaf peel slide.

4. (i) **Guard cell** : This is kidney shaped (in dicot leaf) and dumb-bell shaped (in monocot leaf). It is present on either sides of stomata.



(ii) **Stomata** : It is an opening through which water vapours come out.

5. Only point (iv) is correct.

(i) Stomata is made up of guard cells and an aperture.

(ii) Different leaves have different shapes (kidney/dumb bell) of guard cells.

(iii) Stomata may remain open or closed in leaf peel.

(v) Guard cells have nucleus and chloroplasts.

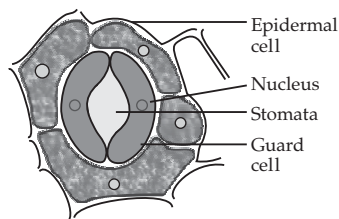
6. (i) The peel must be small in size.

(ii) The peel should not be allowed to dry.

(iii) Overstaining of the material must be avoided.

(iv) The slide must not be dirty.

7.



8. (i) Put out a thin peel from the lower surface of the peel.

(ii) Stain the peel in safranin.

(iii) Remove the extra stain by washing with water.

(iv) Place a drop of glycerine on the slide.

(v) Place the stained peel on the slide.

(vi) Place the coverslip over the peel.

### WORKSHEET-131

1. (d) 2. (d) 3. (d) 4. (b) 5. (c) 6. (b) 7. (c)

### WORKSHEET-132

1. Black paper strips block the light to fall on leaf surface. Thereby, no photosynthesis will take place in the area/part blocked.

2. (i) The covered portion did not photosynthesise whereas in the uncovered portion of the leaf photosynthesis took place.

(ii) Light is necessary for photosynthesis.

3. (i) Do not use the plant or leaves without destarching them.

(ii) The paper strips or light screen should be properly placed over the leaf.

4. (i) It is used for a comparative study of covered and uncovered portions of leaves for the presence of starch.

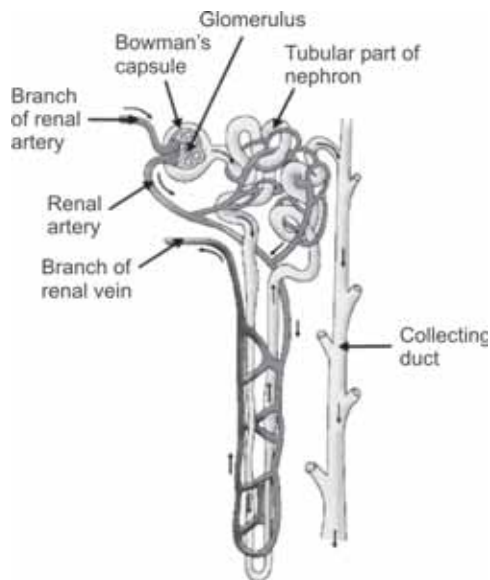
(ii) To decolourise the leaves.



7. (a) Photosynthesis  
(c) Chloroplast.

(b) Nitrogen

8. Nephron



9. (a)

Artery	Vein
1. Have thick, elastic and muscular walls.	1. Have non-elastic and thin walls.
2. Lumen is narrow.	2. Lumen is wide.
3. Carry blood from heart to all body parts.	3. Carry blood from all body parts to heart.
4. Carry oxygenated blood (except pulmonary artery).	4. Carry deoxygenated blood (except pulmonary vein).

- (b) The blood circulation in human heart is called double circulation because the blood passes through the heart twice in one complete cycle of the body—once through the right half in the form of deoxygenated blood and once through the left half in the form of oxygenated blood.
- (c) In four-chambered heart, left half is completely separated from right half by septa. This prevents oxygenated and deoxygenated blood from mixing. This allows a highly efficient supply of oxygenated blood to all parts of the body. This is useful in animals that have high energy needs, such as birds and mammals.

# 2

## CONTROL AND COORDINATION

### WORKSHEET-137

1. Nervous system and endocrine system.
2. Pons.
3. Nervous tissue and endocrine (glandular) tissue.
4. Pituitary secretes growth hormone, which controls the growth of bones and muscles increasing height during childhood.
5. Phototropism.
6. Neuron endings transmit the nerve impulse to dendrite of next neuron through the chemical (neurotransmitter).
7. (a) Shoot will bend towards light.  
(b) Phototropism.
8. Vertebral column made by vertebrae.
9. Nerve cell or neuron.
10. Thyroxin regulates the metabolism of carbohydrates, fats and proteins.
11. Chemotropism is growth of a plant part towards or away from a chemical stimulus.
12. Pancreas. Trypsin.
13. Thyroid secreting thyroxin. It is located in the neck region.
14. Non-directional growth, for example, folding and drooping of leaves of *touch-me-not* plant.
15. All information from the environment is detected by specialized tips of some nerve cells. They are receptors located in our sense organs.
16. Movement on the touch-sensitive plant.
17. Insulin and glucagon.  
Insulin lowers the level of blood sugar. Glucagon raises the level of blood sugar.

18. (a)	Voluntary action	Involuntary action
	<ol style="list-style-type: none"> <li>1. It involves conscious thinking by the brain, <i>e.g.</i>, walking.</li> <li>2. Voluntary actions are controlled by our forebrain.</li> </ol>	<ol style="list-style-type: none"> <li>1. It is the action in response to some change in the environment without thinking about it, <i>e.g.</i>, reflex action.</li> <li>2. Involuntary actions are controlled by our spinal cord, midbrain and hind-brain through peripheral nervous system, <i>e.g.</i>, peristalsis.</li> </ol>

- (b) **Involuntary actions** are beating of heart, salivation in the mouth on viewing a tasty food.

### WORKSHEET-138

1. Heart beats faster, supply of more oxygen to muscles, more blood to skeletal muscles, increased breathing rate.

2. Receptors are specialized tips of some nerve cells located usually in our sense organs. The receptors for taste are gustatory receptors while those detecting smell are olfactory receptors.
3. Chemical coordination in animals occurs through chemicals called hormones which are secreted by endocrine glands.

**Thyroxin hormone:** It regulates metabolism of carbohydrates, fats and proteins. It is advisable to consume iodised salt in our food as iodine is required by our thyroid gland to produce thyroxin hormone.

If it lacks in our body, goitre may occur due to enlargement of thyroid in the neck region.

4. (a) Auxin (b) Gibberellin  
(c) Cytokinin (d) Abscisic acid
5. (a) Pineal gland (b) Pituitary gland  
(c) Thyroid (d) Thymus
6. (a) — (iii), (b) — (iv), (c) — (i), (d) — (ii).
7. Growth hormone is responsible for growth of muscles and bones. If level of growth hormone during childhood is low, height may not increase causing dwarfism. If opposite happens, height will increase abnormally causing gigantism.
8. **Reflex action:** It is a sudden and involuntary action in response to change in the environment, *e.g.*, withdrawing hand from a hot object. These actions occur without thinking about them.  
**Reflex arc:** The pathway of quick transmission of nerve impulse in a reflex action is called reflex arc. It is a connection between input nerve (sensory nerve) and the output nerve (motor nerve) and it is formed in the spinal cord.
9. **Three major regions of human brain are:**  
(a) Forebrain which includes cerebral hemispheres (cerebrum).  
(b) Midbrain.  
(c) Hindbrain which includes pons, cerebellum and medulla.  
Cerebellum maintains posture and equilibrium of the body.
10. A living organism has to respond to changes in its surroundings to (a) protect itself (b) gain advantage from present situation.

Systems of control and coordination help an organism to respond properly to these situations.

11. (a) Oestrogen (b) Growth hormone (c) Insulin (d) Thyroxin

### WORKSHEET-139

1. Chemical coordination in animals occurs through chemicals called hormones which are secreted by endocrine glands. Endocrine glands are ductless glands which pour their secretions directly into the blood which transports them to the target organs or tissue where action occurs, *e.g.*, during an emergency situation like frightening/overexcitement, adrenaline, a hormone is secreted by the adrenal gland into the blood which transports it to target organs including heart. As a result, the heart beats faster resulting in supply of more oxygen to our muscles. Breathing rate also increases due to faster contraction of diaphragm and rib muscles. All these responses together enable the animal body to deal with the situation.
2. Chemical coordination occurs in plants with the help of plant hormones. They are synthesized at places away from point of action and simply diffuse in the area of action. Thus, they help in coordinating growth, development responses to the environment.
3. Secretion of oestrogen from ovaries stimulates development of secondary sexual characteristics at puberty (10–12 years) in females.

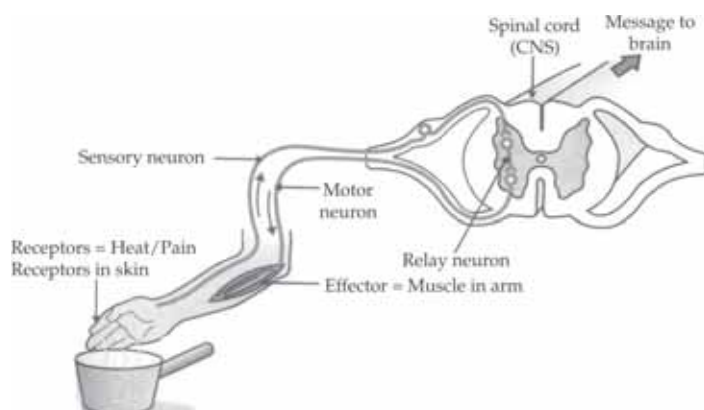
Secretion of hormone testosterone from testis stimulates secondary sexual characteristics during puberty (13–14 years) in males.

**Feedback mechanism:** It regulates timing and amount of hormone to be released in the body, *e.g.*, rise in sugar level in the blood is detected by pancreas, hence insulin secretion is increased. But when sugar level falls, its secretion decreases.

4. Auxins, when the growing shoot of a plant detects light, auxin is synthesised at the shoot tip and diffuses towards the shady side of the shoot. This stimulates cells to grow longer on the shadier side causing the plant to bend.

5. **Reflex action:** It is a sudden and involuntary action in response to change in the environment, *e.g.*, withdrawing hand from a hot object. These actions occur without thinking about them.

**Reflex arc:** The pathway of quick transmission of nerve impulse in a reflex action is called reflex arc. It is a connection between input nerve (sensory nerve) and the output nerve (motor nerve) and it is formed in the spinal cord as shown below:



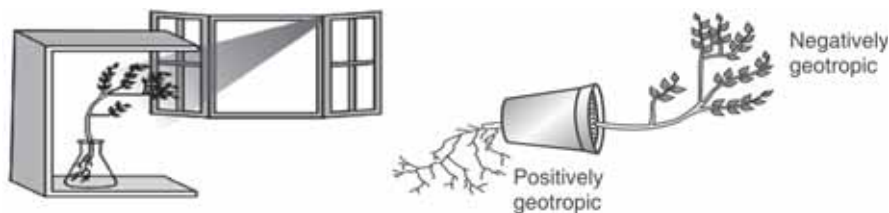
Stimulus → Receptor organ → Sensory nerve → Spinal cord → Motor nerve → Effector organ → Action

## WORKSHEET-140

1. (a) (i) **Phototropism:** Growth dependent movement in which a part of plant moves towards or away from direction of light stimulus. For example, shoot is positively phototropic and roots are negatively phototropic.

(ii) **Geotropism:** Growth dependent movement in which a part of plant moves towards or away from direction of gravitational pull. For example, roots are positively geotropic and shoot is negatively geotropic.

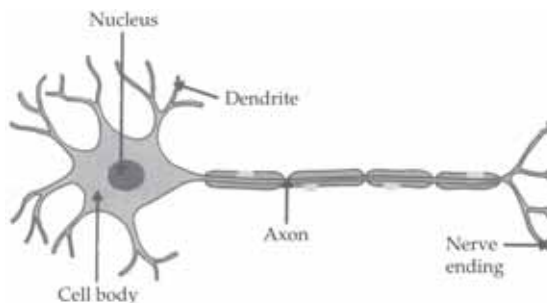
- Fill a conical flask with water.
- Cover the neck of the flask with a wire mesh.
- Keep two or three freshly germinated bean seeds on the wire mesh.
- Take a cardboard box which is open from one side.
- Keep the flask in the box in such a manner that the open side of the box faces light coming from a window.



- After two or three days, you will notice that the shoots bend towards light and roots away from light.
  - Now turn the flask so that the shoots are away from light and the roots towards light. Leave it undisturbed in this condition for a few days.
- (b) (i) **Auxin:** This hormone is responsible for elongation. It causes bending of shoot towards light and twining of tendrils around a support.
- (ii) **Abscissic acid:** It inhibits growth of plant parts to save them during unfavourable conditions. For example wilting and falling of leaves, flowers.
2. Information from the environment is detected by dendritic tip of a neuron located in the sense organ. A chemical reaction sets off here and it creates an electrical impulse which travels from dendrite to cell body and then along the axon to its endings where it sets off the release of some chemicals. The chemicals cross the synapse and set off a similar electrical impulse in dendrites of next neuron. Another synapse at the end of its axon delivers the impulse to the other cells like muscle cells/glands (effector organs) which react to perform the action.

