# Chapter 1

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

**5.** (c) **6.** (a) **7.** (b) **8.** (c)

**9.** (a) **10.** (c)

**11.** It's freezing point will be below 0°C due to the presence of a non-volatile impurity in it.

**12.** Since ice and water are in equilibrium, the temperature would be zero. When we heat the mixture, energy supplied is utilized in melting the ice and the temperature does not change till all the ice melts because of latent heat of fusion. On further heating, the temperature of the water would increase. Therefore the correct option is (d).

**13.** (a) cooling
(b) stronger
(c) liquid, gaseous
(d) sublimation, liquid
(e) evaporation

**14.** (a) — (iii)
(b) — (iv)
(c) — (v)
(d) — (ii)
(e) — (i)

**15.** (a) — (iv)
(b) — (iii)
(c) — (v)
(d) — (ii)
(e) — (i)

**16.** Yes, this is true. In both the phenomena, there is movement of particles from region of higher concentration to that of lower concentration. However, in the case of osmosis the movement of solvent is through a semi permeable membrane which is permeable only to water molecules.

**17.** (a) Osmosis
(b) Diffusion
(c) Osmosis
(d) Osmosis
(e) Osmosis
(f) Diffusion
(g) Diffusion

**18.** In case of ice the water molecules have low energy while in the case of steam the water molecules have high energy. The high energy of water molecules in steam is transformed as heat and may cause burns. On the other hand, in case of ice, the water molecules take energy from the body and thus give a cooling effect.

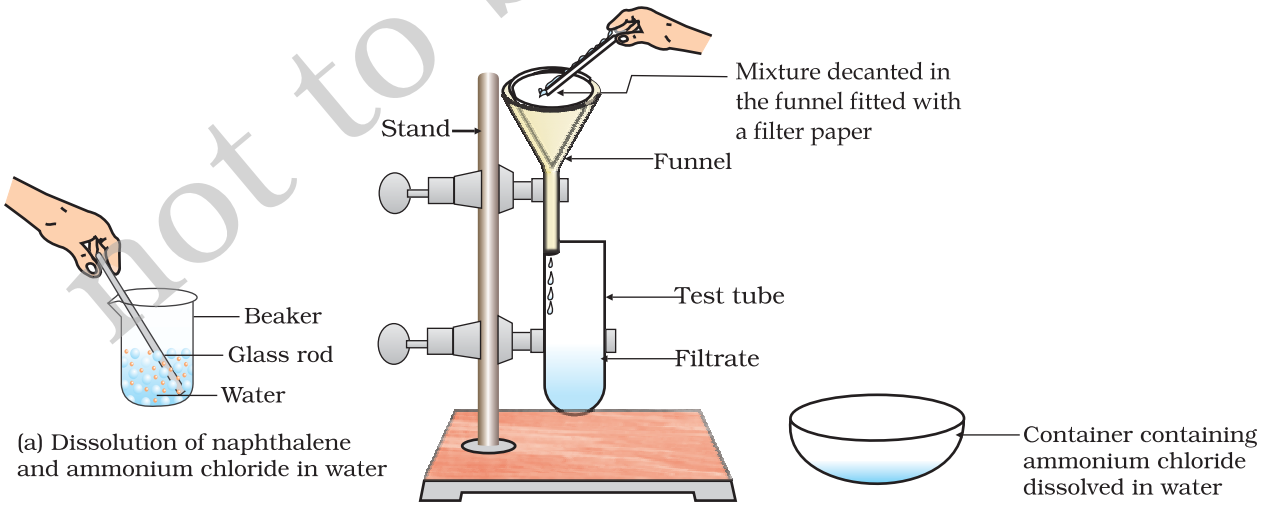
**19.** The temperature of both boiling water and steam is 100°C, but steam has more energy because of latent heat of vapourisation.

**20.** (a) The water will cool initially till it reaches 0°C, the freezing point. At this stage the temperature will remain constant till all the water will freeze. After this temperature would fall again.

**21.** (c) The rate of evaporation increases with an increase of surface area because evaporation is a surface phenomenon. Also, with the increase in air speed, the particles of water vapour will move away with the air, which will increase the rate of evaporation.

**22.** (a) Sublimation
(b) The amount of heat required to convert 1 kg of solid into liquid at one atmosphere pressure at its melting point is known as its latent heat of fusion.

**23.** **Hint**— Naphthalene is insoluble in water but soluble in ether an organic solvent. It is volatile at room temperature. Ammonium chloride is soluble in water and volatile at higher temperature. It decomposes on heating to dryness.




(a) Dissolution of naphthalene and ammonium chloride in water

(b) Filtration

(c) Evaporation

**24.** Cotton being a better absorber of water than nylon helps in absorption of sweat followed by evaporation which leads to cooling. So Priyanshi is more comfortable, whereas Ali is not so comfortable.

**25.** Conditions that can increase the rate of evaporation of water are
(a) an increase of surface area by spreading the shirt
(b) an increase in temperature by putting the shirt under the sun
(c) increase the wind speed by spreading it under the fan.

**26.** (a) Evaporation produces cooling as the particles at the surface of the liquid gain energy from the surroundings and change into vapour thereby producing a cooling effect.

(b) Air around us cannot hold more than a definite amount of water vapour at a given temperature which is known as humidity. So, if the air is already rich in water vapour, it will not take up more water therefore, rate of evaporation of water will decrease.

(c) A sponge has minute holes in which air is trapped. Also the material is not rigid. When we press it, the air is expelled out and we are able to compress it.

**27.** The temperature of a substance remains constant at its melting and boiling points untill all the substance melts or boils because, the heat supplied is continuously used up in changing the state of the substance by overcoming the forces of attraction between the particles. This heat energy absorbed without showing any rise in temperature is given the name latent heat of fusion/latent heat of vapourisation.

# Chapter 2

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

**6.** (c) **7.** (a) **8.** (c) **9.** (d)

**10.** (a) Separation by using separating funnel

(b) Sublimation

(c) Filtration followed by evaporation

**or**

Centrifugation followed by evaporation / distillation

(d) Separation by using separating funnel to separate kerosene oil followed by evaporation or distillation.

**11.** **Hint—** Look for the larger surface area. The presence of beads in tube (a) would provide a larger surface area for cooling.

**12.** Crystallization

**13.** Homogeneous— mixture of salts and water only

Heterogeneous— contains salts, water, mud, decayed plant etc.

**14.** **Hint—** Distillation, since acetone is more volatile it will separate out first.

**15.** (a) Solid potassium chloride will separate out.

(b) Initially the water will evaporate and then sugar will get charred.

(c) Iron sulphide will be formed.

**16.** Particle size in a suspension is larger than those in a colloidal solution. Also molecular interaction in a suspension is not strong enough to keep the particles suspended and hence they settle down.

**17.** Both fog and smoke have gas as the dispersion medium. The only difference is that the dispersed phase in fog is liquid and in smoke it is a solid

**18.** Physical properties – (a) and (c)

Chemical properties – (b) and (d)

**19.** 'C' has made the desired solution

$$\text{Mass by volume \%} = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

$$= \frac{50}{100} \times 100$$

= 50 % mass by volume

**20.** (a) Sublimation
(b) Diffusion
(c) Dissolution / diffusion
(d) Evaporation, diffusion
(e) Centrifugation
(f) Sedimentation
(g) Scattering of light (Tyndall effect)

**21.** Sample 'B' will not freeze at 0°C because it is not pure water. At 1 atm, the boiling point of pure water is 100°C and the freezing point of pure water is 0°C.

**22.** Pure gold is very soft as compared to gold alloyed with silver or copper. Thus for providing strength to gold, it is alloyed.

**23.** This element is a metal. Other characteristics expected to be possessed by the element are–lustre, malleability, heat and electrical conductivity.

**24.** (a) Evaporation or distillation
(b) Distillation
(c) Separation by using separating funnel
(d) Sublimation
(e) Chromatography

**25.** (a) heterogenous, centrifugation
(b) physical, chemically
(c) water, chloroform (hint– density of water is less than that of chloroform)
(d) fractional distillation
(e) scattering, Tyndall effect, colloidal

**26.** It is a pure substance because chemical composition of sugar crystals is same irrespective of its source.

**27.** **Hint—**Tyndall effect can be seen when light passes through a heterogeneous mixture. Example, when sunlight passes through the canopy of a dense forest.

**28.** **Hint—** Water and alcohol are miscible.

**29.** (a) Chemical change

(b) Acidic and basic solutions can be prepared by dissolving the products of the above process in water

$CaO + H_2O \rightarrow Ca(OH)_2$ (basic solution)

$CO_2 + H_2O \rightarrow H_2CO_3$ (acidic solution)

**30.** (a) Iodine

(b) Bromine

(c) Graphite

(d) Carbon

(e) Sulphur, phosphorus

(f) Oxygen

**31.**

| ***Elements*** | ***Compounds*** |
|---|---|
| Cu | $CaCO_3$ |
| Zn | $H_2O$ |
| $F_2$ | |
| $O_2$ | |
| Diamond (carbon) | |
| Hg | |

**32.** Chlorine gas, Iron, Aluminium, Iodine, Carbon, Sulphur powder.

**33.** The fractionating column packed with glass beads provides a surface for the vapours to collide and lose energy so that they can be quickly condensed and distilled. Also length of the column would increase the efficiency.

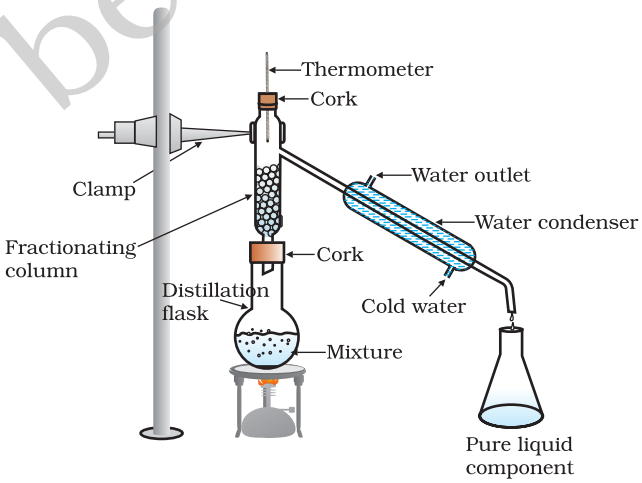



***Figure:*** *Fractional distillation*

**34.** **Hint–** (a) Homogenous mixture, because they have a uniform composition throughout

(b) No, solid solutions and gaseous solutions are also possible. Examples brass and air

(c) No, solution is a homogenous mixture of two or more substances

**35.** **Part A**

$Fe\,(s) + S\,(s) \xrightarrow{Heat} FeS\,(s)$

$FeS + 2\,HCl\,(aq) \rightarrow FeCl_2 + H_2S$

**Part B**

$Fe\,(s) + S\,(s) \rightarrow$ Mixture of iron filings and sulphur

When dilute HCl is added to it

$Fe\,(s) + S\,(s) + 2\,HCl\,(aq) \rightarrow FeCl_2 + H_2$ gas

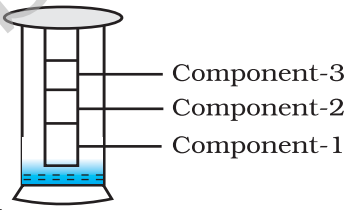
Sulphur remains unreacted

$H_2S$ gas formed has a foul smell and on passing through lead acetate solution, it turns the solution black. Hydrogen gas burns with a pop sound.

**36.** **Hint–** (i) Three different bands will be observed.

(ii) Chromatography

(iii) To separate the pigments present in Chlorophyll.




**37.** (a) Milk is a colloid and would show Tyndall effect.

(b) Salt solution is a true solution and would not scatter light.

(c) Detergent solution, sulphur solution.

**38.** **Hint—**Physical changes —(a), (b), (e)

Chemical changes— (c), (d)

**39.** (a) No.

$$\text{Mass \%} = \frac{\text{Mass of solute}}{\text{Mass of solute} + \text{Mass of solvent}} \times 100$$

(b) Solution made by Ramesh

$$\text{Mass \%} = \left(\frac{10}{10+100}\right)100 = \frac{10}{110} \times 100 = 9.09\%$$

Solution made by Sarika

$$\text{Mass \%} = \frac{10}{100} \times 100 = 10\%$$

The solution prepared by Sarika has a higher mass % than that prepared by Ramesh.

**40. Hint–**

Step-1 Separate iron filings with the help of a magnet

Step-2 Sublimation of the remaining mixture separates ammonium chloride

Step-3 Add water to the remaining mixture, stir and filter

Step-4 The filtrate can be evaporated to get back sodium chloride.

**41.** (c)

$$\text{Mass \%} = \frac{\text{Mass of solute}}{\text{Mass of solute} + \text{Mass of solvent}} \times 100$$

$$= \frac{0.01}{0.01 + 99.99} \times 100$$

$$= \frac{0.01}{100} \times 100$$

$$= 0.01 \text{ g}$$

**42.** Let the mass of sodium sulphate required be = $x$ g

The mass of solution would be = $(x + 100)$ g

$x$ g of solute in $(x + 100)$ g of solution

$$20\% = \frac{x}{x + 100} \times 100$$

$$20x + 2000 = 100x$$

$$80x = 2000$$

$$x = \frac{2000}{80}$$

$$= 25 \text{ g}$$

# Chapter 3

**1.** (d)

(ii) 20 moles of water = 20 ×18 g = 360 g of water, because mass of 1 mole of water is the same as its molar mass, i.e., 18 g.