OR

(a)



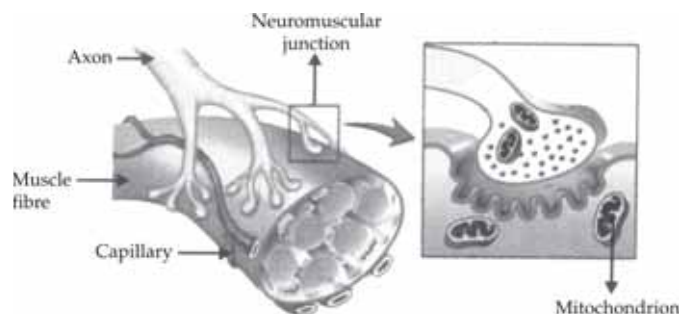
- (b) (i) Dendrite  
(ii) Axon

### WORKSHEET-141

1. Feedback mechanism is a way of controlling the wastage. It controls timing and amount of hormone produced. For example, production of hormones. It regulates timing and amount of hormone to be released in the body, *e.g.*, rise in sugar in the blood is detected by pancreas, hence, insulin secretion is increased. But when sugar falls, its secretion decreases.
2. **Synapse:** A gap junction point between nerve endings of one neuron and dendrites of another neuron.  
Transmission of information impluse:
  - (a) The information is acquired at the end of the dendrites tip of the neuron.
  - (b) A chemical reaction is set off which creates an electrical impulse.



- (c) The electrical impulse travels from the dendrites to the cell body and then along the axon to its end.
- (d) At the axon endings, the electrical impulse sets off release of some chemicals which cross the synapse and start a similar electrical impulse in the dendrites of next neuron. At neuromuscular junction, similar events occur in order to transmit the information.

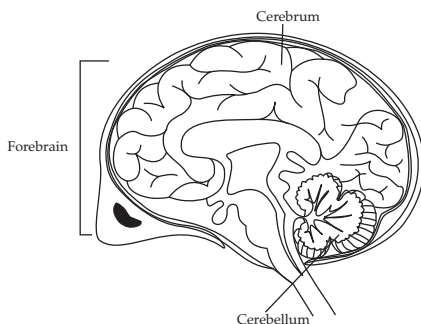


3. Brain and spinal cord constitutes the central and peripheral nervous systems. Brain box and vertebral column protect the components of central nervous system.
4. Some plants like pea plants climb up other plants and fences by means of their tendrils. These tendrils are sensitive to touch. When they come in contact with any such support, auxins are produced by root tip and shoot tip and diffuse to part of the plant away from support and cause the cells to grow longer, the part of the tendril in contact with the support grow causing the tendril to circle the object of support and cling to it.

### WORKSHEET-142

1. (a) Growth hormone is responsible for the growth and development of the body.  
 (b) Pituitary gland produces growth hormone.  
 (b) The people who laugh at dwarf men or women lack responsible behaviour and healthy and good thoughts.
2. (a) Insulin hormone, secreted by pancreatic gland, reduces the blood glucose level in the body. Person in which, this hormone is produced in less amount, the blood glucose level remains high. The excess of glucose is excreted in urine and also has other harmful effects on the body; such a condition is known as diabetes.  
 (b) Modern lifestyle, overconsumption of sugar in foods (sweet foods), lack of physical work or exercise, etc. are the main causes of diabetes. It also occurs due to inheritance, *i.e.*, in some cases it passes on children from their parents.  
 (c) We can avoid this disease by changing our lifestyle and by doing physical work or exercises regularly.

3. (a)



- (b) Labels to be indicated on above diagram are cerebrum and cerebellum.  
(c) Cerebellum controls posture, balance of body and accurate voluntary movements.

### CHAPTER TEST

#### 1. Cerebellum

#### 2. Situation (A)

3. When an electrical signal reaches the end of axon of one neuron, it releases certain chemical substances that cross the synapse and move towards the dendrite of next neuron generating another electrical signal.

4. (a) Adrenal (b) Pancreas (c) Pituitary (d) Ovaries.

5. (a) Auxin (b) Gibberellin (c) Cytokinin (d) Abscisic acid.

6. Electrochemical messages called nerve impulses transfer the information from receptors present in various organs or from sense organs of CNS through nerves.

The orders from CNS are conveyed via nerves to the muscles or glands (effectors). Glands produce secretion (like hormones) which, in turn, control many metabolic activities.

7. Reflex arc

- (a) Sensory neuron (b) Spinal cord (CNS)  
(c) Motor neuron (d) Effector = Muscle in arm.

8. Central nervous system—Brain and spinal cord.

Peripheral nervous system—cranial, spinal and visceral nerves.

The components of central nervous system protected brain box, vertebral column and fluid filled balloon like structure formed from meninges and cerebrospinal fluid.

9. (a) **Oestrogen:** It regulates production of ova from ovaries, secondary sexual characters in females and health of reproductive organs.

(b) **Insulin:** It regulates blood sugar by lowering its level.

(c) **Adrenaline:** It increases heart rate and supply of blood to various organs and helps the body to cope with emergency situations.

(d) **Growth hormone:** It regulates growth and development of bones and muscles.

(e) **Testosterone:** It controls the changes of body features associated with puberty in male.

# 3

## HOW DO ORGANISMS REPRODUCE?

### WORKSHEET-144

1. Reproduction
2. *Leishmania*, binary fission.
3. Two functions of the ovaries of the human female reproductive system are:
  - (a) To produce, ova, which are female gametes.
  - (b) To secrete the female hormones oestrogen and progesterone.
4. The organ by which the embryo is attached to the wall of uterus. The role of placenta is to facilitate exchange of materials between mother and growing foetus.
5. Union of male and female gametes to form a zygote. Fallopian tube or oviduct.
6. One bacterial disease which can be transmitted sexually is syphilis and one viral disease is AIDS.
7. The common passage meant for transporting urine and sperms in males is urethra.
8. AIDS—Acquired Immune Deficiency Syndrome.
9. Example of unisexual flower is papaya, watermelon and bisexual flower is mustard, *Hibiscus*.
10. Ovulation occurs during the mid of menstrual cycle in a normal healthy woman, *e.g.*, if the cycle is of 28 days then ovulation will be on 14<sup>th</sup> day.
11. Menopause is stoppage of menstrual cycle in human female which happens between 50–55 years. It is end of fertility period.
12. Sexual reproduction is advantageous as it results in greater variations in the next generation. On the other hand, in asexual reproduction, offspring are produced from one parent only hence, chances of variations are very rare. Variations form the basis of evolution and better adaptation to the changing environmental conditions.
13. **Self-pollination:** Transfer of pollen grains from anthers to the stigma of the same flower or from anthers of one flower to stigma of another flower on the same plant is called self-pollination.  
**Cross-pollination:** Transfer of pollen grains from flower of one plant to flower of other plant is called cross-pollination. It occurs through agents like wind, water or animals.
14. **Binary fission:** One cell splits into two equal halves, *e.g.*, many bacteria and protozoa like *Amoeba*, *Paramecium* and *Leishmania*.  
**Multiple fission:** One cell divides into many daughter cells simultaneously, *e.g.*, *Plasmodium* (malarial parasite).
15. Asexual modes of reproduction involve a single parent and no involvement of gametes. It is common in unicellular organisms, is also seen in lower multicellular plants and animals as well as in some higher plants. Sexual reproduction is common in multicellular organisms.

16. Contraception means methods to avoid pregnancy. They are:
1. Mechanical/barrier method: Use of condoms and IUCD (Intrauterine contraceptive devices) like Copper-T.
  2. Changing the hormonal balance by chemical method: Oral pills (oral contraceptives) to prevent release of ovum.
  3. Surgical methods: Vasectomy—blocking/cutting a part of each vas deferens.  
Tubectomy—blocking/cutting a part of each fallopian tube.

17.

Male germ cell	Female germ cell
1. Also called sperm in animal and pollen grains in plants.	1. Also called egg/ovum in animals and ovule in plants.
2. Small and motile.	2. Large and immotile.
3. Produced by male organs—testis in animals and anthers in stamens in plants.	3. Produced by female organs—ovary in animal and carpel in plants.

18. Vasectomy—blocking/cutting a part of each vas deferens and ligating it.  
Tubectomy—blocking/cutting a part of each fallopian tube and ligating it.

### WORKSHEET-145

- (a) Two main types of reproduction in living organisms are:
  - (i) **Asexual reproduction:** Offspring arise from a single individual parent.
  - (ii) **Sexual reproduction:** Involves two individuals of different sexes—a male sex and a female sex.

(b) Frog and Earthworm—Sexual reproduction  
*Amoeba* and Yeast—Asexual reproduction.
- The ratio is 1 : 2. Sperms contain either X or Y chromosome whereas an egg will always have an X chromosome.
- Reproduction is producing life forms of its own type. Basic event in reproduction is production of DNA copies in a reproducing cell. The process is called DNA replication. When the cell divides into two, each new cell gets a copy of each DNA or chromosome along with the whole cellular apparatus.  
Complete accuracy in DNA copying leads to two exactly identical cells but any error in duplication can lead to dissimilar cells or variations.
- Regeneration is the ability to give rise to new individuals from the body parts of the parent individual, e.g., *Hydra* and *Planaria*. If their bodies get broken into many pieces, each piece is capable of regrowing into a complete individual. It is not a method of reproduction in all organisms. Most complex organisms cannot give rise to new individuals through regeneration, as it is carried by specialized cells and each organism may not possess them.
- AIDS can be transmitted from an infected to a healthy person in following three ways:
  - (a) through contaminated needles, razors and syringes.
  - (b) through unprotected sex.
  - (c) from infected pregnant mother to her child during delivery.

6. The reason for declining female to male sex ratio in India is sex selective abortions of female foetuses through surgeries (female foeticides). This can be averted by banning pre-natal sex determination and cancelling the licences to practice of medical officials who help people to practise it. Everyone needs to be educated in the society about the equality of gender and health of women.
7. (a) **Unisexual flower:** A flower that has only one male or female part (essential) is called as unisexual flower, *e.g.*, papaya.
- (b) **Bisexual flower:** A flower that has both male or female parts (essential) is called as bisexual flower, *e.g.*, *Hibiscus* (China rose).

8.	Binary fission	Multiple fission
(a)	When a parent cell produces two daughter cells it is called binary fission.	(a) When a parent cell produces more than two daughter cells it is called multiple fission.
(b)	The parent nucleus divides into two and goes to two daughter cells.	(b) The parent nucleus divides into many daughter nuclei each surrounded by cells cytoplasm.
(c)	It is usually during favourable conditions.	(c) It is usually during unfavourable condition in other protozoans.
(d)	No protective covering is formed.	(d) A protective covering cyst is formed.
(e)	It takes in different patterns as in <i>Amoeba</i> and <i>Leishmania</i> .	(e) No such patterns, <i>e.g.</i> , <i>Plasmodium</i> .

9. (i) **Implantation of Zygote:** After the fertilization process zygote is formed. It moves towards the uterus and implants/fixes itself on broad chamber on the uterine wall. And the female is called pregnant.
- (ii) **Placenta:** It is the connecting chord between the developing embryo and the mother for exchange of nutrients and excretory materials.
10. Vegetative propagation is method of reproduction in which a vegetative part of the plant is used to produce a new plant.
- Example :** *Bryophyllum* → Propagates through a leaf.
- Advantages of vegetative propagation:**
- (a) The plants bear flowers and fruits earlier than those propagated sexually.
- (b) Plants have lost capacity to form seeds hence they are propagated vegetatively.
- (c) Such plants are genetically similar to parent plants and have all their characters.
- For example, banana, rose.

## WORKSHEET-146

1. Seminal vesicles and prostate gland.
- Advantages of semen:** Secretion of prostate and seminal vesicles provides nourishment to the sperms and gives them medium to swim.
2. **Rhizopus (common bread mould):** An organism will be benefited if it reproduces through spores, as it helps it to survive in unfavourable conditions. A spore is a special cell protected by thick coating. It is capable of germinating into a new plant when comes in contact with suitable, moist surface, *e.g.*, in *Rhizopus* (bread mould), they are formed inside reproductive, blob-like sacs called sporangia.
- Favourable conditions for spore formation are heat, water and food.

3. The fertilized egg, the zygote gets implanted in the lining of uterus and develops into an embryo with the help of a special tissue called **placenta** through which the developing embryo/foetus gets nutrition from mother's blood. It also transports wastes of the embryo into mother's blood.
4. **Advantage of vegetative propagation in orange:**
  - (a) The plants bear flowers and fruits earlier than those propagated sexually.
  - (b) Plants have lost capacity to form seeds hence they are propagated vegetatively.
  - (c) Such plants are genetically similar to parent plants and have all their characters.
5. Vegetative propagation is method of reproduction in which a vegetative part of the plant is used to produce a new plant.

**Advantages**

- (a) Plants, which do not produce viable seeds or have lost the ability to produce seeds can be propagated by this method only.
  - (b) Plants raised by this method bear flowers and fruits earlier than those produced from seeds.
  - (c) It maintains the genetic traits in all generations as only one parent is involved hence conserves characteristics of specific/varieties of plants.
  - (d) It is a faster and economical method.
6. Four modes of asexual reproduction are:  
Fission, Budding, Spore formation and Regeneration.
  7. Sperms contain either X or Y chromosomes whereas an egg always has an X chromosome. It plays important role in determination of sex of child.
  8. Reproduction is the ability of living organisms to produce living beings similar to them. Reproduction maintains the number of chromosomes specific to a species in each generation. Multicellular organisms have specialised cells in their gonads, which have only half the number of chromosomes and half the amount of DNA as compared to non-reproductive body cells. So, when these germ cells from 2 different individuals combine during sexual reproduction to form a new individual, it results in the re-establishment of the number of chromosomes and the DNA content in the new generation. Thus, it provides stability to the population of a species.
  9. Placenta is a special tissue connection between embryo and uterine wall. It also acts as an endocrine gland.  
Functions:
    - (a) It possesses villi that increases the surface area for absorption of nutrients.
    - (b) It facilitates passage of nutrition and oxygen to embryo from mother through blood.
    - (c) Waste substances produced by embryo are removed through placenta into mothers blood.

**WORKSHEET-147**

1. Characteristics of sexual reproduction:
  - (a) Sexual reproduction occurs by the combination of special reproductive cells called sex cells.
  - (b) It is usually biparental and involves two parents.
  - (c) It involves the formation of sex cells called gametes, followed by the fusion of the gametes.
  - (d) It is comparatively slower as compared to asexual reproduction.
  - (e) Meiosis and mitosis occur during gamete formation, while mitosis occurs during the development of the zygote.
  - (f) Variations appear because of a new combination of genes during crossing over.
2. Regeneration is the ability of organisms to generate lost or damaged parts of the body.  
When a *Hydra* is bisected anywhere in the upper 7th or 8th part of the body column, the

upper half will regenerate a foot at its basal end and the lower half will regenerate a head at its apical end—each half generates the organ which it is missing. The regeneration is precise, and the head and foot are always formed specifically at the apical and basal ends, respectively.

3. (a) Prevent STDs (*significance*),  
(b) Advantage of small family,  
(c) Less mortality among new borns,  
(d) Reduces the cases of maternal mortality.

**Areas which have improved:**

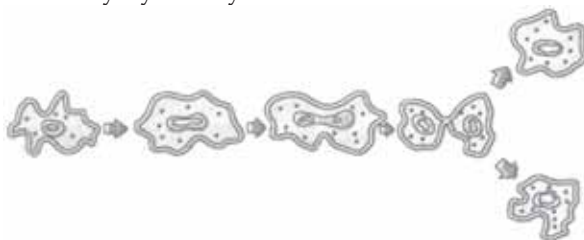
- (a) Family planning,  
(b) Decrease in STD cases (any other).
4. Regeneration is the ability of organisms to generate lost or damaged parts of the body.  
When *Planaria* is cut into many pieces, each piece grows into a complete organisms. This regeneration process is carried out by specialised cell which proliferate, develop and differentiate into various cell types and tissues.
5. Chromosomes are thread like structures made up of DNA found in the nucleus.  
The original number of chromosomes becomes half during gamete formation. Hence, when the gametes combine, the original number of chromosomes gets restored in the progeny.
6. Sexually Transmitted Disease means disease which are transmitted due to act of sex from an infected partner to a healthy one, *e.g.*, two common bacterial STDs are syphilis and gonorrhoea, and viral diseases are warts and HIV-AIDS.

**Prevention:** Using barrier methods.

## WORKSHEET-148

### 1. Mode of reproduction in *Amoeba*

*Amoeba* reproduces asexually by binary fission.



2. (a) **Ovaries:** Production of egg, secreting sex hormone—estrogen.  
(b) **Fallopian tube or oviduct:** Site of fertilization, transfer of zygote or embryo to uterus.  
(c) **Uterus:** Site of implantation, providing nourishment and shelter to growing embryo.
3. When *Planaria* is cut into many pieces, each piece grows into a complete organism. This regeneration process is carried out by specialized cell, proliferate, develop and differentiate into various cell types and tissues. Regeneration is not same as reproduction as most of the organisms would not normally depend on being cut up to be able to reproduce.
4. Asexual reproduction does not involve genetic fusion while sexual reproduction involves fusion of male and female gametes to form a zygote. Species reproducing sexually have better chances of survival.

**Reason:** Sexual reproduction gives rise to more variations which are essential for evolution as well as survival of species under unfavourable conditions.

**5. Four methods of contraception are:**

- (a) Barrier method like condoms.
- (b) Chemical method like oral hormonal pills.
- (c) Surgical methods like vasectomy (cutting and ligating vas deferens) in men and tubectomy (cutting and ligating fallopian tube) in women.
- (d) Intrauterine contraceptive device [IUCDs] like copper-T

These methods help in planning family to a couple. They can space their children as per their will so that family resources are utilized properly. It also takes care of health of the mother and child.

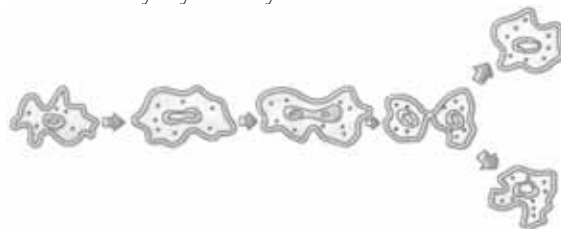
6. (a) Two reasons for the appearance of variations among the progeny formed by sexual reproduction are:
- (i) Sexual reproduction results in new combinations of genes which are brought together during the formation of gametes.
  - (ii) Gene combinations are different in gametes.
- (b)
- (i) Part 'A' labelled is pollen grain.
  - (ii) Part 'B' is stigma. The pollen grain reaches the stigma during pollination.
  - (iii) Part 'C' is the pollen tube. The pollen tube carries the gametes to the embryo sac for fertilisation.
  - (iv) Part 'D' is the egg cell. After fertilisation with the male gametes, the egg cell forms the zygote..

## WORKSHEET-149

1. The process of asexual reproduction in which the parent cell gives rise two daughter cells is called binary fission.

### Mode of reproduction in *Amoeba*

*Amoeba* reproduces asexually by binary fission.



Binary fission in *Amoeba*

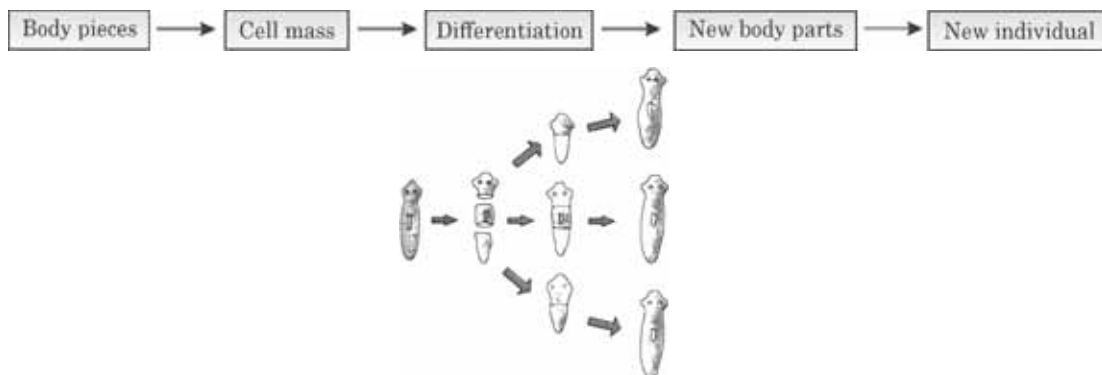
- Step 1 : A mature parent gives rise to a small bud from any part of the body (except mouth and tentacle).
- Step 1 : The parent *Amoeba* prepares itself for binary fission after withdrawing all its activities, such as feeding.
- Step 2 : The parent *Amoeba* extends itself.
- Step 3 : The nucleus of the parent *Amoeba* extends and forms a dumb-bell-shaped structure. Then it divides into two parts (daughter nuclei). This is called karyokinesis–division of nucleus.



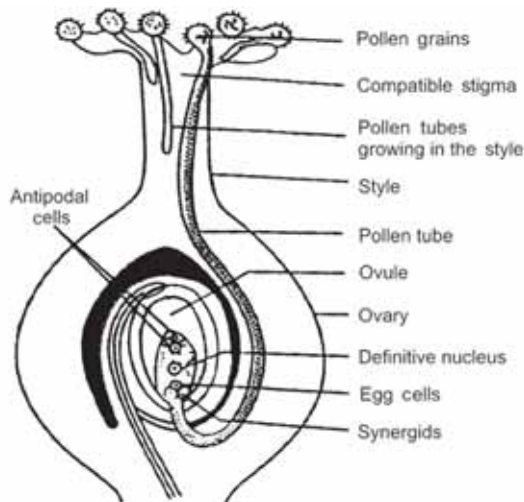
Step 4 : Then the cytoplasm of *Amoeba* divides almost equally. It surrounds each of daughter nuclei. This is called cytokinesis (division of cytoplasm).

**Result:** Two new daughter *Amoebae* are formed. They feed and develop into new adult.

2. (a) A simple asexual method of reproduction in multicellular filamentous algae by simply breaking up from a specific point into small pieces is called fragmentation. For example, *Spirogyra* (pond silk).
- (b) The ability of the organisms to replace or develop the lost part by cell division is called regeneration. Specialised cells take part in regeneration process.



3. (a) In fertilization of plants pollen tube along with male germ cell finds its way to female germ cell through chemotropism.



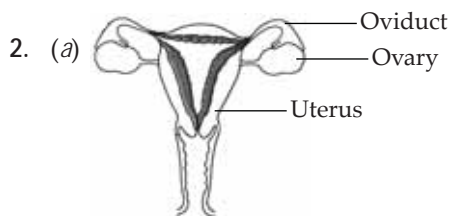
- (b) **Pollination:** Transfer of pollen grains from anthers to the stigma.

**Self-pollination:** Transfer of pollen grains from anthers to the stigma of the same flower or from anthers of one flower to stigma of another flower on the same plant is called self-pollination.

**Cross-pollination:** Transfer of pollen grains from the flower of one plant to a flower of other plant of the same species is called cross-pollination.

## WORKSHEET-150

1. (a) Unisexual flower: palms, papaya  
Bisexual flower: *Hibiscus*, mustard [any one each]
- (b) **After fertilization:**
- (i) Stamens, petals, sepals, style and stigma fall off.
  - (ii) Zygote develops into embryo.
  - (iii) Ovule develops into seed.
  - (iv) Ovary wall ripens to form fruit.
- (c) During formation of germ cells, due to a special type of cell division, germ cells have half the number of chromosomes/amount of DNA so that on fertilization full number/amount of DNA characteristic of that species is regained.



- (i) Ovary (ii) Oviduct (iii) Uterus
- (b) (i) The lining thickens and is richly supplied with blood to nourish the growing embryo.  
(ii) The lining slowly breaks and comes out through the vagina as blood and mucus.
3. (a) A – pollen grain  
B – pollen tube  
C – ovary  
D – ovule
- (b) Transfer of pollen grains from anther to stigma of a carpel is called pollination.  
**Significance of pollination:** Through pollination male germ cell (pollen grain) reaches female gamete (ovule). Pollen grain fuses with ovule to give zygote which is capable of growing into a new plant.
- (c) A pollen grain contains two male gametes. When a pollen grain falls on the stigma of the carpel, it grows a pollen tube downwards into the style. One of the male gametes reaches the ovary through pollen tube and fuses with egg to form zygote.  
The other male gamete fuses with two polar nuclei one from each end of embryo sac to form endosperm nucleus. This fusion is called triple fusion. The zygote grows into an embryo and an endosperm nucleus grows into endosperm (the food storage tissue to seed).
- (i) ovule (ii) ovary

## WORKSHEET-151

1. The placenta is an organ attached to the lining of the womb during pregnancy. The placenta is composed of both maternal tissue and tissue derived from the embryo. It contains blood spaces on the mother's side and villi on the embryo's side.