(iv) $1.2044 \times 10^{25}$ molecules of water contains

$\frac{1.2044 \times 10^{25}}{N_A}$ number of moles, $N_A = 6.023 \times 10^{23}$

$\therefore \frac{1.2044 \times 10^{25}}{6.022 \times 10^{23}} = 20$ moles

20 moles of water = 20×18 g
= 360 g of water.

**2.** (a) Inert gases exist in monoatomic form.

**3.** (b)

**4.** (d)

**5.** (c)

Weight of a sample in gram = number of moles × molar mass

(a) 0.2 moles of $C_{12}H_{22}O_{11}$ = 0.2 × 342 = 68.4 g

(b) 2 moles of $CO_2$ = 2×44 = 88 g

(c) 2 moles of $CaCO_3$ = 2×100 = 200 g

(d) 10 moles of $H_2O$ = 10×18 = 180 g

**6.** (d)

$$\text{Number of atoms} = \frac{\text{Mass of substance} \times \text{Number of atoms in the molecule}}{\text{Molar mass}} \times N_A$$

$\therefore$ (a) 18 g of water = $\frac{18 \times 3}{18} \times N_A = 3N_A$

(b) 18 g of oxygen = $\frac{18 \times 2}{32} \times N_A = 1.12\ N_A$

(c) 18 g of $CO_2$ = $\frac{18 \times 3}{44} \times N_A = 1.23 N_A$

(d) 18 g of $CH_4$ = $\frac{18 \times 5}{16} \times N_A = 5.63 N_A$

**7.** (c)

1 g of $H_2 = \frac{1}{2} \times N_A = 0.5\, N_A$

$= 0.5 \times 6.022 \times 10^{23}$

$= 3.011 \times 10^{23}$

**8.** (a)

Mass of one atom of oxygen = Atomic mass / $N_A$

$= \frac{16}{6.022 \times 10^{23}}$ g

**9.** (a)

Number of moles of sucrose $= \frac{\text{Mass of substance}}{\text{Molar mass}}$

$= \frac{3.42\ \text{g}}{342\ \text{g mol}^{-1}} = 0.01\ \text{mol}$

1 mol of sucrose ($C_{12}H_{22}O_{11}$) contains $= 11 \times N_A$ atoms of oxygen

0.01 mol of sucrose ($C_{12}H_{22}O_{11}$) contains $= 0.01 \times 11 \times N_A$ atoms of oxygen

$= 0.11 \times N_A$ atoms of oxygen

Number of moles of water $= \frac{18\ \text{g}}{18\ \text{g mol}^{-1}} = 1\ \text{mol}$

1 mol of water ($H_2O$) contains $1 \times N_A$ atom of oxygen

Total number of oxygen atoms = Number of oxygen atoms from sucrose + Number of oxygen atoms from water

$= 0.11\ N_A + 1.0\ N_A = 1.11 N_A$

Number of oxygen atoms in solution = 1.11 × Avogadro's number

$= 1.11 \times 6.022 \times 10^{23}$

$= 6.68 \times 10^{23}$

**10.** (c)

**11.** (b) $BiPO_4$— Both ions are trivalent

Bismuth phosphate

**12.** (a) $CuBr_2$

(b) $Al(NO_3)_3$

(c) $Ca_3(PO_4)_2$

(d) $Fe_2S_3$

(e) $HgCl_2$

(f) $Mg(CH_3COO)_2$

**13.** $CuCl_2$ / $CuSO_4$ / $Cu_3(PO_4)_2$
$NaCl$ / $Na_2SO_4$ / $Na_3PO_4$
$FeCl_3$ / $Fe_2(SO_4)_3$ / $FePO_4$

**14.**

| | Anions | Cations |
|---|---|---|
| (a) | $CH_3COO^-$ | $Na^+$ |
| (b) | $Cl^-$ | $Na^+$ |
| (c) | It is a covalent compound | |
| (d) | $NO_3^-$ | $NH_4^+$ |

**15.** (a) $CaF_2$ (e) $Na_2O$
(b) $H_2S$ (f) $CO$, $CO_2$
(c) $NH_3$
(d) $CCl_4$

**16.** (a) Incorrect, the correct symbol of cobalt is Co
(b) Incorrect, the correct symbol of carbon is C
(c) Incorrect, the correct symbol of aluminium is Al
(d) Correct (He)
(e) Incorrect, the correct symbol of sodium is Na

**17.**

| (a) $NH_3$ | (b) CO | (c) HCl | (d) $AlF_3$ | (e) Mg S |
|---|---|---|---|---|
| N : H × 3 | C : O | H : Cl | Al : F × 3 | Mg : S |
| 14 : 1 × 3 | 12 : 16 | 1 : 35.5 | 27 : 19 × 3 | 24 : 32 |
| 14 : 3 | 3 : 4 | 2 : 71 | 9 : 19 | 3 : 4 |

**18.** (a) 4 (b) 5
(c) 7 (d) 2

**19.** ~ 8/18

Mass of one mole (Avogadro Number) of neutrons ~ 1 g

Mass of one neutron = $\frac{1}{\text{Avogadro Number } (N_A)}$ g

Mass of one molecule of water = $\frac{\text{Molar mass}}{N_A} = \frac{18}{N_A}$ g

There are 8 neutrons in one atom of oxygen

Mass of 8 neutrons = $\frac{8}{N_A}$

Fraction of mass of water due to neutrons ~ $\frac{8}{18}$

**20.** Yes, it is a temperature dependent property. The solubility generally, increases with increase in temperature. For example, you can dissolve more sugar in hot water than in cold water.

**21.** (a) 2 (b) 3 (c) 3 (d) 8 (e) 4 (f) 4 (g) 14 (h) 3 (i) 2 (j) 5
(k) 1 (Noble gases do not combine and exist as monoatomic gases)
(l) Polyatomic. It is difficult to talk about the atomicity of metals as any measurable quantity will contain millions of atoms bound by metallic bond (about which you would learn later).

**22.** On heating the powder, it will char if it is a sugar.
Alternatively, the powder may be dissolved in water and checked for its conduction of electricity. If it conducts, it is a salt.

**23.** Number of moles $= \frac{12}{24} = 0.5$ mol

**24.** (a)

| | |
|---|---|
| $CO_2$ has molar mass | $= 44\text{g mol}^{-1}$ |
| 5 moles of $CO_2$ have molar mass | $= 44 \times 5$ |
| | $= 220$ g |
| $H_2O$ has molar mass | $= 18\text{ g mol}^{-1}$ |
| 5 moles of $H_2O$ have mass | $= 18 \times 5$ g |
| | $= 90$ g |

(b) Number of moles in 240g Ca metal $= \frac{240}{40} = 6$

Number of moles in 240g of Mg metal $= \frac{240}{24} = 10$

Ratio 6:10
3: 5

**25.** (a) $CaCO_3$
Ca : C:O × 3
40 : 12 : 16×3
40 : 12 : 48
10 : 3: 12

(b) $MgCl_2$
Mg : Cl × 2
24 : 35.5 × 2
24 : 71

(c) $H_2SO_4$
H × 2 : S : O × 4
1 × 2 : 32 : 16 × 4
2 : 32 : 64
1 : 16 : 32

(d) $C_2H_5OH$
C × 2 : H × 6: O
12 × 2 : 1 × 6: 16
24 : 6 : 16
12 : 3 : 8

(e) $NH_3$
N : H × 3
14: 1 × 3
14:3

(f) $Ca(OH)_2$
Ca : O × 2 : H × 2
40 : 16 ×2 : 1 × 2
40 : 32 : 2
20 : 16 : 1

**26.** 1 mole of calcium chloride = 111g

$\therefore$ 222g of $CaCl_2$ is equivalent to 2 moles of $CaCl_2$

Since 1 formula unit $CaCl_2$ gives 3 ions, therefore, 1 mol of $CaCl_2$ will give 3 moles of ions

2 moles of $CaCl_2$ would give 3×2=6 moles of ions.

No. of ions = No. of moles of ions × Avogadro number

$= 6 \times 6.022 \times 10^{23}$

$= 36.132 \times 10^{23}$

$= 3.6\ 132 \times 10^{24}$ ions

**27.** A sodium atom and ion, differ by one electron. For 100 moles each of sodium atoms and ions there would be a difference of 100 moles of electrons.

Mass of 100 moles of electrons= 5.48002 g

Mass of 1 mole of electron $= \frac{5.48002}{100}$ g

Mass of one electron $= \frac{5.48002}{100 \times 6.022 \times 10^{23}} = 9.1 \times 10^{-28}$ g

$= 9.1 \times 10^{-31}$ kg

**28.** Molar mass of HgS = 200.6 + 32 = 232.6 g $mol^{-1}$

Mass of Hg in 232.6 g of HgS = 200.6 g

Mass of Hg in 225 g of HgS $= \frac{200.6}{232.6} \times 225 = 194.04$g

**29.** One mole of screws weigh = $2.475 \times 10^{24}$g $= 2.475 \times 10^{21}$ kg

$$\frac{\text{Mass of the Earth}}{\text{Mass of 1 mole of screws}} = \frac{5.98 \times 10^{24}\ \text{kg}}{2.475 \times 10^{21}\ \text{kg}} = 2.4 \times 10^{3}$$

Mass of earth is $2.4 \times 10^3$ times the mass of screws

The earth is 2400 times heavier than one mole of screws.

**30.** 1 mole of oxygen atoms = $6.023 \times 10^{23}$ atoms

$\therefore$ Number of moles of oxygen atoms $= \frac{2.58 \times 10^{24}}{6.022 \times 10^{23}}$

$= 4.28$ mol

4.28 moles of oxygen atoms.

**31.** (a) Mass of sodium atoms carried by Krish = (5 × 23) g = 115 g

While mass of carbon atom carried by Raunak = (5 ×12) g = 60g

Thus, Krish's container is heavy

(b) Both the bags have same number of atoms as they have same number of moles of atoms

**32.**

| Species | $H_2O$ | $CO_2$ | Na atom | $MgCl_2$ |
|---|---|---|---|---|
| **Property** | | | | |
| No. of moles | 2 | 0.5 | 5 | 0.5 |
| No of particles | $1.2044 \times 10^{24}$ | $3.011 \times 10^{23}$ | $3.011 \times 10^{24}$ | $3.011 \times 10^{23}$ |
| Mass | 36g | 22g | 115g | 47.5g |

**33.** Number of moles of stars $= \dfrac{10^{22}}{6.023 \times 10^{23}}$

$= 0.0166$ mols

**34.** (a) kilo (b) deci (c) centi (d) micro (e) nano (f) pico

**35.** (a) $5.84 \times 10^{-9}$ kg
(b) $5.834 \times 10^{-2}$ kg
(c) $5.84 \times 10^{-4}$ kg
(d) $5.873 \times 10^{-24}$ kg

**36.** A $Mg^{2+}$ ion and Mg atom differ by two electrons.
$10^3$ moles of $Mg^{2+}$ and Mg atoms would differ by
$10^3 \times 2$ moles of electrons
Mass of $2 \times 10^3$ moles of electrons $= 2 \times 10^3 \times 6.023 \times 10^{23} \times 9.1 \times 10^{-31}$ kg
$\Rightarrow 2 \times 6.022 \times 9.1 \times 10^{-5}$kg
$\Rightarrow 109.6004 \times 10^{-5}$ kg
$\Rightarrow 1.096 \times 10^{-3}$kg

**37.** (i) 100 g of $N_2 = \dfrac{100}{28}$ moles

Number of molecules $= \dfrac{100}{28} \times 6.022 \times 10^{23}$

Number of atoms $= \dfrac{2 \times 100}{28} \times 6.022 \times 10^{23} = 43.01 \times 10^{23}$

(ii) 100 g of $NH_3 = \dfrac{100}{17}$ moles $= \dfrac{100}{17} \times 6.022 \times 10^{23}$ molecules

$= \dfrac{100}{17} \times 6.022 \times 10^{23} \times 4$ atoms

$= 141.69 \times 10^{23}$

$NH_3$ would have more atoms

**38.** 5.85 g of NaCl = $\frac{5.85}{58.5} = 0.1$ moles

or 0.1 moles of NaCl particle

Each NaCl particle is equivalent to one $Na^+$ one $Cl^-$

$\Rightarrow$ 2 ions

$\Rightarrow$ Total moles of ions $= 0.1 \times 2$

$\Rightarrow 0.2$ moles

No. of ions $= 0.2 \times 6.022 \times 10^{23}$

$\Rightarrow 1.2042 \times 10^{23}$ ions

**39.** One gram of gold sample will contain $\frac{90}{100} = 0.9$ g of gold

Number of moles of gold $= \frac{\text{Mass of gold}}{\text{Atomic mass of gold}}$

$= \frac{0.9}{197} = 0.0046$

One mole of gold contains $N_A$ atoms $= 6.022 \times 10^{23}$

$\therefore$ 0.0046 mole of gold will contain $= 0.0046 \times 6.022 \times 10^{23}$

$= 2.77 \times 10^{21}$

**40.** Atoms of different elements join together in definite proportions to form molecules of compounds. Examples— water, ammonia, carbondioxide. Compounds composed of metals and non-metals contain charged species. The charged species are known as ions. An ion is a charged particle and can be negatively or positively charged. A negatively charged ion is called an anion and the positively charged ion is called cation. Examples— sodium chloride, calcium oxide.

**41.** Mass of 1 mole of aluminium atom = the molar mass of aluminium

$= 27$ g $mol^{-1}$

An aluminium atom needs to lose three electrons to become an ion, $Al^{3+}$

For one mole of $A1^{3+}$ ion, three moles of electrons are to be lost.

The mass of three moles of electrons $= 3 \times (9.1 \times 10^{-28}) \times 6.022 \times 10^{23}$ g

$= 27.3 \times 6.022 \times 10^{-5}$ g

$= 164.400 \times 10^{-5}$ g

$= 0.00164$ g

Molar mass of $Al^{3+}$ $= (27 - 0.00164)$ g $mol^{-1}$

$= 26.9984$ g $mol^{-1}$

Difference $= 27 - 26.9984$

$= 0.0016$ g

**42.** Mass of silver = m g

Mass of gold $= \frac{m}{100}$ g

Number of atoms of silver $= \frac{\text{Mass}}{\text{Atomic mass}} \times N_A$

$= \frac{m}{108} \times N_A$

Number of atoms of gold $= \frac{m}{100 \times 197} \times N_A$

Ratio of number of atoms of gold to silver = Au : Ag

$= \frac{m}{100 \times 197} \times N_A : \frac{m}{108} \times N_A$

= 108 : 100×197

= 108 : 19700

= 1 : 182.41

**43.** Mass of 1 molecule of $CH_4 = \frac{16\text{ g}}{N_A}$

Mass of $1.5 \times 10^{20}$ molecules of methane $= \frac{1.5 \times 10^{20} \times 16}{N_A}$ g

Mass of 1 molecule of $C_2H_6 = \frac{30}{N_A}$ g

Mass of molecules of $C_2H_6$ is $= \frac{1.5 \times 10^{20} \times 16}{N_A}$ g

$\therefore$ Number of molecules of ethane $= \frac{1.5 \times 10^{20} \times 16}{N_A} \times \frac{N_A}{30} = 0.8 \times 10^{20}$

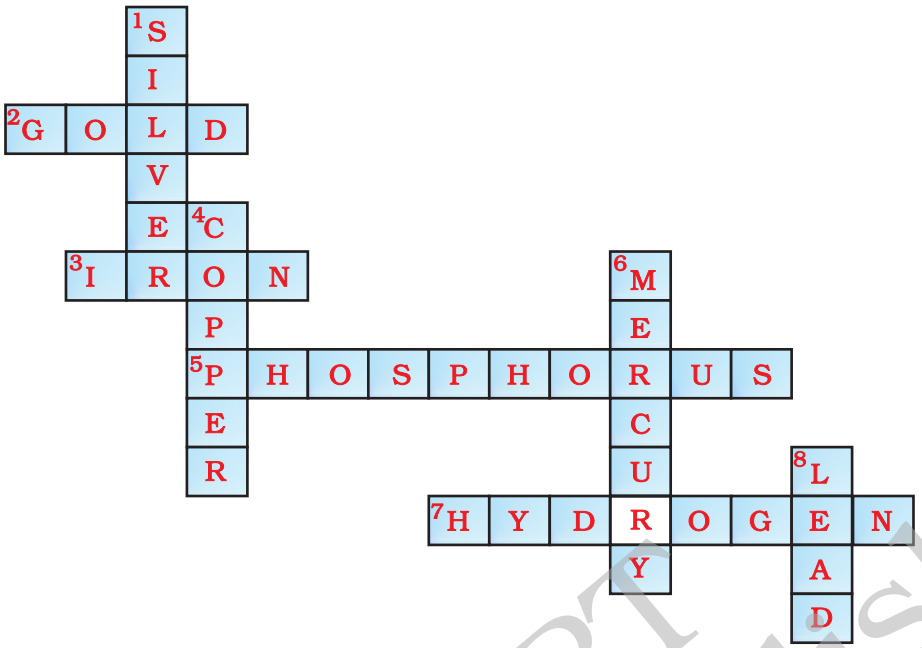
**44.** (a) Law of conservation of mass

(b) Polyatomic ion

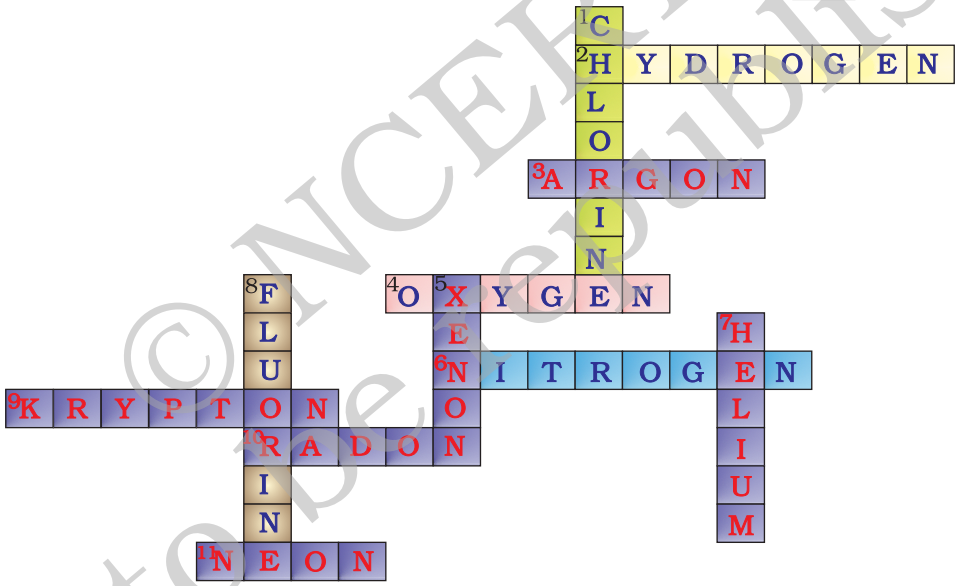
(c) (3 × atomic mass of Ca) + (2 × atomic mass of phosphorus) + (8 × atomic mass of oxygen) = 310

(d) $Na_2CO_3$; $(NH_4)_2SO_4$

**45.**




**46 (a)**




**(b)** Six : Helium (He); Neon ( Ne); Argon (Ar); Krypton (Kr); Xenon (Xe); Radon (Rn).

**47.** (a) KOH

$(39 + 16 + 1) = 56 \text{ g mol}^{-1}$

(b) $NaHCO_3$

$23 + 1 + 12 + (3 \times 16) = 84 \text{ g mol}^{-1}$

(c) $CaCO_3$

$40 + 12 + (3 \times 16) = 100 \text{ g mol}^{-1}$

(d) NaOH

$23+16+1 = 40 \text{ g mol}^{-1}$

(e) $C_2H_5OH = C_2H_6O$

$2 \times 12 + (6 \times 1) + 16 = 46 \text{ g mol}^{-1}$

(f) NaCl

$23 + 35.5 = 58.5 \text{ g mol}^{-1}$

**48.** $6CO_2 + 6\,H_2O \xrightarrow[\text{Sunlight}]{\text{Chlorophyll}} C_6H_{12}O_6 + 6O_2$

1 mole of glucose needs 6 moles of water

180 g of glucose needs (6×18) g of water

1 g of glucose will need $\frac{108}{180}$ g of water.

18 g of glucose would need $\frac{108}{180} \times 18$ g of water = 10.8 g

Volume of water used $= \frac{\text{Mass}}{\text{Density}} = \frac{10.8\text{ g}}{1\text{g cm}^{-3}} = 10.8 \text{ cm}^3$.

# Chapter 4

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

**5.** (a) **6.** (d) **7.** (a) **8.** (b)

**9.** (b) **10.** (d) **11.** (c) **12.** (c)

**13.** (d) **14.** (c) **15.** (a) **16.** (c)

**17.** (a) **18.** (c)

**19.** Yes, it is true for hydrogen atom which is represented as ${}_{1}^{1}H$

**20.** **Hint—** Discovery of electrons and protons

**21.** **Hint—** No, ${}^{35}Cl$ and ${}^{37}Cl$ are isotopes of an element.

**22.** **Hint—** gold has high malleability

**23.** (a) 0
(b) 1

**24.** + 1

**25.** 2, 8, 7. The L shell has eight electrons

**26.** –2

**27.**

| | Atomic No. | Mass No. | Valency |
|---|---|---|---|
| X | 5 | 11 | 3 |
| Y | 8 | 18 | 2 |
| Z | 15 | 31 | 3,5 |

**28.** **Hint—** No, the statement is incorrect. In an atom the number of protons and electrons is always equal.

**29.** Mass number = No. of protons + No. of neutrons = 31

∴ Number of neutrons = 31– number of protons
= 31–15
= 16

**30.** (a) (iii) (b) (iv) (c) (i) (d) (ii)

(e) (vi) (f) (vii) (g) (v)

**31.** Isobars

**32.**

| Element | $n_p$ | $n_n$ |
|---|---|---|
| Cl | 17 | 18 |
| C | 6 | 6 |
| Br | 35 | 46 |

**33.** Helium atom has 2 electrons in its outermost shell and its duplet is complete. Hence the valency is zero.

**34.** (a) atomic nucleus

(b) atomic number, mass number

(c) 0 and 1.

(d) Silicon—2, 8, 4

Sulphur— 2, 8, 6

**35.** Valency is zero as K shell is completely filled.

**36.** Helium has two electrons in its only energy shell, while Argon and Neon have 8 electrons in their valence shells. As these have maximum number of electrons in their valence shells, they do not have any tendency to combine with other elements. Hence, they have a valency equal to zero.

**37.** (i) Volume of the sphere = $\frac{4}{3}\pi r^3$

Let R be the radius of the atom and r be that of the nucleus.

$\Rightarrow R = 10^5 r$

Volume of the atom = $\frac{4}{3}\pi R^3 = \frac{4}{3}\pi (10^5 r)^3$ (Q $R = 10^5 r$ )

$= \frac{4}{3}\pi r^3 \times 10^{15}$

Volume of the nucleus = $\frac{4}{3}\pi r^3$

Ratio of the size of atom to that of nucleus = $\frac{\frac{4}{3}\times 10^{15} \times \pi r^3}{\frac{4}{3}\pi r^3} = 10^{15}$

(ii) If the atom is represented by the planet earth ($R_e = 6.4 \times 10^6$ m) then the radius of the nucleus would be $r_n = \frac{R_e}{10^5}$

$$r_n = \frac{6.4 \times 10^6 \text{ m}}{10^5}$$
$$= 6.4 \times 10 \text{ m}$$
$$= 64 \text{ m}.$$

**38.** Rutherford concluded from the α-particle scattering experiment that–

(i) Most of the space inside the atom is empty because most of the α-particles passed through the gold foil without getting deflected.

(ii) Very few particles were deflected from their path, indicating that the positive charge of the atom occupies very little space.

(iii) A very small fraction of α-particles were deflected by $180^0$, indicating that all the positive charges and mass of the gold atom were concentrated in a very small volume within the atom.

From the data he also calculated that the radius of the nucleus is about $10^5$ times less than the radius of the atom.

**39.** Rutherford proposed a model in which electrons revolve around the nucleus in well-defined orbits. There is a positively charged centre in an atom called the nucleus. He also proposed that the size of the nucleus is very small as compared to the size of the atom and nearly all the mass of an atom is centred in the nucleus. Whereas, Thomson proposed the model of an atom to be similar to a christmas pudding. The electrons are studded like currants in a positively charged sphere like christmas pudding and the mass of the atom was supposed to be uniformly distributed.

**40.** The orbital revolution of the electron is not expected to be stable. Any particle in a circular orbit would undergo a acceleration and the charged particles would radiate energy. Thus, the revolving electron would lose energy and finally fall into the nucleus. If this were so, the atom should be highly unstable and hence matter would not exist in the form that we know.

**41.** The postulates put forth by Neils Bohr's about the model of an atom:

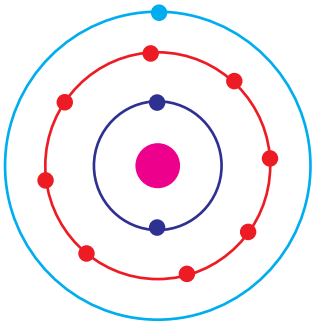
(i) Only certain special orbits known as discrete orbits of electrons, are allowed inside the atom.

(ii) While revolving in discrete orbits the electrons do not radiate energy.

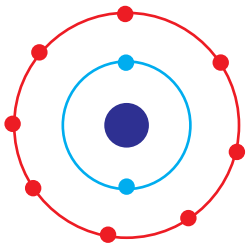
These orbits are called energy levels. Energy levels in an atom are shown by circles.