### Functions of the placenta:

- (a) It provides food and oxygen to the foetus.  
(b) The foetus gives away waste products and carbon dioxide to the mother's blood for excretion.
2. (a) Yes. It is necessary to introduce sex education at school level to curb population explosion.  
(b) No, contraception is not useful in just to plan one's family. Barrier method of contraception also helps in checking the spread of sexually transmitted diseases.  
(c) Yes, couples in rural India can be made aware of different methods of contraception through advertisements on radio, TV, newspapers, magazines, etc. Marriage counselors can also be employed to sort out their queries
3. (a) To prevent spread of AIDS.  
(i) Avoid sharing needles, syringes, razors and personal belonging with others.  
(ii) Blood must be tested before transfusion.  
(iii) One must follow a healthy sexual life.  
(b) HIV is the causative organism of AIDS that may be present in the blood of an infected person in small number in initial stage. When symptoms of the disease start manifesting, only then one is said to be suffering from a disease. The time period between infection and manifestation of symptoms is called incubation period and it may be upto 12 years in case of AIDS.  
(c) The virus of AIDS does not spread through physical touch or saliva so one need not avoid meeting or comforting those who are suffering from it. They must not be made social outcasts.

### WORKSHEET-152

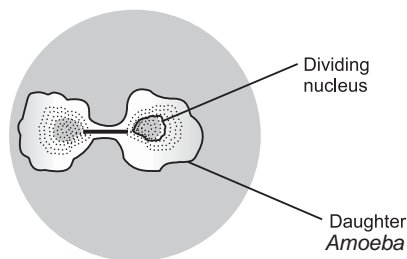
1. (b) 2. (c) 3. (a) 4. (d) 5. (c) 6. (b) 7. (d) 8. (a)

### WORKSHEET-153

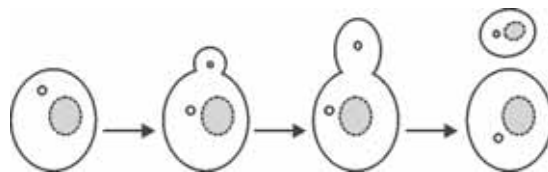
1. (b) 2. (c) 3. (c) 4. (a) 5. (d) 6. (b) 7. (a) 8. (b) 9. (c)

### WORKSHEET-154

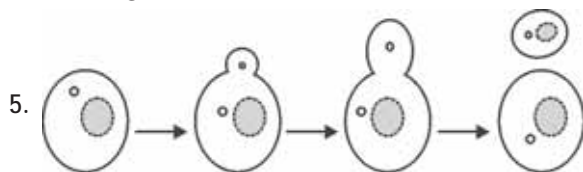
1. The parent body (cell) divides into two nuclei first and then the division of cytoplasm takes place. It is mitosis cell division.



- 2.(a) Fine  
(b)



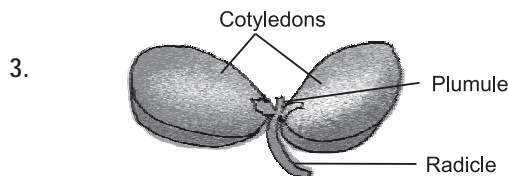
3. (i) The student observed the slide of binary fission in *Amoeba*.  
(ii) X – Cytoplasm, Y – Nucleus, Z – Plasma membrane
4. The diagram illustrate the budding in yeast.  
A–Daughter buds; B–Yeast cell; C–Nucleus



### WORKSHEET- 155

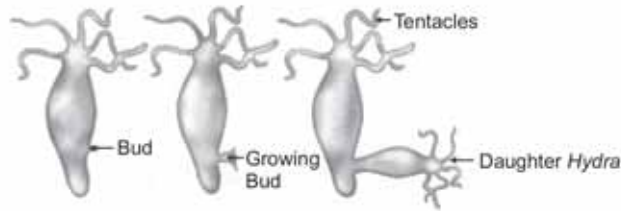
1. (d) 2. (b) 3. (a) 4. (a) 5. (b) 6. (c) 7. (a) 8. (b) 9. (c) 10. (b)  
11. (a) 12. (d) 13. (a)

1. Take a soaked and swollen gram seed. Remove the seed coat by carefully peeling it with the help of forceps or finger nails. The yellow structure observed is cotyledons, on opening it gently a pale coloured embryo is seen.
2. Following precautions should be taken:  
(a) Seed coat should be removed carefully.  
(b) Cotyledons should be unfolded carefully to observe the (young) baby plant.



### CHAPTER TEST

1. Reproduction is the process of producing life forms of its own type. Basic event in reproduction is production of DNA copies in a reproducing cell. The process is called DNA replication. When the cell divides into two, each new cell gets a copy of each DNA or chromosome along with the whole cellular apparatus.
- Complete accuracy in DNA copying leads to two exactly identical cells but any error in duplication can lead to dissimilar cells or variations.
2. Sexual reproduction involves two parents with different sets of characters. They contribute one gamete each. The gene combinations are different in gametes.
3. Budding in *Hydra*.
- Step 1 : A mature parent gives rise to a small bud from any part of the body (except mouth and tentacle).
- Step 2 : The small bud gradually grows into a bigger bud.
- Step 3 : The big bud detaches itself from the mother *Hydra* and fixes itself on the substratum.
- Step 4 : The young *Hydra* feeds and grows.



4. Clone refers to genetically identical organisms that may be offspring of an organism formed by asexual method of reproduction or identical twins.

Since they possess exact copies of the DNA of their parent, they are genetically identical clones exhibit remarkable similarity.

5. Moisture is an important factor for the growth of hyphae.

Moistened bread slice offers both moisture and nutrients to the bread mould, hence it grows profusely. Dry slice of bread offers nutrients but not moisture, hence hyphae fail to grow.

6. Malaria parasite reproduces through the process of multiple fission. In this process one cell divides into many daughter cells simultaneously, e.g., *Plasmodium*. It helps organism to increase its population in very short time.

7. Sperm comes out from testis into the vas deferens and then passes through urethra before ejaculation. The secretions of seminal vesicle and prostate glands provide nutrition to the sperms and also facilitate their transport.

The ratio is 1 : 2.

Sperms contain either X or Y chromosome whereas an egg will always have an X chromosome.

8. Four methods of contraception are:

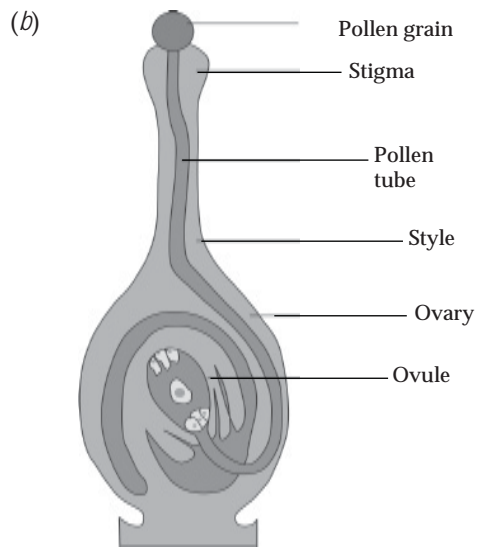
- (a) Barrier method like condoms.
- (b) Chemical method like oral hormonal pills.
- (c) Surgical methods like vasectomy (cutting and ligating vas deferens) in men and tubectomy (cutting and ligating fallopian tube) in women.
- (d) Intrauterine contraceptive device [IUCDs] like copper-T.

These methods help in planning family to a couple. They can space their children as per their will so that family resources are utilised properly. It also takes care of health of the mother and child.

9. (a) The process or mechanism of transfer of pollen grains from the anther to the stigma is termed pollination.

It takes place in plants only.

The fusion of male and female gametes giving rise to zygote is termed fertilization. It may take place in all sexually reproducing organisms, plants as well as animals.



# 4

## HEREDITY AND EVOLUTION

### WORKSHEET-157

1. Organs of man, homologous to the wing of birds, are arms or forelimbs.
2. Two recessive traits of garden pea are dwarfness for height and white colour of flower.
3. **Organic evolution:** The gradual unfolding of organisms from pre-existing organisms through slow change since the beginning of life.
4. The two main factors which could lead to the formation of a new species are natural selection leading to accumulation of adaptation in geographically separated population of a species and development of reproductive barrier among them (speciation and geographical isolation).
5. The change in the frequency of some genes in a population which provides diversity without any survival advantage is called genetic drift.
6. An organism in which sex determination is regulated by environmental factors is snail.
7. Origin of new species from pre-existing ones through the process of natural selection and reproductive isolation is called speciation.
8. Microevolution is a change at a small scale like a variation with survival advantage getting selected and becoming an adaptation in that population.
9. Human beings look different from each other in terms of size, colour and looks because these are variations which exist among the members of a sexually reproducing population commonly. Sexual reproduction involves two parents with different sets of characters. They contribute one gamete each. The gene combinations are different in gametes. Therefore variations are seen in offspring of sexually reproducing organisms.
10. Characters or traits of an organism are controlled by the genes/DNA.
11. Gene is a unit of heredity composed of DNA through which character or traits are inherited.
12. Small differences among the members of a population. Variation is responsible for evolution of a species through natural selection.
13. (a) We conclude that human, cat and horse having these structures, even if used differently, must have originated from a common ancestor.  
(b) The term given to such structures is homologous organs.
14. Mendel selected garden pea plant (*Pisum sativum*) for his experiment on heredity because in nature it is a self-pollinating and self-fertilizing plant so pure lines are easily available. Secondly, it has many pairs of contrasting characters like tallness and dwarfness for height, white and purple flowers, etc.
15. No, this information is enough to tell us which trait is dominant and which one is recessive. It is not clear whether the pattern of inheritance is Mendelian or not.  
**Reason:** The number of progeny is only one—too less to work out the inheritance pattern. Secondly the result of only one generation is shown which again is not enough to know the inheritance pattern.  
Thirdly only phenotype of parents and daughter are given. Without genotype it is difficult to conclude.

16. Charles Robert Darwin proposed the theory of natural selection. According to his theory, the favourable variations in fittest organisms led to their survival in nature but he could not explain how the variations arise. Hence, his theory was criticized.
17. Four ways in which individual with a particular trait may increase in population were:
- (a) Variations that occur in species help in the survival of individuals.
  - (b) Organisms when show genetic drift which cope them to survive in the given environment.
  - (c) Adaptation and natural selection.
  - (d) Sexual reproduction results in variation.

## WORKSHEET-158

1. (a) **Speciation:** Formation of new species due to variation and isolation. The isolated individuals get a chance to increase their numbers under favourable conditions.
- (b) **Natural selection:** The process of selection of best individual/fittest individual is done by the nature. Whereas the ones not fit are rejected. Those fittest individuals are allowed to reproduce and increase in population.
2. Character or traits are inherited through hereditary units called 'genes' which are segments of a DNA molecule and genes are located on the chromosome at fixed locations. DNA makes RNA which, in turn, helps in making proteins in the body cells. Proteins control and express various traits such as insulin, colour of eyes, enzymes, etc. If the DNA has some mistakes, it will not be able to make protein and hence, that trait will not be expressed.
3. **Sex in different organism may be determined by:**
- (a) Environmental factors as in some snails, turtles and lizards.
  - (b) Chromosomes as in human beings, fruit flies, etc.

### **Determination of sex in human being:**

It is determined by the sex chromosomes (XX in females and XY in males). If a sperm carrying 'X' fuses with ovum, female offspring is produced. If a sperm with 'Y' fuses with ovum, male offspring is produced. Hence, sex chromosomes of male parent are involved in determining the sex of offspring.

4. (a) **Homologous organs:** Structures in animals share a common ancestry. The structure, which has similar basic structure and developmental origin but perform different functions, *e.g.*, forelimbs in vertebrates. Homologous organs give an evidence of common ancestry and evolutionary relationship between apparently different species.
- (b) **Analogous organs:** Analogous organs are the organs in different organisms which have different basic structure but have similarity in shape and function. However, these organs do not provide an evidence in support with common ancestry, *e.g.*, wings of bat and insect.
5. Fossils are impressions on rocks of dead organisms that got buried in earth millions of years ago. They give us information about the type of organisms that existed at that time and provide evolutionary relationship with present-day animals.
6. Each species has a fixed chromosome number. Gametes have half the number of chromosomes. When they fuse, the original number is restored. At the time of fertilization male and female germ cells (gametes) are fused to form a zygote that develops into a baby.



7. Fossils are impressions of the body/body parts or the remains of organisms living in the past, which got preserved in sediments of earth.

**Importance of fossils:**

- (a) Study of not living species but also fossils helps in working out evolutionary relationships.
  - (b) Fossils provide one of the most acceptable evidences in support of evolution, because we can study the evolutionary past of individuals in the form of their fossils.
  - (c) Age of fossils can also be found by time-dating using isotopes of carbon (carbon dating).
  - (d) By studying fossils occurring in different strata of rocks, geologists are able to reconstruct the time course of evolutionary events.
8. All living things are identified and categorised on the basis of their body design in form and function. After a certain body design comes into existence, it will shape the effects of all other subsequent design changes simply because it already exists. So, characteristics which came into existence earlier are likely to be more basic than characteristics which have come into existence later. This means that the classification of life forms will be closely related to their evolution. On connecting this idea of evolution to classification, it is seen that some groups of organisms with ancient body designs have not changed very much. However, other groups of organisms have acquired their particular body designs relatively recently. Because there is a possibility that complexity in design will increase over evolutionary time, it may not be wrong to say that older organisms are simpler, while younger organisms are more complex.
9. **Reproductive isolation:** It means when two or more population which may have been geographically isolated from each other for a long time show inability to reproduce with each other. It may happen because of change in number of chromosomes in their germ cell, change in their body forms or behaviour. Thus it leads to speciation.