These orbits are represented by the letters K,L,M,N,... or the numbers, n=1,2,3,4,....

**42.**



Sodium atom



Sodium ion

Since the atomic number of sodium atom is 11, it has 11 electrons. A positively charged sodium ion ($Na^+$) is formed by the removal of one electron from a sodium atom. So, a sodium ion has 11–1 = 10 electrons in it. Thus, electronic distribution of sodium ion will be 2, 8. The atomic number of an element is equal to the number of protons in its atom. Since, sodium atom and sodium ion contain the same number of protons, therefore, the atomic number of both is 11.

**43.** % of α-particles deflected more than $50^0$ =1% of α-particles.

% of α-particles deflected less than $50^0$ =100–1 = 99%

Number of α-particles bombarded = 1 mole = $6.022 \times 10^{23}$ particles

Number of particles that deflected at an angle less than $50^0$

$$= \frac{99}{100} \times 6.022 \times 10^{23}$$

$$= \frac{596.178}{100} \times 10^{23}$$

$$= 5.96 \times 10^{23}$$

# Chapter 5

| | | | |
|---|---|---|---|
| **1.** (c) | **2.** (b) | **3.** (c) | **4.** (c) |
| **5.** (c) | **6.** (a) | **7.** (b) | **8.** (b) |
| **9.** (a) | **10.** (a) | **11.** (c) | **12.** (a) |
| **13.** (d) | **14.** (d) | **15.** (d) | **16.** (b) |
| **17.** (a) | **18.** (b) | **19.** (c) | **20.** (c) |
| **21.** (a) | **22.** (b) | **23.** (a) | **24.** (b) |
| **25.** (a) | **26.** (a) | **27.** (b) | **28.** (c) |
| **29.** (d) | | | |

**30.** Lysosomes are known as 'suicide-bags' because when cell gets damaged during the disturbance in cellular metabolism, lysosomes may burst and the digestive enzymes thus released digest their own cell.

**31.** **Hint—** Cell→ tissue → organ → organ system → organism

**32.** Soap solution is very concentrated - Hypertonic solution, so water moves out of your finger cells by osmosis.

**33.** **Hint—** Cell wall is absent in animals

**34.** Exosmosis in intestine causes dehydration

**35.** Ribosomes

**36.** Diffusion and osmosis respectively

**37.** Exosmosis

**38.** **Hint—** (b) Onion peel has cell wall and RBC does not have cell wall

**39.** **Hint—** Small vesicles associated with plasma membrane

**40.** a—iv; b—v; c—iii; d—i; e—ii

**41.** Flower and Fruit— Chromoplast
Leaves of the plant— Chloroplast
Root of the plant— Leucoplast

**42.** (a) Endoplasmic reticulum (b) Mitochondria
(c) Golgi body (d) Lysosome
(e) Vacuole (f) Chloroplast
(g) Nucleus

**43.** **Hint**— Bacterial cell is a prokaryote
Onion peel cell is a plant cell— an eukaryote

**44.** **Hint**—Diffusion and osmosis

**45.** **Hint**—Endocytosis

**46.** **Hint**—Mitochondria and plastids

**47.** **Hint**—Remove debris of the cell

**48.** **Hint**—Nucleus

**49.** **Hint**—(a) Leucoplast (b) Chloroplast (c) Chromoplast

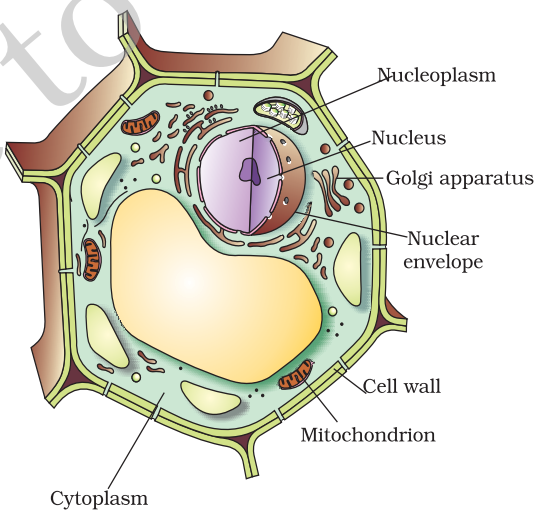
**50.** **Hint**—Vacuoles not only store many important substances, they also contain cell sap that give turgidity to cell.

**51.** **Hint**—Chromosomes are made up of chromatids and chromatids are made up of chromatin

**52.** (a) Exosmosis (b) Endosmosis (c) No effect

**53.** **Hint**— (a) Nucleus
(b) Golgi apparatus
(c) Cell wall
(d) Cytoplasm
(e) Nucleoplasm.
Diagram of the plant cell can be drawn and label it with parts mentioned above

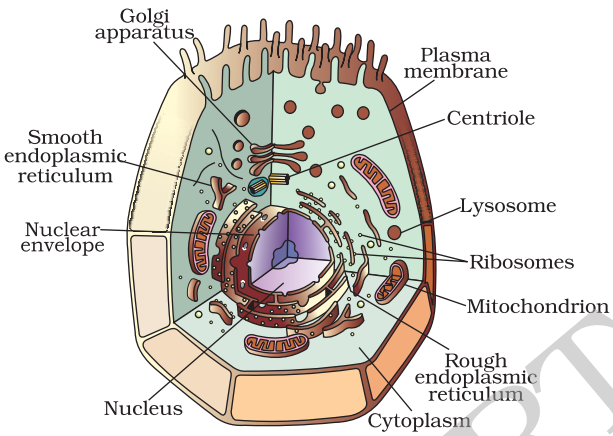
**54.**




Plant cell

| Plant Cell | Animal Cell |
|---|---|
| 1. Cell wall present<br>2. Plastids are present<br>3. It has a large vacuole<br>4. Centriole absent | 1. Cell wall absent<br>2. Plastids are absent<br>3. It has a small vacuole<br>4. Centriole present |

**55.**




Animal cell

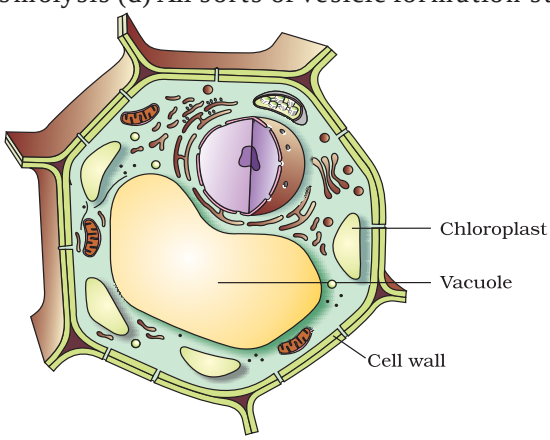
**56.** Any electron microscopic diagram of Nucleus can be drawn. It is a membrane bound organelle.

**57.** The ribosomes, which are present in all active cells, are the sites of protein synthesis. Endoplasmic reticulum helps in transporting these proteins to various places. The smooth endoplasmic reticulum help in manufacture of fat and lipids which alongwith proteins help in building the cell membrane.

| Smooth Endoplasmic Reticulum (SER) | Rough Endoplasmic Reticulum (RER) |
|---|---|
| SER has no ribosomal particles on the surface, hence look smooth SER helps in the manufacture of lipids and fat molecules | RER has particles of ribosome on the surface. Ribosomes are the sites of protein synthesis. |

**58.** **Hints—**(a) First it swells due to endosmosis and then exosmosis occurs and it shrinks. (b) It will lose water and shrink. (c) The cell will die. (d) The cell gets killed on boiling so no plasmolysis (d) All sorts of vesicle formation stops.

**59.**




Plant cell

# Chapter 6

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

**5.** (b) **6.** (c) **7.** (d) **8.** (b)

**9.** (c) **10.** (c) **11.** (c) **12.** (c)

**13.** (b) **14.** (b) **15.** (c) **16.** (b)

**17.** (c) **18.** (c) **19.** (c) **20.** (b)

**21.** (d) **22.** (b) **23.** (a) **24.** (a)

**25.** (d) **26.** (d) **27.** (c) **28.** (a)

**29.** (a) **30.** (c) **31.** (b) **32.** (c)

**33.** (c)

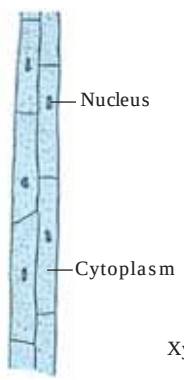
**34.** **Hint—** Fat acts as subcutaneous insulation of body for thermoregulation

**35.** a—v; b—iv; c—iii; d—i; e—ii; f—vi;

**36.** a—i; b—ii c—iv; d—iii; e—v;

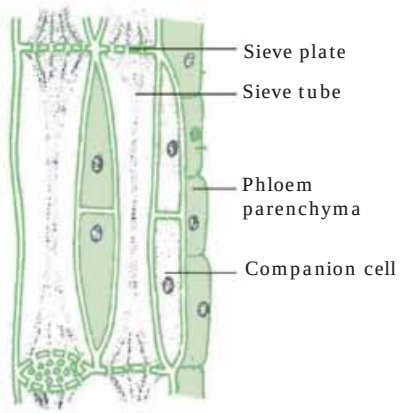
**37.** **Hint—** Because of transpiration

**38.** **Hint—**Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres.




Xylem parenchyma

**39. Hint—**Sieve tubes, companion cells, phloem fibres and phloem parenchyma.




*Section of phloem*

**40.** (a)—T, (b)—T, (c)—F, (d) —T, (e)—F

**41.** Voluntary muscles can be moved by conscious will when we want them to move. For example, muscles of limbs or skeletal muscles. Involuntary muscles function on their own. We cannot start or stop them from working by our desire. examples are cardiac muscles and smooth muscles.

**42.** (a)—V, (b)—I V, (c)—V, (d) —I V

**43.** (a) squamous epithelium
(b) columnar epithelium
(c) cuboidal epithelium
(d) respiratory tract

**44. Hint**— Due to aerenchyma present in the swollen petiole.

**45. Hint-** Epidermis having thick cuticle and waxy substances to prevent the invasion of parasites.

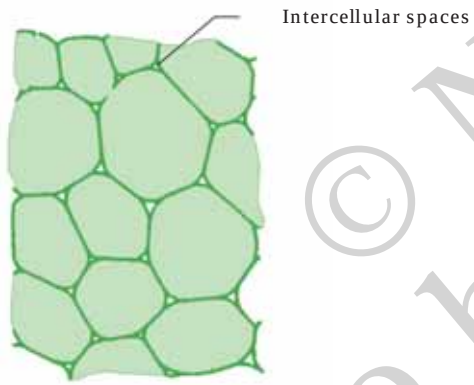
**46.** (a) suberin (b) sieve tubes (c) calcium and phosphorus

**47. Hint—**Epidermis is important for plants due to the following reasons
(i) it gives protection
(ii) helps in gaseous exchange
(iii) checks water loss
(iv) root hairs arising from epidermis helps in absorption of water and minerals.

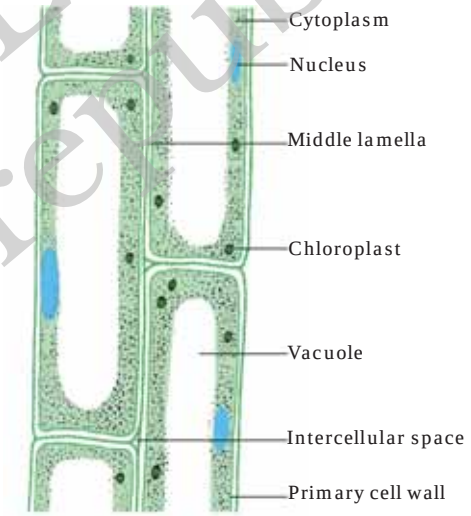
**48.** (a) Xylem and phloem
(b) Stomata
(c) Suberin
(d) Sclerenchyma
(e) Collenchyma
(f) Xylem; phloem
(g) Water; minerals
(h) food; leaf

**49.** Differences between parenchyma and sclerenchyma.

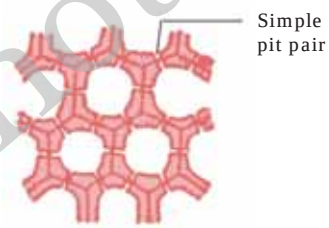
| Parenchyma | Sclerenchyma |
|---|---|
| (1) Cells are thin walled and unspecialised | (1) Cells are thick walled and lignified |
| (2) These are living cells | (2) Tissues are made up of dead cells |
| (3) Cells are usually loosely packed with large intercellular space | (3) No intercellular spaces between the cells are found |
| (4) Stores nutrient and water in stem and roots | (4) Provides strength to the plant parts |
| (5) Some cells contain chlorophyll called chlorenchyma and perform photosynthesis. Other cells have large air cavities called aerenchyma which provide buoyancy to the hydrophytic plants | (5) The cells are long and narrow, make the plant hard and stiff. The tissue is present in the stem around vascular bundles, in veines of leaves and hard covering of seeds and nuts. |



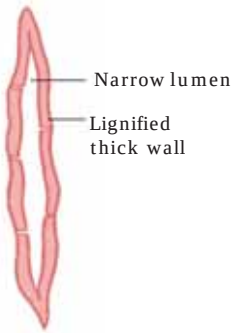

T.S. Parenchyma




L.S. Parenchyma




T.S. Sclerenchyma



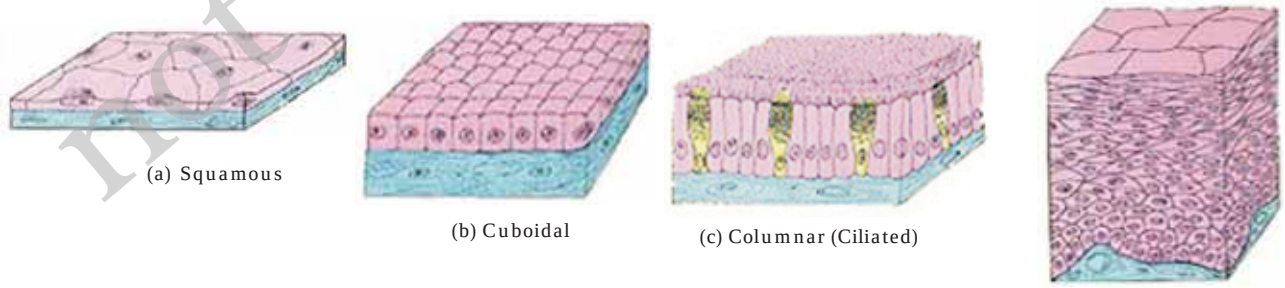

L.S. Sclerenchyma

**50.** Epithelial tissues are the covering or protective tissues in the animal body. Epithelium covers most organs and cavities within the body and keep different body systems separate. The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue. Epithelial tissue cells are tightly packed and form a continuous sheet. They have only a small amount of cementing material between them and almost no intercellular spaces. The permeability of the cells of various epithelia play an important role in regulating the exchange of materials between the body and the external environment and also between different parts of the body. Regardless of the type, all epithelia are usually separated from the underlying tissue by an extracellular fibrous basement membrane.

Epithelial tissues are of following types— (1) Simple squamous epithelium (2) Stratified squamous epithelium (3) Columnar epithelium, and (4) Cubodial epithelium. These tissues differ in structure that correlate with their unique functions. For example, in cells lining blood vessels or lung alveoli, where transportation of substances occurs through a selectively permeable surface, there is a simple flat kind of epithelium. This is called the simple squamous epithelium. Simple squamous epithelial cells are extremely thin and flat and form a delicate lining. The skin, oesophagus and the lining of the mouth are also covered with squamous epithelium. Skin epithelial cells are arranged in many layers to prevent wear and tear. Since, they are arranged in a pattern of layers, the epithelium is called stratified squamous epithelium.

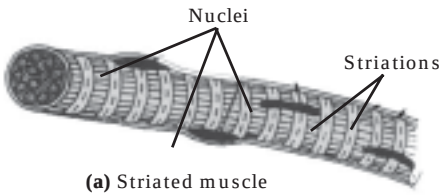
Where absorption and secretion occur, as in the inner lining of the intestine, tall epithelial cells are present. This columnar epithelium facilitates movement across the epithelial barrier. In the respiratory tract, the columnar epithelial tissue also has cilia, which are hair-like projections on the outer surfaces of epithelial cells. These cilia can move, and their movement pushes the mucus forward to clear it. This type of epithelium is thus ciliated columnar epithelium.

Cuboidal epithelium forms the lining of kidney tubules and ducts of salivary glands, where it provides mechanical support. Epithelial cells often acquire additional specialisation as gland cells, which can secrete substances at the epithelial surface. Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed. This is glandular epithelium.

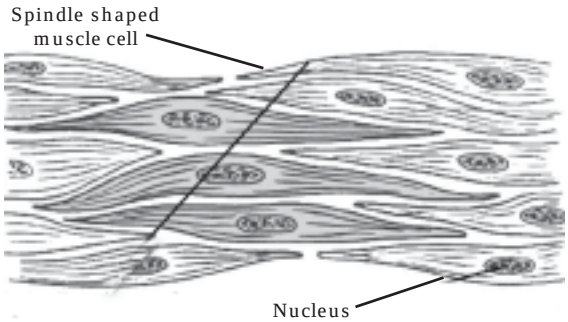



Different types of epithelial tissues

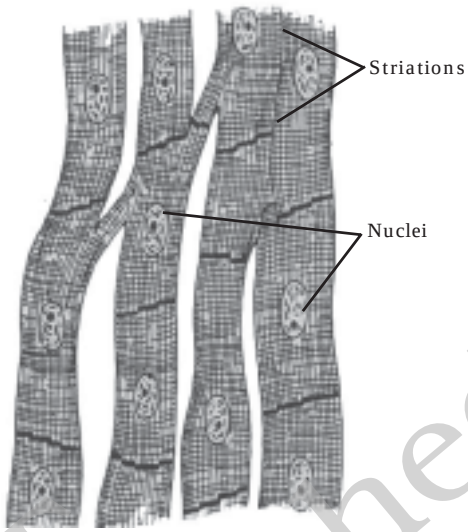
**51.**




**(a)** Striated muscle




**(b)** Smooth muscles




**(c)** Cardiac muscle

**52. Hint—**

(a) No need of storage.

(b) Because they are lignified.

(c) Presence of stone cells (sclerenchyma)

(d) Presence of Collenchyma.

(e) Sclerenchyma.

**53. Characteristics**

a)

- Cells of cork are dead at maturity
- These cells are compactly arranged
- Cells do not possess intercellular spaces.
- Cells possess a chemical substances suberin in their walls
- They are several layers thick.

b) As plants grow older, a strip of secondary meristem replaces the epidermis of the stem. Cells cut on the outer side by this meristem are called cork.

c) They are protective in function for older stem / twigs / branches.

They are impervious to gases and water.

**54.** Both xylem and phloem consist of more than one type of cells, which coordinate to perform a common function.

| Xylem | Phloem |
|---|---|
| Consists of tracheids, vessels, xylem, parenchyma and xylem fibres | Consist of sieve tubes, companion cell, phloem parenchyma and phloem fibres. |
| They transport water and minerals vertically from soil to aerial parts of the plant. | They transport food from leaves to other parts of the plant. |
| Most of the cells except xylem parenchyma are dead cells | Most of the cells except phloem fibres are living cells. |

**55.**

| Meristematic | Permanent |
|---|---|
| Cells of this tissue divide throughout their life. | They lose the ability to divide to takeup specific function. |
| They are located at specific regions of the plant viz: apical lateral, intercalary | They are distributed throughout the plant body. |
| Cells of this tissue are very active, have dense cytoplasm, thin walls and prominent nuclei. They lack vacuoles | They are vacuolated, vary in shape and size. Their cell wall may be thick. |
| Cell wall is cellulosic. | Cell wall is made up of cellulose/ lignin/ suberin. |

(b) The loss of ability to divide by taking up a permanent shape, size and function is called differentiation.

(c) Simple: Parenchyma/collenchyma/sclerenchyma

Complex: Phloem/xylem

# Chapter 7

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

**5.** (b) **6.** (a) **7.** (a) **8.** (a)

**9.** (a) **10.** (c) **11.** (d) **12.** (c)

**13.** (a) **14.** (d) **15.** (c) **16.** (b)

**17.** (d) **18.** (c) **19.** (a) **20.** (d)

**21.** (b) **22.** (b) **23.** (a) **24.** (d)

**25.** (a) **26.** (b) **27.** (b) **28.** (a)

**29.** (a) **30.** (b) **31.** (b) **32.** (a)

**33.** (b) **34.** (b)

**35.** (a) T (b) T (c) F (d) T (e) F (f) T

**36.** (a) saprophytic (b) chitin (c) lichens (d) carbohydrate
(e) species (f) thallophyta (g) bryophytes

**37.** Gram—dicot Wheat—monocot Rice—monocot,
Pumpkin—dicot Maize—monocot Pea—dicot

**38.** (a)—B; (b)—A; (c)—D; (d)—C; (e)—F; (f)—E, (g)—G.

**39.** (a)—C; (b)—B; (c)—F; (d)—A; (e)—E; (f)—D

**40.** *Spongilla* —Acoelomate
Sea anemone—Acoelomate
*Planaria*—Acoelomate
Liver fluke—Acoelomate
*Wuchereria*—Pseudocoelomate
*Ascaris*—Psudocoelomate
*Nereis*—Coelomate
Scorpion—Coelomate
Earthworm—Coelomate
Birds, Fishes and Horse—Coelomate

**41.** Torpedo—Cartilagenous, Sting ray—Cartilagenous, Dog fish—Cartilagenous, Rohu—Bony, Angler fish— Cartilagenous Exocoetus—bony.

**42.** Rohu, *Scoliodon*— 2 chambered. Frog, Salamander, Flying lizard, King Cobra—3 chambered. Crocodile, Ostrich, Pigeon, Bat, Whale—4 chambered.

**43.** Cold blooded—Rohu, *Scoliodon*, Frog, Salamander, Flying Lizard, King Cobra, Crocodile, Warm blooded— Ostrich, Pigeon, Bat, Whale.

**44.** (i) *Platypus* (ii) *Echidna*

**45.** (a) Robert Whittaker
(b) Species
(c) Monera
(d) Eukaryotic unicellular organisms
(e) Chlorophyll
(f) Mushroom
(g) Yeast
(h) Lichens

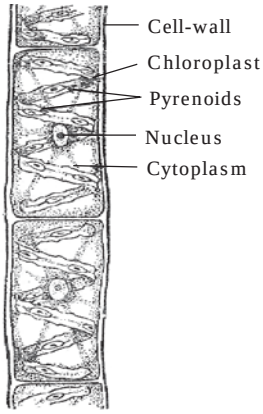
**46.** (a) F (b) T (c) F (d) T (e) T (f) T

**47.** (a) Liver fluke
(b) Filarial worm
(c) Arthropods
(d) Nematodes

**48.** (a) Dorsal fin
(b) Caudal fin
(c) Pelvic fin
(d) Pectoral fin
Function of Caudal fin–Caudal fin helps in streamlined movement in water.

**49.** (a) Thallophyta
(b) Without specialized vascular tissue
(c) Pteridophyta
(d) Phanerogams
(e) Bear naked seeds
(f) Angiosperms
(g) Have seeds with two cotyledons
(h) Monocots

**50.** *Ulothrix, Spirogyra, Cladophara, Ulva* and *Chara,*




*Spirogyra*

**51.** The Thallophyta, bryophyta and pteridophyta are called as 'Cryptogams' because the reproductive organs of these groups are inconspicuous or hidden. Seeds are absent. On the other hand 'Phanerogams' include gymnosperms and angiosperms which have well differentiated reproductive tissue and the embryo with stored food. Embryo develops into seed.

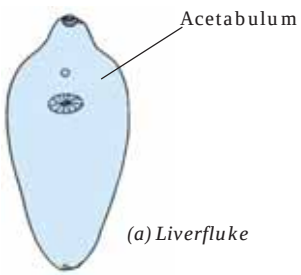
*Pinus*

*Cycas*

**52.** (a) The left and right halves of the body have the same design, eg, liver fluke

(b) Coelom is the internal body cavity between visceral organs and body wall in which well developed organs can be accommodated, eg. butterfly

(c) Animals having three layers of cells from which differentiated tissue can be made are called triploblastic, eg. star fish




*(a) Liverfluke*

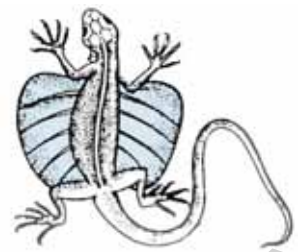
*(b) Butterfly*

*(c) Asterias (star fish)*

**53.** All organisms given in the question do not belong to same group. Leech and *Nereis* belong to phylum annelida because they have metamerically segmented body i.e., body is divided into many segments internally by septa. Body segments are lined up one after the other from head to tail. But *Scolopendra*, prawn and scorpion belong to phylum arthropoda as these have jointed legs and open circulating system.

**54.** **Hint—** Mango tree is more complex and evolved because, it is eukaryotic, autotrophic, terrestrial sporophyte with covered seed. The bacteria is unicellular prokaryote and fungi are the heterotrophic, simple thallophyte with no tissue systems.

**55.** *Flying lizard* belongs to group reptiles and characterised as cold blooded,body covered with scales and having three chambered heart, while *birds* belong to group aves and have characteristics of being warm blooded, having feather covered body, forelimbs modified as wings and having four chambered heart.



*Flying lizard (Draco)*

*Pigeon*

**56**. Bat, rat and cat belong to class mammalia and have following common features

(a) All have notochord at some stage of life cycle.

(b) All are warm blooded.

(c) All have four chambered heart.

(d) All have skin covered with hair and with sweat and oil glands.

**57.** **Hint—** Because both are (1) cold blooded (2) have scales (3) breathe through lungs (4) have three chambered heart, and (5) they lay eggs with tough covering.