## WORKSHEET-159

1. (a) **Natural selection:** The process of selection of best individual/fittest individual is done by the nature. Whereas the ones not fit are rejected. Those fittest individuals are allowed to reproduce and increase in population
- (b) **Variation:** The difference among the offspring of the same parent is called variation. It forms the basis of survival and increase in population, such as in case of red to green beetles. The predators of red beetles easily identify the prey and feed on it. Thereby increasing the population of green beetles.
- (c) **Speciation:** Formation of new species due to variation and isolation. The isolated individuals get a chance to increase their numbers under favourable conditions.
2. (a) **Homologous organs:** Organs that have similar origin and structural plan but perform different functions are called **homologous organs**.
- Example:* Inheritance pattern of limbs in amphibians (frog), reptiles (lizard), birds (sparrow) and mammal (human) is same. The limbs in above organisms perform different functions.
- (b) **Analogous organs:** Organs that have dissimilar origin and structural plan but perform similar function are called **analogous organs**.
- Example:* Wings of birds (sparrow), bat (a mammal), insects (cockroach), etc., have the same use flying, but are structurally different. Wings of birds have feathers, wing of bat is a skin fold between the fingers, wings of insects are membranous without bones.
- (c) **Fossils:** Study of different fossils of different organisms. Such as study of fossils of origin and evolution of feathers in dinosaurs. It shows that dinosaurs also had it but did not

use it. The use of feathers for flying was done by birds. It shows that birds are related to dinosaurs as these are reptiles.

3. **By sexual reproduction:** The formation of germ cells carry genetic material from each parent. When the germ cells unites to form the zygote they contribute equal genetic material.

Both parents contribute to the DNA of progeny. If both parents contribute the one set of same gene, it means the progeny will have two sets of all genes. For this each germ cell must have one gene set. How is it done?

The traits are present as separate independent pieces called **chromosomes**. Each cell has two copies of each chromosome. One is from father and the other is from mother. Germ cells inherit/take either of the sets. When two germ cells unite, they will restore the normal number of progeny. This ensures the stability of DNA and chromosome number in a species.

4. In red colour beetle population a colour variation takes place due to sexual reproduction. A green beetle is produced. It can pass the colour to its progeny. Due to green colour of beetle and green leaves they cannot be identified by crow (the predator) and they survive. This way red beetles will disappear and green beetles population will emerge.

5. Such traits are acquired traits. Traits acquired during the lifetime of an individual are not inherited as these changes are not in the genes of reproductive tissues. The changes in the non-reproductive tissues cannot be passed on to the DNA of the germ cells, hence such acquired changes are not inherited by the progeny, *e.g.*, tailless mice (if tail is removed by surgery) cannot produce tailless progeny.

6.	Natural selection	Artificial selection
	(a) It is carried out by nature.	(a) It is carried out by the human beings.
	(b) It operates overall organisms.	(b) It is applicable on some selected organisms.
	(c) It is a slow process.	(c) It is fast process.
	(d) Organisms produced through natural selection do not require human protection.	(d) Organisms produced through artificial selection require human protection.
	(e) The selected traits can automatically be adapted.	(e) The selected traits are important to human beings.

## WORKSHEET - 160

- (a) All tall

(b) 3 : 1

(c) Dwarf plants. Reason dominance of tallness over dwarfness.

2.	Acquired trait	Inherited trait
	(a) They are because of experiences of lifetime in an individual.	(a) Genetically inherited.
	(b) It cannot be passed on from one generation to the next.	(b) They can be passed on from one generation to the next.
	(c) For example, power to lift weights and reading French.	(c) For example, eye colour or height.

3. The organs which have similar basic structure and mode of origin but perform different functions in different animals are called homologous organs, *e.g.*, Forelimbs of amphibians, reptiles, birds and mammals.

Analogous organs are the organs in different organisms which have different basic structure but have similarity in shape and function, *e.g.*, Wings of bat and bird these organs do not provide an evidence in support with common ancestry.

Homologous organs give an evidence of common ancestry and evolutionary relationship between apparently different species.

4. Fossils are impressions of the body/body parts or the remains of organisms living in the past, which got preserved in sediments of earth. Any remains of an organism that has been preserved in the earth's crust.

Study of not only living species but also fossils helps in working out evolutionary relationships.

Age of fossils can be determined by time dating using isotopes of carbon (carbon dating).

Two ways of determining age of fossils:

(i) **Relative** – fossils closer to the surface are more recent.

(ii) **Dating** – finding the ratio of different isotopes.

5. Speciation means creation of new species from pre-existing ones.

The two main factors which could lead to the formation of a new species are natural selection leading to accumulation of adaptation in geographically separated populations of a species and development of reproductive barrier among them.

Complete separation of sub-populations of a species (genetic drift) and difference in way of natural selection in them for many generations results in speciation, *i.e.*, formation of new species that cannot interbreed under natural conditions.

## WORKSHEET-161

1. Traits acquired during the lifetime of an individual are not inherited as these changes are not in the genes of reproductive tissues. The changes in the non-reproductive tissues cannot be passed on to the DNA of the germ cells, hence such acquired changes are not inherited by the progeny, *e.g.*, tailless mice (if tail is removed by surgery) cannot produce tailless progeny.

Such traits are called acquired traits.

2. Yes, it is possible.

For example, when pure tall pea plants are crossed with pure dwarf pea plants, only tall pea plants are obtained in  $F_1$  generation.

On selfing tall plants of  $F_1$ , both tall and dwarf plants are obtained in  $F_2$  generation in the ratio 3 : 1.

Reappearance of the dwarf character, a recessive trait in  $F_2$  generation shows that the dwarf trait/character was present in individuals of  $F_1$  but it did not express (due to the present of tallness, a dominant trait/character).

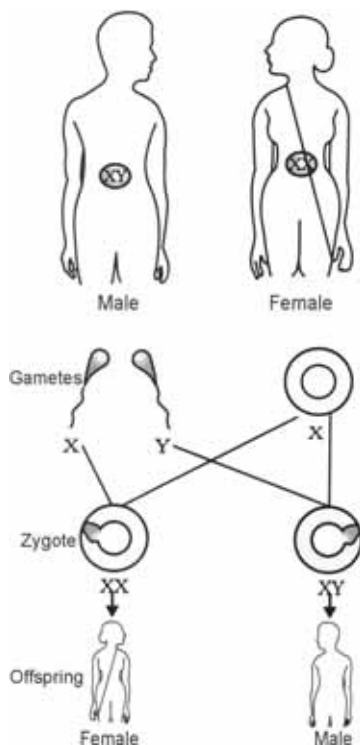
3. Preserved traces of living organisms are called fossils. By studying them we can assess about their ancestry, *i.e.*, evolutionary relationship.

Two ways of determining age of fossils:

(i) **Relative** – fossils closer to the surface are more recent.

(ii) **Dating** – finding the ratio of different isotopes.

4.



**Justification:** Women produce only one type of ovum (carrying X chromosome) and males produce two types of sperms (carrying either X or Y chromosome) in equal proportions.

A child who inherits an X chromosome from his father would be a girl (XX) while the child who inherits a Y chromosome from the father would be a boy (XY).

5. (a) A change that is useful for one property to start with can become useful later for quite a different function. Feathers, for example, can start out as providing insulation in cold weather. But later, they might become useful for flight. In fact, some dinosaurs had feathers, although they could not fly using the feathers. Birds seem to have later adapted the feathers to flight. This, means that birds are very closely related to reptiles, since dinosaurs were reptiles. Birds have evolved from reptile.
- (b) No.

Evolution takes place in stages, *i.e.*, bit by bit over generations. Even an intermediate stage, such as a rudimentary eye, can be useful to some extent. This might be enough to give a fitness advantage. In fact, the eye seems to be a very popular adaptation.

Insects have them, so does an octopus, and so do vertebrates. And the structure of the eye in each of these organisms is different – enough for them to have separate evolutionary origins.

## WORKSHEET-162

1. (a) The organs which have similar basic structure and mode of origin but perform different functions in different animals are called homologous organs, *e.g.*, forelimbs of amphibians, reptiles, birds and mammals. Homologous organs give an evidence of common ancestry and evolutionary relationship between apparently different species.
- Analogous organs are the organs in different organisms which have different basic structure but have similarity in shape and function. However, these organs do not provide evidence in support of common ancestry, *e.g.*, wings of an insect and bird.

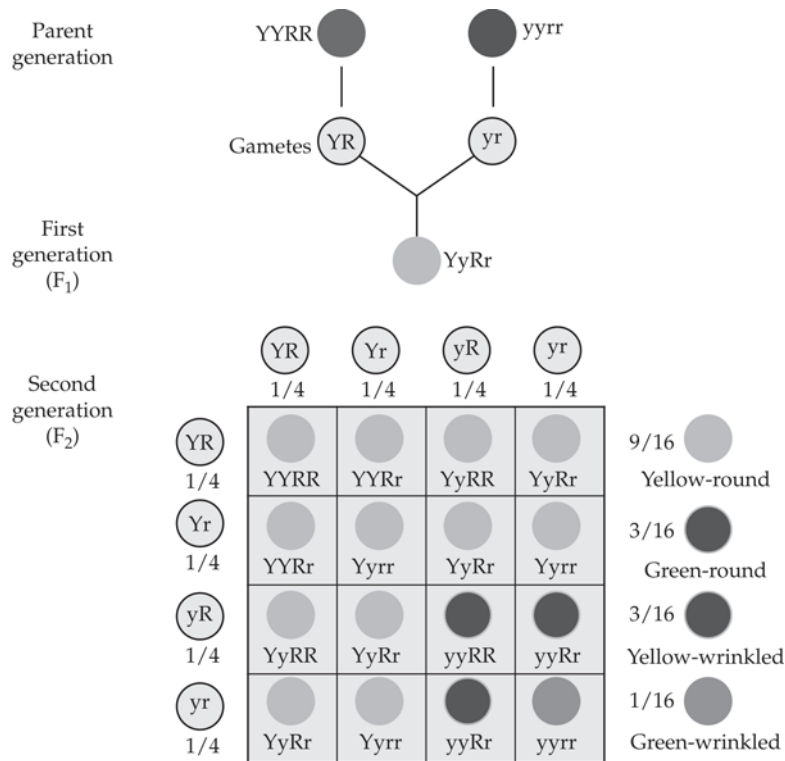
**Analogous:** wings of an insect and wings of a bat.

**Homologous:** forelimbs of a frog and forelimbs of a human.

(b) Yes.

- Mendel carried out dihybrid crosses by crossing two pea plants differing in contrasting traits of two characters. For example, he crossed a pea plant having yellow colour and round seed characters with another pea plant bearing green colour and wrinkled seed characters. In the  $F_2$  generation, he obtained pea plants with two parental and two recombinant phenotypes as yellow round and green wrinkled (parental) and yellow wrinkled and green round (recombinant).

This indicated that traits separated from their original parental combinations and got inherited independently.



- Evolution is the formation of more complex organisms from pre-existing simpler organisms over a certain period. Accumulation of variation in genetic material forms the basis of evolutionary processes.

Fossils provide a unique view into the history of life by showing the forms and features of life in the past. Fossils tell us how species have changed across long periods of the earth's history.

**Importance of fossils in the evolutionary process:**

- Some invertebrates living on the seabed died and were buried in the sand.
- More sand was accumulated and formed sandstone under pressure.

- (c) After millions of years, dinosaurs living in the area died and their bodies were buried in the mud.
- (d) The mud got compressed into the rock, just above the rock containing earlier invertebrate fossils.
- (e) Again millions of years later, the bodies of horse-like creatures dying in the area were fossilised in the rocks above the earlier rocks.
- (f) Much later, because of erosion and water flow, some rocks wore out and exposed the horse-like fossils.