# Chapter 8

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

**5.** (a) **6.** (c) **7.** (b) **8.** (b)

**9.** (a) **10.** (c) **11.** (a)

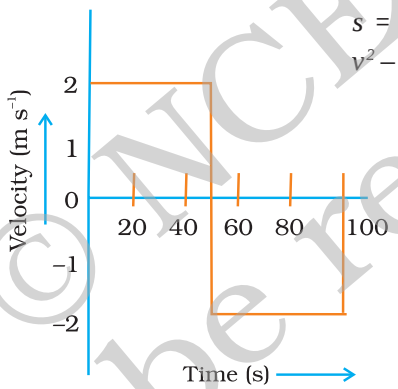
**12.** No. Though the moving object comes back to its initial position the distance travelled is not zero.

**13.** Acceleration $a = 0$, $v = u$

$s = ut$

$v^2 - u^2 = 0$

**14.**




**15.** The distance travelled in first 8 s, $x_1 = 0 + \frac{1}{2}(5)(8)^2 = 160$ m.

At this point the velocity $v = u + at = 0 + (5 \times 8) = 40$ m s$^{-1}$

Therefore, the distance covered in last four seconds, $x_2 = (40 \times 4)$ m $= 160$ m

Thus, the total distance $x = x_1 + x_2 = (160 + 160)$ m $= 320$ m

**16.** Let AB = $x$, So $t_1 =$, $\frac{x}{30}$ and $t_2 = \frac{x}{20}$

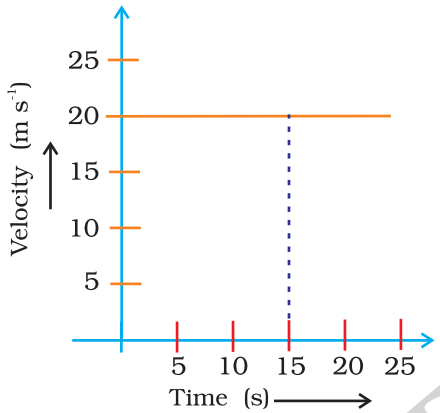
Total time = $t_1 + t_2 = \frac{5x}{60}$ h.

Average speed for entire journey $= \frac{\text{Total distance}}{\text{Total Time}} = \frac{2x}{\frac{5x}{60}} = 24$ km h$^{-1}$

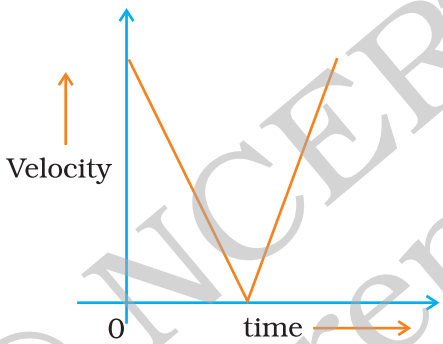
**17.** (i) Since velocity is not changing, acceleration is equal to zero.

(ii) Reading the graph, velocity = 20 m $s^{-1}$

(iii) Distance covered in 15 seconds, $s = u \times t = 20 \times 15 = 300$ m




**18.**




**19.** Initial difference in height = (150 – 100) m = 50 m

Distance travelled by first body in 2 s = $h_1 = 0 + \frac{1}{2} g (2)^2 = 2g$

Distance travelled by another body in 2 s = $h_2 = 0 + \frac{1}{2} g (2)^2 = 2g$

After 2 s, height at which the first body will be = $h_1' = 150 - 2g$

After 2 s, height at which the second body will be = $h_2' = 100 - 2g$

Thus, after 2 s, difference in height = $150 - 2g - (100 - 2g)$

= 50 m = initial difference in height

Thus, difference in height does not vary with time.

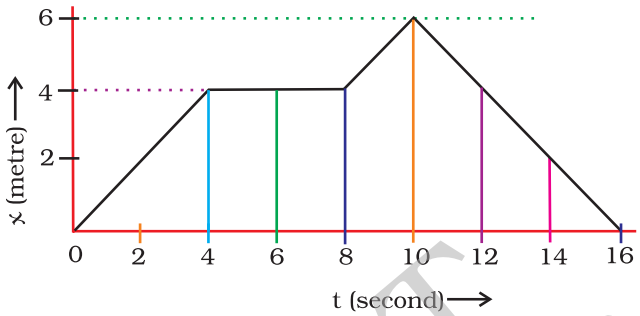
**20.** $s_1 = ut + \frac{1}{2}at^2$ or $20 = 0 + \frac{1}{2}a\ (2)^2$ or $a = 10\ \text{m s}^{-2}$,

$v = u + at = 0 + (10 \times 2) = 20\ \text{m s}^{-1}$

$s_2 = 160 = vt' + \frac{1}{2}\ a'(t')^2 = (20 \times 4) + (\frac{1}{2}\ a' \times 16) \Rightarrow a' = 10\ \text{m s}^{-2}$

Since acceleration is the same, we have $v' = 0 + (10 \times 7) = 70\ \text{m s}^{-1}$

**21.**




Average velocity for first 4 s.

$$\text{Average velocity} = \frac{\text{Change in displacement}}{\text{Total time taken}}$$

$$v = \frac{4-0}{4-0} = \frac{4}{4} = 1\ \text{m s}^{-1}$$

For next 4 s, $v = \frac{4-4}{8-4} = \frac{0}{4} = 0\ \text{m s}^{-1}$

(or as $x$ remains the same from 4 to 8 seconds, velocity is zero)

For last 6 s, $v = \frac{0-6}{16-10} = -1\ \text{m s}^{-1}$

**22.** Given initial *velocity*, $u = 5 \times 10^4\ \text{m s}^{-1}$
and acceleration, $a = 10^4\ \text{m s}^{-2}$

(i) final velocity $= v = 2u = 2 \times 5 \times 10^4\ \text{m s}^{-1} = 10 \times 10^4\ \text{m s}^{-1}$

To find $t$, use $v = u + at$

$$\text{or } t = \frac{v-u}{a}$$

$$\left(\frac{10 \times 10^4 - 5 \times 10^4}{10^4}\right) = \frac{5 \times 10^4}{10^4} = 5\ \text{s}$$

(ii) Using $s = ut + \frac{1}{2}at^2$

$$= (5 \times 10^4) \times 5 + \frac{1}{2}(10^4) \times (5)^2 = 25 \times 10^4 + \frac{25}{2} \times 10^4 = 37.5 \times 10^4\ \text{m}$$

**23.** Using the equation of motion $s = ut + \frac{1}{2}at^2$

Distance travelled in 5 s $s = u \times 5 + \frac{1}{2}a \times 5^2$

or $s = 5\,u + \frac{25}{2}\,a$ ——(i)

Similarly, distance travelled in 4 s, $s' = 4\,u + \frac{16}{2}\,a$——(ii)

Distance travelled in the interval between $4^{th}$ and $5^{th}$ second

$= (s - s') = (u + \frac{9}{2}\,a)$ m

**24.** We know for upward motion, $v^2 = u^2 - 2\,g\,h$ *or* $h = \frac{u^2 - v^2}{2g}$

But at highest point $v = 0$

Therefore, $h = u^2/2g$

For first ball, $h_1 = u_1^2/2g$

and for second ball, $h_2 = u_2^2/2g$

Thus $\frac{h_1}{h_2} = \frac{u_1^2/2g}{u_2^2/2g} = \frac{u_1^2}{u_2^2}$ or $h_1 : h_2 = u_1^2 : u_2^2$

# Chapter 9

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

**5.** (a) **6.** (b) **7.** (c) **8.** (b)

**9.** **Steel.** As the mass is a measure of inertia, the ball of same shape and size, having more mass than other balls will have highest inertia. Since steel has greatest density and greatest mass, therefore, it has highest inertia.

**10.** Yes. the balls will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest but due to inertia the balls try to remain in motion, therefore, they begin to roll. Since the masses of the balls are not the same, therefore, the inertial forces are not same on both the balls. Thus, the balls will move with different speeds.

**11.** From the light rifle, according to law of conservation of momentum or explanation by Newton's laws of motion.

**12.** The force applied by the horse balances the force of friction.

**13.** Law of conservation of momentum is applicable to isolated system (no external force is applied). In this case, the change in velocity is due to the gravitational force of earth.

**14.** Acceleration $= a = \frac{v - u}{t} = -\frac{80}{8}\ \text{ms}^{-2} = -10\ \text{ms}^{-2}$

Force $= m\ a = \frac{50}{1000} \times 10 = 0.5\text{N}$

**15.** Calculate using $F = m\ a$

Acceleration becomes one-fourth of the original.

**16.** Separation between them will increase. Initially the momentum of both of them are zero as they are at rest. In order to conserve the momentum the one who throws the ball would move backward. The second will experience a net force after catching the ball and therefore will move backwards that is in the direction of the force.

**17.** The working of the rotation of sprinkler is based on third law of motion. As the water comes out of the nozzle of the sprinkler, an equal and opposite reaction force comes into play. So the sprinkler starts rotating.

**18.** (i) $m = 10\ \text{g} = \frac{10}{1000}\ \text{kg}$

$u = 10^3\ \text{m/s}$

$v = 0$

$s = \frac{5}{100}\ \text{m}$

$v^2 - u^2 = 2\ a\ s$

$0 - (10^3)^2 = 2.a.\ \frac{5}{100}$

$a = \frac{-1000 \times 1000}{2.5} \times 100$

$= -10^7\ \text{m s}^{-2}$

$F = m.a = 10^5\ \text{N}$

(ii) $v = u + a\ t$

$0 = 10^3 - 10^7 t$

$10^7 t = 10^3$

$t = \frac{10^3}{10^7}$

$= 10^{-4}\ \text{s}$

**19.** $F = m\ a = \text{kg m s}^{-2}$

This unit is also called newton. Its symbol is N.

$m_1 = \frac{F}{a_1} = \frac{5}{8}\ \text{kg},$

$m_2 = \frac{F}{a_2} = \frac{5}{24}\ \text{kg},$

$M = \left(\frac{5}{8} + \frac{5}{24}\right)\ \text{kg} = \left(\frac{5}{6}\right)\ \text{kg}$

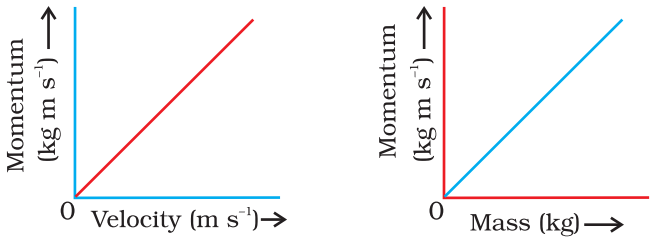
Acceleration produced in M,

$a = \frac{F}{M} = \frac{5}{5/6} = 6\ \text{m s}^{-2}$

**20.** Momentum = mass × velocity

SI unit of momentum is kg m $s^{-1}$

Force = Rate of change in momentum



# Chapter 10

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

**16.** Gravitational force. This force depends on the product of the masses of the planet and sun and the distance between them.

**17.** Both stones will take the same time to reach the ground because the two stones fall from the same height.

**18.** The moon will begin to move in a straight line in the direction in which it was moving at that instant because the circular motion of moon is due to centripetal force provided by the gravitational force of earth.

**19.** The value of '*g*' at the equator of the earth is less than that at poles. Therefore, the packet falls slowly at equator in comparison to the poles. Thus, the packet will remain in air for longer time interval, when it is dropped at the equator.

**20.** $g_e = g$ and $g_m = g/6$

Force applied to lift a mass of 15 kg at the earth, $F = m\, g_e = 15\, g_e$ N

Therefore, the mass lifted by the same force on the moon,

$$m = F/g_m = \frac{15\,g}{g/6} = 90 \text{ kg}$$

**21.** $g = \frac{GM}{R^2}$ or $M = \frac{g \times R^2}{G} \Rightarrow$ Density $D = \frac{\text{mass}}{\text{volume}} = \frac{g \times R^2}{G \times V_e}$

(Where $V_e$ is the volume of the earth )

or $$D = \frac{g \times R^2}{G \times \frac{4}{3}\pi R^3} = \frac{3g}{4\pi GR}$$

**22.** The gravitational force is responsible for providing the necessary centripetal force.

**23.** Weight of an object is directly proportional to the mass of the earth and inversely proportional to the square of the radius of the earth. i.e.,

Weight of a body $\propto \frac{M}{R^2}$

Original weight $W_o = m\,g = m\,G\,\frac{M}{R^2}$

When hypothetically $M$ becomes $4\,M$ and $R$ becomes $\frac{R}{2}$

then weight becomes $W_n = m\,G\,\frac{4M}{(\frac{R}{2})^2} = (16\,m\,G)\frac{M}{R^2} = 16 \times W_o$

The weight will become 16 times.

**24.** $F \propto m_1 m_2$ and $F \propto \frac{1}{d^2}$

This hypothesis is not correct. The two bricks, like a single body, fall with the same speed to reach the ground at the same time in case of free-fall. This is because acceleration due to gravity is independent of the mass of the falling body.

**25.** $h_1 = \frac{1}{2} g t_1^2$ $\quad h_2 = \frac{1}{2} g t_2^2$, as $x$ = o

$\frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}}$.

Ratio will not change in either case because acceleration remains the same. In case of free-fall acceleration does not depend upon mass and size.