### WORKSHEET-163

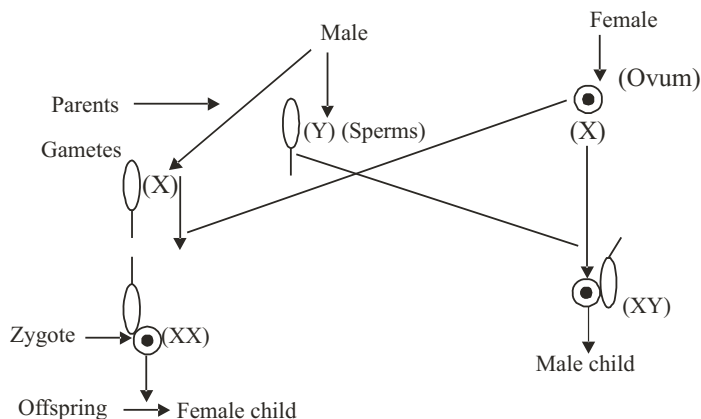
1. (a) When Mendel cross-pollinated pure tall pea plants with pure dwarf pea plants, only tall plants were obtained in  $F_1$  generation. On self-pollinating the  $F_1$  progeny, both tall and dwarf plants appeared in  $F_2$  generation in the ratio 3 : 1.

Appearance of tall character in both the  $F_1$  and  $F_2$  shows that it is a dominant character. The absence of dwarf character in  $F_1$  generation and its reappearance in  $F_2$  shows dwarfness is the recessive character.

- (b) When Mendel conducted a dihybrid cross having two sets of characters, he obtained only one set of parental characters in  $F_1$  generation whereas in  $F_2$  generation he obtained both the set of parental characters now recombined in the ratio of 9 : 3 : 3 : 1.

The appearance of new recombinants in the  $F_2$  generation along with parental type shows that traits are inherited independently.

2. The sex of the child is determined at the time of fertilization when male and female germ cells (gametes) are fused to form a zygote. The sex is determined by a specific pair of chromosomes called sex chromosomes. In female human being, this pair consists of two similar (homologous) chromosomes denoted as XX. Hence, females produce only one type of gametes (ova/eggs) each having an 'X' chromosome. Whereas male human being has two different types of sex chromosomes, *i.e.*, X, Y (heterologous) having different sizes and shapes. Hence, male produces two different kinds of gametes (sperms). Half of them have 'X' chromosome and half have 'Y' chromosome.



If a sperm with 'X' fuses with the ovum, female child is born and if a sperm with 'Y' chromosome fuses with the ovum, male child is born as shown below in the cross.

Hence, we find that the sex of the child is actually determined by the type of sperm that fuses with ovum at the time of fertilization. Chances of such union are equal and it is a matter of chance whether a couple will give birth to a boy or a girl.

3. (a) I would explain to the mother-in-law that it is the genetic contribution of man that decides the gender of the child to be born. The gender of child cannot be controlled by will power.
- (b) No, chances of a child being born as a boy or girl depends on whether it is X sperm or Y sperm that fertilizes the egg and possibility of both is equal in each pregnancy irrespective of number and gender of children born already.
- (c) No, it should not be allowed. It would encourage social crimes like female infanticide, a skewed male to female ratio and other social problems.
- (d) Yes, it will increase crime against women, their social oppression, etc.

#### WORKSHEET-164

1. (b)    2. (a)    3. (c)    4. (d)    5. (d)    6. (b)    7. (d)    8. (d)    9. (c)    10. (c)
11. (d)    12. (c)    13. (b)    14. (c)    15. (d)

#### WORKSHEET-165

1. This figure shows analogy in the climbing organs in plants. It is seen in plants that have weak stem and need support, for which they have wire like structures called tendrils.
2. These organs are called thorns. This similarity called analogy of defensive organs.
3. Examples – *Opuntia* and *Asparagus*.
  - (a) Photosynthetic organs help in/carry out photosynthesis.
  - (b) Phylloclades, cladodes, phyllodes are analogous organs to green leaves.
4. (a) These structures show homology in the embryonic development, skeletal support and blood and nerve supply, etc.
  - (b) Forelimbs are modified in these vertebrates for flying in bird and bat, for swimming in seal, for running in horse and for holding/grasping things in man.
5. (a) These structures of animals show analogy or analogous organs.
  - (b) They are externally similar in appearance and function (*i.e.* for flying) but have dissimilar developmental plan.
6. The organs which have similar basic structure but perform different functions in different species are called homologous organs.

**Examples:**

  - (a) Tendrils of pea plant and spines of barberry.
  - (b) Forelimbs of frog and bird.
7. The organs which are quite different in fundamental structure but perform same function are called analogous organs.

**Examples:**

  - (a) Tendrils of pea and cucurbits.
  - (b) Wings of birds and bat.

8.	Homologous organ	Analogous organ
	(a) Tendrils of cucurbits and spines of <i>Bougainvillea</i> .	(a) Sweet potato and potato.
	(b) Carrot and radish.	(b) Wings of bird and wings of bat.

### CHAPTER TEST

1. There are 46 chromosomes in human beings.

Yes. In male 23rd pair of chromosome is XY while it is XX in female.

2. The traits are independently inherited as per principle of inheritance described by Mendel.

3. Two individuals of a species.

4.	Acquired trait	Inherited trait
	They are because of experiences of lifetime in an individual.	Genetically inherited.
	It cannot be passed on from one generation to the next.	They can be passed on from one generation to the next.
	E.g., power to lift weights and reading French.	E.g. eye colour or height.

5. (a) No, eyes of these animals do not show any evolutionary relationship as they are analogous organs.

(b) No.

Evolution takes place in stages, *i.e.*, bit by bit over generations. Even an intermediate stage, such as a rudimentary eye, can be useful to some extent. This might be enough to give a fitness advantage. In fact, the eye seems to be a very popular adaptation.

Insects have them, so does an octopus, and so do vertebrates. And the structure of the eye in each of these organisms is different – enough for them to have separate evolutionary origins.

6. If DNA copying is not perfectly accurate, then there is more chances of mutation in individuals. Mutation may be harmful or beneficial.

7. (a) Characters/traits are controlled by genes present on chromosomes.

(b) There may be two or more forms of the gene existing in nature out of which one form may be dominant over the other.

(c) An individual has two forms of the gene whether similar or dissimilar.

(d) The two forms separate at the time of gamete formation.

(e) The two forms are brought together in the zygote.

(f) Genes express themselves by making proteins.

8. (a) Green seed

(b) Wrinkled seed

**Mendel chose pea plant for his experiments because it is:**

(a) Easy to grow.

(b) Short lifespan.

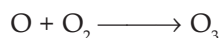


- (c) Easily distinguishable characters.
  - (d) Larger size of flower.
  - (e) Self-pollinated.
9. (a) The sex of the individual is genetically determined, *i.e.*, genes inherited from parents decide whether the newborn will be a boy or a girl. A newborn who inherits an 'X' chromosome from father will be a girl and one who inherits a 'Y' chromosome will be a boy.
- (b) Human females have two X chromosomes called sex chromosomes. During meiosis at the time of gamete formation, one X chromosome enters each gamete. Hence, all the gametes possess an X chromosome.
- (c) The woman produces ova with 'X' chromosome. The man produces sperms with X and Y chromosomes which actually determine the sex of the baby.

# 5 OUR ENVIRONMENT

## WORKSHEET-167

- 10% law of energy flow states the amount of energy available at a trophic level in a food chain is 10% of the previous one.
- Two examples of biodegradable pollutant are cow dung and waste paper, whereas non-biodegradable pollutants are plastic and metals.
- The two things moving through an ecosystem are energy and matter.
- Two non-biodegradable wastes which can be recycled are glass and plastics.
- Two methods of garbage disposal are:
  - Converting organic wastes into biogas or compost.
  - Recycling plastics, glass and metals.
- Using only biodegradable chemicals in agriculture and otherwise will be helpful in preventing accumulation of harmful chemicals in our bodies.
- 1000 joules.
- Ecosystem is abiotic and biotic components of an area and their interaction with each other.
- A food web is a network of interlinked food chains operating in an area.
- An example of a natural ecosystem is river and man-made ecosystem is a crop field.
- (a) Producers                      (b) Herbivores      (c) Decomposers
- Skin and blood cancer.
- Wastes pollute our environment, air, soil, water and cause harmful effects on all living organisms.
- Crop fields are man-made and some biotic and abiotic components are manipulated by humans.
- Grass → Insect → Frog → Snake  
Frog is a secondary consumer.
- Because the use of CFCs in refrigerators was affecting/depleting the ozone layer of the atmosphere.
- They decompose the organic matter and return the nutrients back to the ecosystem.
- Ozone layer checks the entry of ultraviolet rays of sun from reaching the earth. These rays otherwise can cause skin and blood cancer as well as defects in vision in human beings.
- Hawk
- Ozone layer forms due to combination of molecular and elemental form of oxygen in the presence of UV rays.  $O_3$  or ozone is a deadly poison formed from oxygen  $O_2$  due to the effect of UV-rays of sun.



21. 100 J.
22. Chlorofluorocarbons (CFCs) are responsible for its depletion.
23. Bacteria and fungi are called decomposers because they have enzymes to break down complex organic substances to simple and smaller ones.

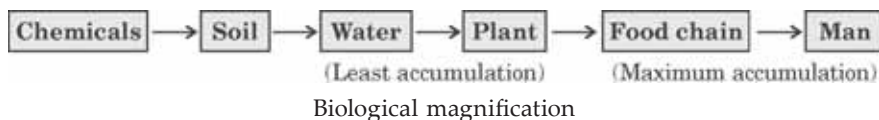
### WORKSHEET-168

1. Substances that are broken down into simpler substances by biological processes are said to be biodegradable. For examples, wood, paper.  
Substances that cannot be broken down into simpler ones by biological processes are said to be non-biodegradable. For examples, plastic, DDT.
2. Gases like methane, carbon dioxide and carbon monoxide can trap atmospheric heat. This phenomenon is called greenhouse effect.
  - (a) It can result in increase in temperature of earth 'Global warming'.
  - (b) Due to global warming, polar ice melts submerging the coastal area.
3. Some substances such as plant and animal wastes can be acted upon by decomposers in nature and broken down easily in simpler substances. These wastes are **biodegradable** in nature. Some other wastes or materials especially the ones produced by man cannot be broken down by decomposers as they do not possess enzymes to do so. They are **non-biodegradable** wastes such as some pesticide DDT, detergents, plastics, radioactive wastes, metals, etc. These substances may be broken down by chemical and physical processes in nature such as rusting of iron but not by biological processes.
4. Reduction in O<sub>2</sub> level in the water bodies due to excessive loading with nutrients and algal blooms is called eutrophication.

**Harmful effects:**

1. It affects the fish population adversely.
  2. It deprives us of one of our sources of food and makes water unfit for use.
5. If we kill all the organisms in one trophic level it will decrease the population of those dependent on them and increase those eaten by them. For example, in food chain  
Grass → grasshopper → frogs → snakes  
If frogs are killed in large number, grasshopper population will grow unchecked and eat away all grass causing soil erosion. Snakes will starve to death. Thus, removal of organisms of one trophic level leads to ecological imbalance.
6. Phytoplankton → zooplankton → insect → crustaceans → fish → shark
  7. Phytoplankton → insect → fish  
Fish is at third trophic level. It is secondary consumer.
  8. (a) They cause biomagnification.  
(b) They make the environment unclean.  
(c) They kill useful microorganisms.  
(d) They increase pollution.
  9. The accumulation of harmful chemicals in the body tissues of organisms due to the food chain is called biological magnification.

10. Excessive use of pesticide to protect the crops indiscriminate gets washed away with water into soil or water bodies like pond and changes the chemistry of the abiotic component.



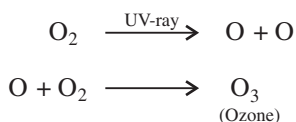
11. Ozone layer depletion is a concern because it will lead to coming of UV-rays of sun to the earth and it will cause harmful effects to human such as skin cancer. This damage can be stopped by freezing the production of CFCs to the levels of 1986 as agreed by the UNEP in 1987.

## WORKSHEET-169

**1. Cloth or jute bags are:**

- (a) capable of carrying more things.
  - (b) made of biodegradable material hence do not pollute our environment.
  - (c) made from old clothes and can be made from renewable resource like plant fibres.
  - (d) reused and washed from time to time.
2. Improper disposal of domestic wastes makes the place dirty and infested with flies as well as stray animals. People should be made to realize the harms caused by it through:
- (a) Regular visit of health workers to such colonies.
  - (b) Newspaper articles and posters.
  - (c) Door to door checking, cleaning drives and counselling.
3. Plastic bags are non-biodegradable. They cause environmental pollution. They can be replaced by jute or cloth bags.
4. Advantages of using jute/cloth bag over polythene bags:
- (a) Cloth/jute is biodegradable.
  - (b) It does not add to the garbage and land pollution.
  - (c) It is manufactured from renewable resources.
  - (d) Polythene bags may block the flow of water in the drains which become the breeding places for mosquitoes which carry parasites of malaria and dengue.
5. The microorganisms that convert dead organic matter into simpler compounds are called decomposers.
- Importance of decomposers:
- (a) They clean up garbage of environment.
  - (b) They maintain the fertility of soil by making humus in soil.
6. Ozone is a molecule containing three atoms of oxygen (O<sub>3</sub>)/a highly poisonous gas present in the upper layers of the atmosphere.