**26.** a) (i) The cube will experience a greater buoyant force in the saturated salt solution because the density of the salt solution is greater than that of water.

(ii) The smaller cube will experience lesser buoyant force as its volume is lesser than the initial cube.

b) Buoyant force = weight of the liquid displaced

= density of water × volume of water displaced ×g

$= 1000 \times \frac{4}{4000} \times 10 = 10$ N

# Chapter 11

**1.** (c) **2.** (a) **3.** (d) **4.** (a)

**5.** (d) **6.** (c) **7.** (d) **8.** (d)

**9.** (c)

**10.** Initial velocity = $v$, then $v' = 3v$

Initial kinetic energy = $\frac{1}{2} m v^2$

Final kinetic energy (K.E.) = $\frac{1}{2} m v'^2 = \frac{1}{2} m (3v)^2 = 9 (\frac{1}{2} m v^2)$

(K.E) initial : (K.E) final = 1:9

**11.** Power of Avinash $P_A = F_A \cdot v_A = 10 \times 8 = 80$ W
The power of Kapil $P_k = F_k \cdot v_k = 25 \times 3 = 75$ W
So, Avinash is more powerful than Kapil.

**12.** $F = 5$ N

$W = F.S$

$W = 5 \times [1500 + 200 + 2000] = 18500$ J.

**13.** Yes, mechanical energy comprises both potential energy and kinetic energy. Momentum is zero which means velocity is zero. Hence, there is no kinetic energy but the object may possess potential energy.

**14.** No. Since mechanical energy is zero, there is no potential energy and no kinetic energy. Kinetic energy being zero, velocity is zero. Hence, there will be no momentum.

**15.** $P = \frac{W}{\Delta t} = \frac{mgh}{\Delta t} \Rightarrow \frac{m \times 10 \times \cancel{10}}{6\cancel{0}} = 2000\ W$

or $m = \frac{12000}{10} = 1200$ kg

**16.** Since, weight of the person on planet A is half that on the earth, acceleration due to gravity there, will be 1/2 that on the earth. Hence he can jump double the height with the same muscular force.

***or***

The potential energy of the person will remain the same on the earth and on planet A.

Thus, $\cancel{m}\ g_1 h_1 = \cancel{m}\ g_2 h_2$

if $g_1 = g$ then $g_2 = \frac{1}{2} g$, $h_1 = 0.4$

Then $h_2 = \frac{g_1 h_1}{g_2} = \frac{g \times 0.4}{g/2}$

or $h_2 = 0.4 \times 2 = 0.8$ m

**17.** $v^2 - u^2 = 2\,a.s$

This gives $s = \frac{v^2 - u^2}{2a}$

$F = m\,a$

we can write work done (W) by this force $F$ as

$$W = ma\left(\frac{v^2 - u^2}{2a}\right) = \frac{1}{2} m\,v^2 - \frac{1}{2}\,m\,u^2 = (\text{K.E})_f - (\text{K.E})_i$$

**18.** Yes, it is possible, if an object is moving in a circular path. Because force is always acting perpendicular to the direction of displacement.

**19.** $m\,g\,h = m \times 10 \times 10 = 100m$ J.

Energy is reduced by 40% then the remaining energy is $60m$ J.

Therefore, $60\ \cancel{m} = \cancel{m} \times 10 \times h'$ or $h' = 6$ m

**20.** $P = \frac{1200}{1000} = 1.2$ kW

$t = \frac{\cancel{30}}{\cancel{60}} = 0.5$ h

$E$ = Power × time × days

= 1.2×.5×30

= 18 kW h

**21.** $p_1 = m_1 v_1 \quad p_2 = m_2 v_2$

But $p_1 = p_2$ or $m_1 v_1 = m_2 v_2$

If $m_1 < m_2$ then $v_1 > v_2$

$(\text{K.E})_1 = \frac{1}{2} m_1 v_1^2 \qquad (\text{K.E})_2 = \frac{1}{2} m_2 v_2^2$

$(\text{K.E})_1 = \frac{1}{2}(m_1 v_1) v_1 = \frac{1}{2} p_1 v_1 \qquad (\text{K.E})_2 = \frac{1}{2}(m_2 v_2) v_2 = = \frac{1}{2} p_2 v_2$

$$\frac{(\text{K.E})_1}{(\text{K.E})_2} = \frac{\frac{1}{2} p_2 v_1}{\frac{1}{2} p_2 v_2} = \frac{v_1}{v_2}$$

But $v_1 > v_2$

Therefore, $(\text{K.E.})_1 > (\text{K.E})_2$

**22.** $m_{(A)} = m_{(B)} = 1000$ kg. $\quad v = 36$ km/h $= 10$ m/s

Frictional force = 100 N

Since, the car A moves with a uniform speed, it means that the engine of car applies a force equal to the frictional force

$$\text{Power} = \frac{\text{Force} \times \text{distance}}{\text{time}} = F.v$$

$= 100 \text{ N} \times 10 \text{ m/s}$

$= 1000 \text{ W}$

After collision

$m_A u_A + m_B u_B = m_A v_A + m_B v_B$.

$1000 \times 10 + 1000 \times 0 = 1000 \times 0 + 1000 \times v_B$

$v_B = 10 \text{ m s}^{-1}$

**23.** $u = 4 \text{ m s}^{-1}$ , $v = 0$, $s = 16$ m

$$a = \frac{v^2 - u^2}{2s} = -\frac{16}{2 \times 16} = -\frac{1}{2} \text{ m s}^{-2}$$

$$\text{Force} = m\,a = 40 \times \left(-\frac{1}{2}\right) = -20 \text{ N}$$

Work done on the trolley = 20 N × 16 m = 320 J

Work done by the girl = 0 J.

**24.** (a) $F = 250 \text{ kg} \times g \qquad (g = 10 \text{ m s}^{-2})$

$= 2500$ N

$s = 1$ m

$W = F.s = 2500$ N m

$= 2500$ J

(b) zero; as the box does not move at all, while holding it.

(c) In order to hold the box, men are applying a force which is opposite and equal to the gravitational force acting on the box. While applying the force, muscular effort is involved. So they feel tired.

**25.** Power is the rate of doing work. Kilowatt is the unit of power and kilowatt hour is the unit of energy.

$h$ = 20 m, and mass = $2000 \times 10^3$ kg = $2 \times 10^6$ kg

$$\text{Power} = \frac{m\,g\,h}{t} = \frac{2\times10^6 \times 10 \times 20}{60}\ \text{W}$$

$$= \frac{4}{6}\times10^7\ \text{W} \qquad = \frac{2}{3}\times10^7\ \text{W}$$

**26.** $$\text{Power} = \frac{\text{work done or energy}}{\text{time}} = \frac{m\,g\,h}{t} = m.\,g.\left(\frac{h}{t}\right)$$

Here $\frac{h}{t}$ = speed

Therefore, $$m = \frac{\text{power}}{g \times \text{speed}} = \frac{100}{10\times1} = 10\ \text{kg}$$

**27.** One watt is the power of an agent which does work at the rate of 1 J $s^{-1}$

1 kilowatt = 1000 J $s^{-1}$

Total Power = $150 \times 500 = 7.5 \times 10^4$ W

$$\text{Force} = \frac{\text{Power}}{\text{velocity}} = \frac{7.5\times10^4}{20} = 3.75\times10^3\ \text{N}$$

Force = 3750 N.

**28.** (*i*) Power = $mg \times$ velocity, $g$ = 10 m $s^{-2}$

$$= \frac{1}{1000}\times10\times0.5\ \text{W}$$

$$= \frac{0.5}{100}\ \text{W} = 5\times10^{-3}\ \text{W}$$

(*ii*) $$\text{Power} = \frac{250}{1000}\times10\times0.5\ \text{W}$$

$$= \frac{1}{4}\times10\times0.5 = 1.25\ \text{W}$$

Hence, the power with which the squirrel is climbing is much higher than that of a butterfly flying.

# Chapter 12

**1.** (c) **2.** (a) **3.** (a) **4.** (c)

**5.** (b) **6.** (b) **7.** (b) **8.** (c)

**9.** (c)

**10.** From the graph

Time period, $T = 2 \times 10^{-6}$ s.

Frequency, $\nu = 1/T = 5 \times 10^{5}$ Hz.

Wavelength, $\lambda = v/\nu = 5 \times 10^{5}$ m.

**11.** Graph (a) represents the male voice. Usually the male voice has less pitch (or frequency) as compared to female.

**12.** If the time gap between the original sound and reflected sound received by the listener is around 0.1 s, only then the echo can be heard.

The minimum distance travelled by the reflected sound wave for the distinctly listening the echo

= velocity of sound × time interval

; $344 \times 0.1$

; 34.4 m

But in this case the distance travelled by the sound reflected from the building and then reaching to the girl will be (6 + 6) = 12 m, which is much smaller than the required distance. Therefore, no echo can be heard.

**13.** Humming bees produce sound by vibrating their wings which is in the audible range. In case of pendulum the frequency is below 20 Hz which does not come in the audible range.

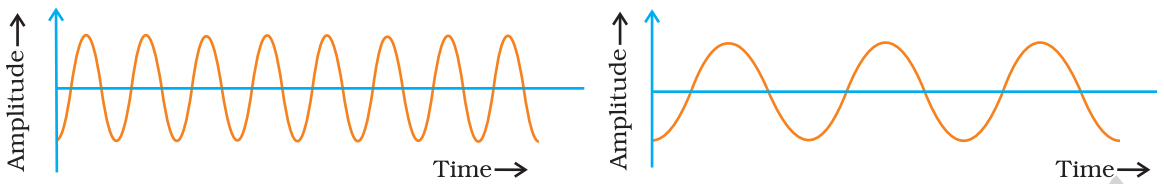
**14.** Longitudinal waves.

**15.** s ; 340 m $s^{-1}$ × 10 s = 3400 m or 3.4 km.

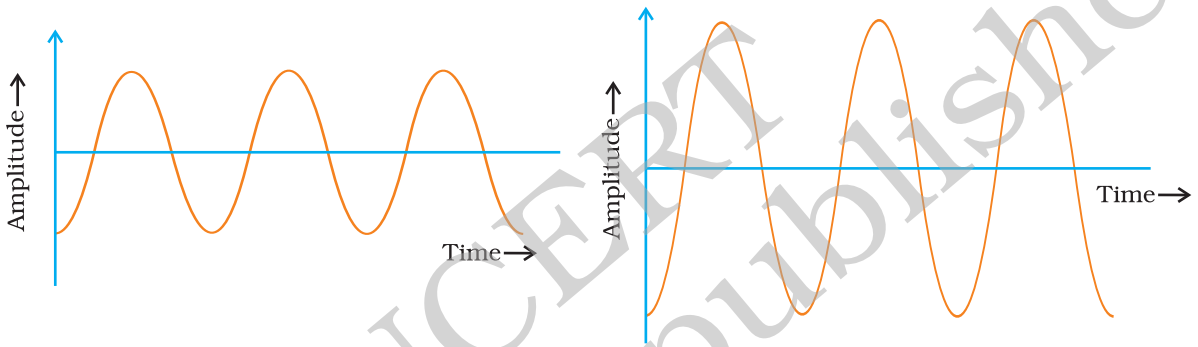
**16.** $\angle i = \angle r$, so $x = 90° - \angle r = 90° - 50° = 40°$

**17.** Ceiling and walls are made curved so that sound after reflection reaches the target audience.

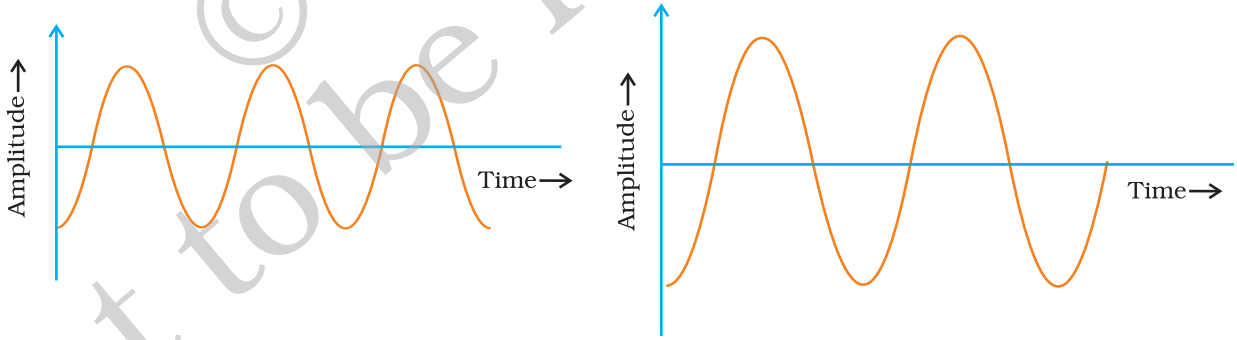
**18**




Same amplitude but different frequency




Same frequency but different amplitude




Different amplitudes and different wavelengths

**19.** Derivation of formula $v = \nu\lambda$.

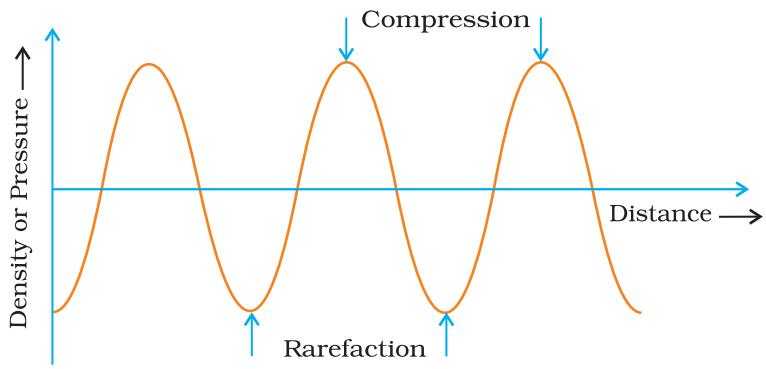
(i) $340 = 256\ \lambda$

$\lambda = 1.33$ m.