**Formation of ozone:** The UV radiations split some molecular oxygen (O<sub>2</sub>) apart into free oxygen atoms (O + O). These atoms then combine with molecular oxygen to form ozone.



**Effect:** Ozone layer shields the surface of the earth from the damaging UV-radiations of the sun.

7. Biodegradable substances – can be broken down into simpler substances by nature/ decomposers/bacteria/saprophytes/saprobionts.

For example, human excreta/vegetable peels, etc. (any one)

Non-biodegradable substances – can't be broken down into simpler substances by nature/ decomposers.

For example, plastic/glass (or any other) (any one)

**Change habits:**

- (a) Use of separate dustbins for biodegradable and non-biodegradable waste.
- (b) Reuse of things such polybags, etc.
- (c) Recycle of waste.
- (d) Use of cotton/jute bags for carrying vegetables, etc.

## WORKSHEET-170

1. (a) Separation of biodegradable and non-biodegradable substances.  
(b) Gardening and use of compost and overcomplicate in place of fertilisers.  
(c) Use of gunny bags/paper bags in place of polythene/ plastic bags.
2. (a) Ecosystem is the interaction of living and non-living components present in a given area.

Its two main components are:

- Physical or non-living components
- Biological or living components.

- (b) Aquarium needs to be cleaned because it does not have decomposers like bacteria and fungi which are otherwise found in natural ecosystems. Decomposers break down the complex organic substances of the dead and decaying organic matter into simpler inorganic substances that return the nutrients and are used up again by the plants.
3. Non-biodegradable wastes materials are not decomposed in nature by microorganisms. They may be inert and persist for a long time. They may harm various members of ecosystem. For example, DDT, plastics, etc.  
(a) Excessive use of non-biodegradable chemical pesticides leads to biological magnification— Accumulation of chemicals at the successive trophic levels of a food chain.  
(a) Wastes pollute our environment, air, soil and water, and cause harmful effects like eutrophication and biological magnification in the environment causing harm to all living organisms.

**Methods of disposal:**

- (a) Some solid wastes like paper, glass, plastic, metal can be treated in special plants and recycled.
- (b) Molten plastic waste mixed with asphalt can be used to make roads.
4. It happens because of biomagnification. It is progressive accumulation of non-biodegradable at various trophic levels of food chain.

Pesticides like DDT are sprayed to kill pests of crops or household. They seep into soil reaching groundwater or run off to water bodies. They are either absorbed by the roots of plants, water plants and animals or remain sticking to fruits and vegetables. In this manner they enter the food chains and get accumulated in our body (bioaccumulation) causing disorders of kidney, brain and circulatory system. Human are the worst sufferers in this case as we occupy the top position in most of the food chain.

Further damage can be avoided by following organic farming, *i.e.*, using biodegradable chemical in agriculture like manures, biofertilizers, biocides or following techniques like crop rotation.

5. The flow of energy generally is

Sun → producer → herbivore → carnivore → top carnivore

Since the flow is progressively from one trophic level to another and does not revert back, it is said to be unidirectional. The energy that is captured by the autotrophs does not revert to the solar input and the energy which passes to the herbivores does not come back to autotrophs. As it goes further, the available energy decrease in the higher trophic levels making reverse direction.

The pesticides and other chemicals used in crop fields are either washed down into the soil or into the water bodies. From the soil these are absorbed by the plant along with water and minerals, and from the water bodies these are taken up by aquatic plants and animals. In this way they enter the food chain. As human beings occupy the top level in any food chain, the maximum concentration of these chemicals accumulate in our bodies.

6. Food chain is defined as the phenomenon of transfer of energy through series of organisms falling on successive trophic levels.

**Example:** The sun is the ultimate source of energy. Producers or green plants photosynthesize and utilize solar energy. Thereafter the energy is transferred to other successive levels.

Food chain can be depicted as follows:

Plants → grasshopper → snake → decomposers

## WORKSHEET-171

1. Four modes of waste disposal are:

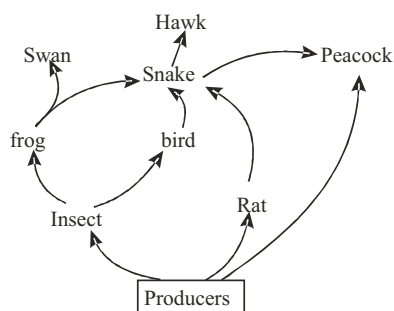
- (a) Most of the solid wastes are buried in urban areas as landfills.
- (b) Some wastes like plastics, metals and papers are recycled.
- (c) Organic wastes like cow dung, leaves, etc., can be decomposed and converted into useful substances like biogas.
- (d) Cow dungs and leaves are also converted into useful manure.

2. (a) My major concerns will be that:

- (i) People should not be affected. If they need to be displaced, new homes must be provided to them.
  - (ii) They should not lose their jobs, property and homes. If they do then suitable compensation must be made for the same.
  - (iii) Ecology must not be disturbed of the area. There must be no loss of biodiversity.
- (b) (i) They should be shifted to a higher and safer place that must be better than before.  
(ii) They must be provided with better facilities and jobs than before.

3. The flow of food from sun to autotrophs and from autotrophs to carnivores is called **food chain**. A food chain can have two levels or five to six levels also.

**Food web:** When an organism is eaten by two or more other kinds of organisms, instead of straight chain an interlinked chain is formed, which is termed as food web.



Food web

Smaller the food chain the energy available for the next level of consumer in such a chain is more. As the loss of energy at each step takes place and very little energy is left after four trophic levels.

The green plants in terrestrial ecosystem capture about 1% of the sun's energy and convert it into food energy. When green plants are eaten by primary consumers, a great deal of energy is lost for the life processes and only 10% of the energy is available for the next level of consumers.

4. (a) It is necessary to conserve our environment because
- It helps in protecting the ozone layer.
  - It helps in maintaining animal and human food chains.
  - It provides us with many useful products such as medicines and wood.
- (b) Disposal of household waste is carried out in green and blue bins, respectively. It will be very useful in the separate disposal of biodegradable and non-biodegradable wastes. This will also ensure the application of 3Rs—reduce, reuse and recycle.
- (c) Two values exhibited are
- Creating environmental awareness among students and society.
  - Working hard on prevention of environmental degradation of surroundings.

## CHAPTER TEST

- Ozone prevents UV-rays from reaching the earth.
- 1000 kJ.
- Two methods of garbage disposal are:
  - Converting organic wastes into biogas or compost. Organic wastes like cow dung, leaves, etc. can be decomposed and converted into useful substance like biogas and manure.
  - Recycling plastics, glass and metals.
- The population of tiger decreases and the population of grass increases. It can cause ecological imbalance in nature.

5. The flow of energy generally is sun → producer → herbivore → carnivore. Since the flow progresses from one trophic level to another and does not reverse back, it is said to be unidirectional.

Further, the available energy decreases in the higher trophic levels making it impossible for energy to flow in the reverse direction.

6. (a) Separation of biodegradable and non-biodegradable substances.  
 (b) Gardening and use of compost and vermicompost in place of fertilisers.  
 (c) Use of gunny bags/paper bags in place of polythene/plastic bags.  
 (d) Harvesting rainwater.
7. Decomposers break down the complex organic substances of the dead and decaying organic matter into simpler inorganic substances that return the nutrients and are used up again by the plants.

Thus, they play a very important role in the nutrient recycling in the environment.

- (a) Decomposers break down garbage, dead animals and plants in the absence of decomposers.  
 (b) Recycling of material in the biosphere will not take place.  
 (c) Soil will not regain its fertility through natural means.  
 (d) Garbage will cause pollution.

8.	Food chain	Food web
	(a) Food chain is a series of organisms feeding on one another.	(a) Food web consists of a number of interlinked food chains.
	(b) Members of higher trophic level feed upon a single type of organism of the lower trophic level.	(b) Members of higher trophic level can feed upon organisms of the lower trophic levels of other food chain.

Sun is the ultimate source of energy for all trophic levels in them.

9. (a) Excessive use of fertilisers changes the chemistry of soil and kills useful microbes.  
 (b) Excessive use of non-biodegradable chemical pesticides leads to biological magnification— Accumulation of chemicals at the successive trophic levels of a food chain.  
 (c) Extensive cropping causes loss of soil fertility.  
 (d) Excess use of groundwater for agriculture lowers the water table.  
 (e) Damage to natural ecosystem/habitat.

Wastes pollute our environment, air, soil and water, and cause harmful effects like eutrophication and biological magnification in the environment causing harm to all living organisms.



# 6

## MANAGEMENT OF NATURAL RESOURCES

### WORKSHEET-173

1. Conservation of environment refers to activities which can provide individual or commercial benefits, but at the same time, prevent excessive use leading to environmental damage.
2. Two categories of natural resources are: renewable and non-renewable.
3. Chipko movement was started by Sunderlal Bahuguna.
4. Two industries which are dependent on forests for raw materials are furniture and paper industries.
5. Two inexhaustible sources are wind and sea water.
6. Two resources which cannot be recycled are metals and fossil fuels.
7. *Coliform* bacteria are *E. coli* bacteria which live on organic matter and also found in human intestine. Presence of these bacteria indicates contamination of water by disease-causing bacteria.
8. Two measures to conserve the natural resources of the environment are:
  - (a) Maintain green grassy patches between concrete buildings.
  - (b) Use more of environment-friendly (biodegradable) materials.
9. Level of water pollution can be measured by number of *Coliform* bacteria and pH.
10.
  - (a) Use buckets or mugs for watering plants. Wash vehicles only when they are dirty. Unused water in the water bottle may be used for watering plant.
  - (b) Close all the taps and tight when not in use.
11.
  - Using envelopes, bags, cans, bottles, etc. once the product packed in them has been used up.
  - Metal, plastic, glass and paper can be segregated to be converted to recycled items.
12.
  - (a) Water harvesting
  - (b) Reducing the use of water.
13. Water harvesting is a technique to collect water from rain in underground or overhead reservoirs so that it can seep down the soil once more to form groundwater in that area rather than running off to water bodies and going to far off places.

It is an age old technique adopted by local people by making the traditional structures like ponds, tanks, small earthen dams, constructing dykes, sand and limestone reservoirs, etc.

The terms used in different states and languages for water harvesting structures are:

  - (a) Khadins, tanks and nadis in Rajasthan.
  - (b) Bandharas and tals in Maharashtra.

14. Sunderlal Bahuguna started Chipko Movement in hilly areas like Himachal Pradesh.

Two benefits were:

- (a) Existing forest cover was protected reducing landslides, land erosion. It actually protected environment and maintained ecological balance.
- (b) Forest wealth could be utilized for food, fodder, fuel, fertilizers and fibres keeping in mind its conservation.

15. The natural resources are component of natural environment that can be utilized by man to promote his welfare.

The important resources are soil, water, land, energy, marine and minerals.

There should be equitable distribution of resources as they are limited and demand is more. It will ensure distribution to all and not to only rich and powerful.

Two factors that work against an equitable distribution of these resources are:

- (a) Social disparity and political forces.
- (b) Economical disparity.

16. The resources which can be regenerated are called renewable resources.

Non-renewable sources cannot be regained or reconstructed once they are used up. For example, fossil fuels, metals, minerals, etc. Whereas renewable resources can be regenerated once they are used up. For example, products from forests, grasslands soil, groundwater, biological species, etc.

17. Wildlife means our flora and fauna. Its biodiversity that is various species of plants and animals should be preserved in Botanical Gardens, National Parks, Zoological Parks and Wildlife Sanctuaries.

Wildlife is important because:

- (a) to preserve biodiversity
- (b) as each species has a position in the food chain so wildlife helps in balancing the nature.

18. Sustainable development means to adopt such means of development to fulfil the human needs which can maintain a balance between environment and development and prevent degradation of the environment thereby sustaining the resources for future use.

As an individual I can contribute or make a difference to the management of resources in the following manner:

- (a) Using paper on both sides.
- (b) Using a jute bag instead of plastic or polythene bag.
- (c) Throwing organic and recyclable waste in separate bins.
- (d) Growing more plants.

19. Causes:

- (a) Disposal of industrial effluents.
- (b) Human activities like bathing, washing, immersion of ashes, etc.
- (c) Disposal of untreated sewage. (any two)

**Harmful effects of health:**

- (a) Spreads waterborne diseases.
- (b) Consumptions of contaminated fishes. (or any other relevant effect)

## WORKSHEET-174

1. Forests are hotspots of biodiversity. They give raw materials for many industries. They regulate climate and maintain the quality of air and soil. They help in recharging groundwater. Two causes of deforestation are clearing forests for agriculture, buildings and industries as well as forest fires.
2. Four measures for conserving forests are:
  - (a) Bringing more area under forest.
  - (b) Planting more trees through programmes like Van Mahotsava.
  - (c) Saving the trees from being cut through programme like 'Hug the trees'.
  - (d) Encouraging recycling of paper so that fresh raw material is not required from trees.
3. Disadvantages are as follows:
  - (a) Fossil fuels release harmful gases such as carbon monoxide and oxides of sulphur and nitrogen.
  - (b) They release greenhouse gases such as carbon dioxide.
  - (c) They pollute the atmosphere.
  - (d) They add to global warming.
4.
  - (a) Wind, solar energy.
  - (b) Fossil fuels—coal, petroleum.
5. Those resources that cannot be renewed and can be exhausted on its use are called non-renewable sources of energy. For example, fossil fuels – coal and petroleum.
6.
  - (a) **Biodiversity:** Number and range of variety of species of life forms in an area.
  - (b) **Effect:** Loss of diversity may lead to a loss of ecological stability.
7. Forests are hotspots because they have large number of species of plants and animals. Two ways in which management of forests and wildlife can be done by afforestation and local people should be involved.
8. **Sustainable management:** Sustainable development means to adopt such means of development to fulfil the human needs which can maintain a balance between environment and development and prevent degradation of the environment thereby sustaining the resources for further use. We must increase in vegetation and green grasses patches between the concrete building. We should use environmentally sound technologies which do not pollute the environment.  
Reuse is better than recycling as it does not require energy.
9. Ill planned dams cause following problems:
  - (i) Social problems because they displace large number of peasants and tribals without adequate compensation or rehabilitation.
  - (ii) Economic problems because they swallow up huge amount of public money without generation of proportionate benefits.
  - (iii) Environmental problems because they contribute enormously to deforestation and loss of biodiversity.  
These problems can be solved if proper planning is done before hand.
10. Products of combustion of fossil fuel are CO<sub>2</sub>, CO, soot, smoke and ash. CO<sub>2</sub> and CO are greenhouse gases so they cause global warming. Soot and smoke cause air pollution. Gases dissolve in rainwater and cause acid rain.

Fossil fuels are non-renewable and produce large amount of acidic and greenhouse gases. Oxides of nitrogen and sulphur, **carbon dioxide, that are given out during burning of fossil fuel and contribute towards acid rain formation.** Acid rain occurs due to air pollution. When oxides of nitrogen and sulphur in air dissolve in rainwater, they form nitric acid and sulphuric acid respectively. Rain carrying these acids is called acid rain. Besides corrosion of monuments, it also makes soil acidic thereby declining the soil productivity.

11. The advantages of groundwater are:
  - (a) It does not evaporate.
  - (b) Spreads out to recharge wells, provides moisture to vegetation over a wide area.
  - (c) It does not provide breeding ground for mosquitoes like stagnant water.
  - (d) It is protected from contamination and pollution by human and animal waste.
12. **Fossil fuel and global warming:** Products of combustion of fossil fuel are  $\text{CO}_2$  and  $\text{CO}$  which are greenhouse gases. They are responsible for greenhouse effect as they trap heat reflected by earth so they cause global warming.

### WORKSHEET-175

1. Reduce, Reuse, Recycle (for all the three)  
**Examples:**
  - (a) Switch off the fans and bulbs when not in use.
  - (b) Reuse of paper, polythene bags, etc.
  - (c) Reduce the wastage of water/paper or any other item (or any other relevant example) (any two).
2. Water harvesting increases the income of watershed communities. It conserves soil as well as plant resources.  
The ground water level increases due to recharging of wells. The water can be stored during rainy season and can be used when required. Ground water keeps the layers of soil above it moist and prevents loss of water by evaporation.
3. Sustainable development means to adopt such means of development to fulfil the human needs which can maintain a balance between environment and development and prevent degradation of the environment thereby sustaining the resources for further use.  
Reuse is better than recycle because it saves energy demand by industries to recycle them.
4. Four stakeholders which may help in the conservation of forests are:
  - (a) The Forest Department of the Government which owns the forest land and controls the resources from forests.
  - (b) People who live in and around the forest and are dependent on forest produce to lead their lives.
  - (c) Industrialists who use various forest products for their factories.
  - (d) Forest and wildlife activists who want to see forests in their original form.
5. Exploiting sources with short-term perspective will be providing food, clothes and other things for comfort of present generation. There will be development in all fields. Presently natural resources are able to give us these advantages.
6. When we exploit our resources with a long-term perspective, it would lead to sustainable development. There will be enough for the comforts of present and still left for future

generation. There would not be pollution or other environment related problems. There will be equitable distribution of sources among all not just with rich and powerful.

7. Sustainable development means to adopt such means of development to fulfil the human needs which can maintain a balance between environment and development and prevent degradation of the environment thereby sustaining the resources for further use. We must increase in vegetation and green grasses patches between the concrete building. We should use environmentally sound technologies which do not pollute the environment.

The reasons to achieve may be:

- (a) Prevent degradation of the environment or to check pollution.
  - (b) To leave the resources for further use.
  - (c) To make life comfortable and healthy for all.
8. Resources can be classified under two headings:
    - (a) **Inexhaustible:** Available in unlimited quantities, *e.g.*, solar energy, wind, rainfall, etc.
    - (b) **Exhaustible:** They are limited and can be exhausted by indiscriminate usage, *e.g.*, coal, petrol, minerals, etc.

The groundwater resource can get exhausted if it is overused and wasted.

## WORKSHEET-176

1. In 1972, West Bengal forest department recognized its failures in the revival of the degraded sal forest in southwestern districts of the state. This had led to alienation of people by the administration. Result was clash between forest officials and villagers. These conflicts were major factor in fuelling the militant, peasant movements led by the naxalites. Later the department changed its strategy. In the Arbari forest range of Midnapore district, forest officer A.K. Banerjee and villagers got involved in the protection of 1,272 hectares of badly degraded sal forest. Villagers were given:
  - (a) Employment in the programme of replenishment of forests, *i.e.*, silviculture and harvesting operations 25 per cent of the final harvest.
  - (b) Allowed fuelwood and fodder collection on payment of nominal fee.As a result of active participation of people mainly the local community, the sal forests of Arbari underwent recovered by the year 1983.
2. Since people used excessive fertilisers in the fields, they were carried down to the lake during rains. As many fertilisers contain phosphates and nitrates, the water body became enriched with these chemicals. These chemicals promote excessive growth of aquatic plants and the surface of water was completely covered with plants (eutrophication). Depletion of light in the water body and insufficient availability of dissolved oxygen and nutrients resulted in the death of fish.
3. **Stakeholders are:**
  - (a) People living in or around forests who are fully dependent on forests for their life.
  - (b) The forests department of government, owners of the land and working to control the resources from forests.
  - (c) The industrialists using forest produce but not dependent on the forests in any one area.
  - (d) People involved in wildlife and nature conservation.

Each of the above groups depends on forests in a different way:

### Local people around forests

Use of bamboo to make huts, baskets for collecting and storing food materials.

Use wood to make implements for agriculture, fishing and hunting, gather fruits, nuts and medicines from forests, graze cattle in forests.

These people lived in forests for centuries and ensured sustainable use of resources.

### The forest department of government

These plantations worked as an important source of revenue for the forest department. These plantations are being used by industrialists to procure timber, paper, lac and sports equipment.

### The industrialists

Forests provide raw material for various industries. Industrialists have access to these raw materials at artificially low rates. Industrialists are not interested in sustainability of forests. They do not ensure that one particular area should yield optimal amount of some produce for all coming up generations.

### Nature and wildlife enthusiastic

They are not all dependent on the forests. They have realized the need to preserve biodiversity. Local people should have the authority to decide about the management of this resource as they are the caretakers of forest. Their lives are affected the most if forests are destroyed.

4. Due to increasing demand for energy, new resources need to be exploited. More pollution is caused. Non-renewable resources may get over. It means development of present generation but not future generation.

### Steps to meet these problems are:

- (a) Use of alternate sources of energy.
- (b) Development of better technology to reduce pollution.

It will stop environmental degradation leaving enough resources for future generation, *i.e.*, sustainable development.

## WORKSHEET-177

1. (a) To maintain balance between environment and human development, it is necessary to strive for sustainable development to meet the needs of present generation and conserving it for the future generation. To achieve this we have to consider the different aspects of development. Conservation, sustainability and biological diversity are interrelated. In order to survive man has to live in harmony with nature.  
We must increase in vegetation and green grasses patches between the concrete buildings. We should use environmentally sound technologies which do no pollute the environment. There should be equitable distribution of resources as resources are limited and demand is more.
- (b) Exploiting sources with short-term perspective will be providing food, clothes and other things for comfort of present generation. There will be development in all fields. Presently natural resources are able to give us these advantages. Sustainable development means to adopt such means of development to fulfil the human needs which can maintain a balance between environment and development and prevent degradation of the environment thereby sustaining the resources for further use.
- (c) As an individual I can contribute or make a difference to the management of resources and sustainable development in the following manner:

- (i) **Forests and wildlife**
    - Using paper on both side.
    - Using a jute bag instead of plastic or polythene bag.
  - (ii) **Water resources**
    - Throwing organic and recyclable waste in separate bins.
    - Growing more plants.
  - (iii) **Coal and petroleum**
    - Walking or cycling down the school instead of coming in a car.
    - Switching off fans and light in the rooms which are not being used.
    - Avoiding AC as far as possible and using fans or coolers.
2. (a) People living in colony must build structures in their houses as to collect rainwater in an underground tank part of which should be allowed to seep back in ground.  
All public buildings in colony should also be covered in a similar scheme so that every rain drop falling on them also is harvested, collected and made to recharge groundwater.
  - (b) Depending on the topography of place, water harvesting method may differ for example on shallow mountain slope, earthen structures can be constructed to stop the rainwater so that it gets collected against it. As it seeps through the raw earth, it recharges groundwater at the bottom of mountain in the valley. A well dug up in valley will give benefit to people of surrounding villages.
  - (c) Yes. In villages of Himachal Pradesh, local people have constructed, Kulhs—cemented open drains through which water of melted snow from nearby mountains flows next to their fields so that they can use it as and when they need.
  3. (a) The reasons are same as pollution of Ganga that is regular use by people for various activities, dumping of domestic and industrial waste.
  - (b) Colour and smell of water, number of *Coliform* bacteria, organic and inorganic matter present in water.
  - (c) Kanpur has a huge leather industries. Water of Ganga is used for cleaning hides of animals and curing leather. As a result river receives lots of waste.
  - (d) Citizens must not dump the waste in river without treating it beforehand. They must follow laws set by Government to avoid water pollution. They must not use the water for bathing, washing and cleaning directly.

### CHAPTER TEST

1. Sustainable management: Sustainable development means to adopt such means of development to fulfil the human needs which can maintain a balance between environment and development and prevent degradation of the environment thereby sustaining resources for further use. We must increase in vegetation and green grasses patches between the concrete building. We should use environmentally sound technologies which do not pollute the environment.
2. Reuse is better than recycling as it does not require energy.
3. (a) The groundwater level increases due to recharging of wells. The water can be stored during rainy season and can be used when required.
- (b) Groundwater keeps the layers of soil above it moist and prevents loss of water by evaporation.
4. (a) Put off the fans and lights when they are not required.
- (b) Use of solar water heating system during winters.

5. Paper and plastic box.
6. Since farmers used excessive fertilisers in the fields, they were carried down to the lake during rains. As many fertilisers contain phosphates and nitrates, the water body became enriched with these chemicals. These chemicals promote excessive growth of aquatic plants and the surface of water was completely covered with plants (eutrophication). Depletion of light in the water body and insufficient availability of dissolved oxygen and nutrients resulted in the death of fish.
7. Both the energy sources coal and petroleum take millions of years for their formation from fossils of plants and animals, hence they are known as fossil fuels. As these resources are being utilised at a much faster rate than their formation, they will be exhausted in the near future, hence they need to be conserved.
8.
  - (a) Unused water in the water bottle may be used for watering plant.
  - (b) Close all the taps and light when not in use. Use fan and light only when required.
  - (c) Use buckets or mugs for watering plants. Wash vehicles only when they are dirty.
  - (d) Use solar water heating devices.
  - (e) Use CFL in place of conventional bulbs/tubes.
  - (f) Use both sides of paper.
9.
  - (a) **Forests are renewable resources which provide:**
    - (i) Habitat, food and protection to wildlife.
    - (ii) Help in balancing between CO<sub>2</sub> and O<sub>2</sub> of atmosphere.
    - (iii) Improves water holding capacity of soil.
    - (iv) Regulates water cycle.
    - (v) For human being, they are the source for all essential commodities like, fuel wood, timber pulp, paper, etc.
    - (vi) It provides useful products like fruits, resins, gums, essential oils, bidi wrapper, etc.
  - (b) The forest department developed a strategy in which the villagers were involved in the protection of the forest. In return for the labour, the villagers were paid and also had some benefit in harvesting operations. They were allowed to collect wood and fodder on payment of nominal fee. In this way, by the active and willing participation of the local people, the sal forests of Arabari were conserved.