(ii) $340 = \nu\,(0.85)$

$\nu = 400$ Hz

**20.**




Wavelength is the distance between two consecutive compressions or two consecutive rarefactions. Time period is the time taken to travel the distance between any two consecutive compressions or rarefactions from a fixed point.

# Chapter 13

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

**5.** (a) **6.** (c) **7.** (c) **8.** (b)

**9.** (c) **10.** (c) **11.** (c) **12.** (d)

**13.** (d) **14.** (c) **15.** (b) **16.** (c)

**17.** (b) **18.** (a)

**19.** (a) Viral fever, Flu
(b) Elephantiasis, Tuberculosis (TB)
(c) Small pox, Chicken pox
(d) Diabetes, Goitre

**20.** (i) Sleeping sickness caused by *Trypanosoma* / Malaria by plasmodium
(ii) Kala-azar caused by *Leishmania*

**21.** (i) *Helicobactor pylori*
(ii) Marshall and Warren.

**22.** Antibiotic is a chemical substance that kill bacteria, secreted by micro-organisms which can kill the pathogens. Examples, Penicillin and Streptomycin.

**23.** (a) Communicable
(b) Fungi
(c) Bacteria
(d) Vector

**24.** (a) Liver
(b) Brain
(c) Lungs
(d) Skin

**25.** Edward Jenner.
Example— Small pox, Polio

**26.** (a) Chronic, long term effect
(b) Acute
(c) Health
(d) Infectious/ communicable
(e) Fungi

**27.** (a) infectious
(b) infectious
(c) infectious
(d) non-infectious
(e) non-infectious
(f) infectious
(g) non-infectious

**28.** Bacteria and fungi

**29.** Malaria, Dengue and Kala-azar

**30.** (a) Food is necessary for the growth and development of the body. Balanced diet provides raw materials and energy in appropriate amount needed for the substances likes protein, carbohydrates, fats, minerals etc which in turn are essential for the proper growth and functioning of the healthy body.

(b) Health is a state of being well enough to function well physically, mentally and socially and these conditions depend upon the surrounding environmental conditions. eg., If there is unhygienic conditions in surrounding area, it is likely we might get infected or diseased.

(c) This is so because many water borne diseases and insect vectors flourish in stagnant water which cause diseases in human beings.

(d) Human beings live in societies and different localities like villages or cities, which determines the social and physical environment and hence both are to be kept in harmony. Public cleanliness is important for individual health. For better living conditions lot of money is required. We need good food for healthy body and for this we have to earn more. For the treatment of diseases also, one has to be in good economic condition.

**31.** **Hint—** When the functioning or the appearance of one or more systems of the body change for the worse the body is said to be diseased. The diseases can be — acute/chronic/ infectious/non infectious. Examples, influenza, tuberculosis, pneumonia, cancer respectively.

**32.** When the functioning or the appearance of one or more systems of the body will change for the worse, it gives certain abnormal signs of the disease. These visual changes in human beings are called symptoms. Symptoms give indication of the presence of a particular disease.

Example (i) Lesions on the skin are the symptoms of chickenpox.

Example (ii) Cough is the symptom of lung infection.

**33.** The immune system of our body is a kind of defense mechanism to fight against pathogenic microbes. It has cells that are specialized to kill infecting microbes and keep our body healthy.

**34.** Following precautions should be taken for prevention of disease.

(1) Maintaining hygienic conditions.

(2) Awareness about the disease and causal organism.

(3) Balanced diet.

(4) Regular medical check up.

**35.** **Hint—** Due to poor immune system, some children fall ill frequently. Balanced diet and proper nutrition for healthy body is required to have a strong immune system.

**36.** Antibiotics generally block the biosynthetic pathways and they block these pathways of the microbes/bacteria. However, viruses have very few biochemical mechanisms of their own and hence are unaffected by antibiotics.

**37.** Because of strong immune system our body is normally fighting off microbes. We have cells which are specialised to kill the pathogenic microbes. These cells are active when infecting microbes enter the body and if they are successful in removing the pathogen, we remain disease– free. So even if we are exposed to infectious microbes, it is not necessary that we suffer from diseases.

**38.** For a healthy person it is necessary that

(i) The surrounding environment should be clean. Air and water borne diseases will not spread.

(ii) Personal hygiene prevents infectious diseases.

(iii) Proper, sufficient nourishment and food is necessary for good immune system of our body.

(iv) Immunisation against severe diseases.

**39.** AIDS causing virus— HIV that comes into the body via, the sexual organs or any other means like blood transfusion will spread to lymph nodes all over the body. The virus damages the immune system of the body and due to this the body can no longer fight off many minor infections. Instead, every small cold can become pneumonia, or minor gut infection can become severe diarrhoea with blood loss. The effect of disease becomes very severe and complex, at times killing the person suffering from AIDS. Hence there is no specific disease symptoms for AIDS but it results in a complex diseases and symptoms. Therefore, it is known as a syndrome.

# Chapter 14

| | | | |
|---|---|---|---|
| **1.** (d) | **2.** (c) | **3.** (b) | **4.** (d) |
| **5.** (c) | **6.** (b) | **7.** (b) | **8.** (a) |
| **9.** (a) | **10.** (d) | **11.** (c) | **12.** (d) |
| **13.** (b) | **14.** (b) | **15.** (c) | **16.** (d) |
| **17.** (b) | **18.** (d) | **19.** (b) | **20.** (a) |
| **21.** (a) | **22.** (d) | **23.** (d) | **24.** (c) |
| **25.** (b) | **26.** (a) | **27.** (a) | **28.** (a) |
| **29.** (b) | **30.** (b) | | |

**31.** Water is capable of dissolving a large number of substances. As water flows over the rocks containing soluble minerals, some of them get dissolved in the water. Thus, rivers carry many nutrients from land to the sea.

**32.** Loss of top soil can be prevented by

(i) increasing the vegetational cover

(ii) checking the falling of trees

(iii) by preventing excessive grazing by animals

**33.** Addition of undesirable chemicals like pesticides, fertilizers, industrial waste and domestic wastes not only kill the organisms, they also cause diseases to the aquatic organisms. Besides, the requirement of oxygen by aquatic organisms is also increased. There is a reduction in the dissolved oxygen in water which adversely affects the aquatic organisms.

**34.** **Hint—** Air near water bodies is cooled due to evaporation of water.

**35.** **Hint—** Air above the land gets heated quickly during day and starts rising. This creates a region of low pressure as a result air over sea rushes into this area of low pressure. This movment of air from one region to the other creates winds. During night, as water cools down slowly, the air above water is warmer than the air on land. So air moves from land to sea creating winds.

**36.** **Hint—** Lichens and Mosses (a) and (b). Lichens and mosses release substances which break down the stones resulting in the formation of soil.

**37.** *Abiotic factors making soil*— sun, water, wind

*Biotic factors*— lichens, mosses and trees

**38.** **Hint—** Through photosynthesis and absorption from soil

**39.** **Hint—** Cycling of these gases maintains consistency.

**40.** **Hint—** Absence of atmosphere on the moon.

**41.** **Hint—** Due to wind created during the day time

**42.** Mathura refinery releases toxic gases (like oxides of sulphur) which causes acid rain and hence corrosion of the marbles of Taj Mahal.

**43.** **Hint—**It is a bio-indicator and sensitive to $SO_2$ pollution from automobiles. Delhi has maximum number of automobiles, hence has a highly polluted environment.

**44.** **Hint—**Marine water is not useful for human and plant life directly. Uneven distribution of limited fresh water resources need conservation to cater to the demands.

**45.** **Hint—**(i) Thermal pollution (ii) Addition of poisonous (mercury) compounds in water (iii) Due to blockage of gills with any pollutant.

**46.** Lichens release chemical substances to break the rocks into smaller particles and hence make soil.

**47.** Water helps in formation of soil in following ways

(i) Water causes 'wear off' of rocks over a long period of time.

(ii) It also causes the rocks to rub against other rocks creating small particles which are taken away downstream and deposited as soil.

(iii) Water expands on freezing in crevices of rocks and cracks rocks into smaller pieces.

**48.** Fertile soils are rich in organisms that decomposes dead organic matter forming humus. Humus gives minerals, absorbs water and makes soil porous.

**49.** **Hint—** This is practiced to check soil erosion through water currents on the slopes.

**50.** In root nodules nitrogen fixing *Rhizobium* bacteria are present which increases the soil fertility.

**51.** The fossil fuels like coal and petroleum contain small amounts of nitrogen and sulphur. When fossil fuels are burnt, it produces oxides of nitrogen and sulphur. These gases cause inhalation problems and in presence of rain forms acid rain. Burning of fossil fuels also increase the amount of suspended particles in air that reduce the visibility.

**52.** Water pollution can be caused by addition of

(i) undesirable substances like fertilizers and pesticides or any poisonous substances.

(ii) sewage directly entring a water body.

(iii) hot water from the power plant that increases the temperature and reduces the dissolved oxygen in water thus killing the aquatic organisms.

(iv) industrial effluents or radioactive substances in water body.

We can take following measures to check water pollution

(i) The sewer lines should not be directly connected to the water body.

(ii) We should not throw our garbages or domestic waste in the water body.

(iii) Prevent dumping of toxic compounds in the water bodies.

(iv) Washing of clothes should be avoided near water bodies as it adds lot of detergents to it.

(v) Plant trees near the banks of the river to check soil erosion otherwise erosion leads to siltation of water body.

**53.** Infra-red radiations in sunlight pass through the glass and heat the interior of the car. The radiation emitted by upholstery and other inner parts of the car cannot pass out of the glass, so the heat trapped inside raises the temperature of the interior. This is because glass is transparent to infra-red radiation from the sun having smaller wavelength than that emitted by the interior of the car which are of longer wavelength to which the glass is opaque.

**54.** Dust remains present in air as suspended particles can cause allergy and other respiratory diseases. It also affects plant growth, by covering stomata on leaf surface. It acts as the carrier of toxic compounds like heavy metals.

**55.** **Hint**— The rocks are heated by the sun; they contract during night but not at same rate —resulting in cracks in rocks and ultimately to smaller particles.

**56.** **Hint—** Increasing concentration (more than normal) of $CO_2$ is harmful and considered as a pollutant. Higher concentrations of $CO_2$ is one of the causes of green house effect / global warming.

# Chapter 15

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

**5.** (a) **6.** (c) **7.** (d) **8.** (b)

**9.** (a) **10.** (a) **11.** (b) **12.** (a)

**13.** (d) **14.** (d) **15.** (d) **16.** (c)

**17.** (d)

**18.** (a)— (ii) (b)— (iii) (c)— (i) (d)— (iv)

**19.** (a) protein (b) fodder (c) Kharif (d) vegetables
(e) Rabi

**20.** Crop which has been developed by introducing a new gene from any other source, to obtain the desired character, is called as genetically modified (GM) crop. Bt Cotton is an example of GM crop which is made insect-resistant by introducing a new gene from a bacteria.

**21.** Useful traits of improved crops are
(a) higher yield
(b) improved nutritional quality
(c) resistance to biotic and abiotic stresses
(d) change in maturity
(e) wide range of adaptability
(f) desired agronomic characteristics.

**22.** Organic matter is important for crops because
(a) it helps in improving soil structure.
(b) it helps in increasing water holding capacity of sandy soil.
(c) in clayey soil large quantity of organic matter helps in drainage and in avoiding water logging.

**23.** **Hint—** Excess use of fertilizers causes environmental pollution as their residual and unused amounts will become pollutants for air, water and soil.

**24.** (a) organic farming (b) mixed cropping (c) inter cropping
(d) crop rotation (e) weeds (f) pathogen

**25.** (a)—(iii) (b)—(v) (c)—(iv) (d)—(i) (e)—(ii)

**26.** Farmers of low rainfall area will be suggested to
(a) practice farming with drought resistant and early maturing varieties of crops.
(b) to enrich the soil with more humus content as it increases the water-holding capacity and retains water for longer duration.

**27.** (1) Energy yielding— wheat, rice, maize
(2) Protein yielding— gram, pigeon gram, lentil, soybean
(3) Oil yielding— groundnut, castor, mustard, soybean
(4) Fodder crops— barseem, oat, sudan grass

**28.** Hybridisation— Hybridisation refers to crossing between genetically dissimilar organisms.
Photoperiod— Duration of sunlight available to the plant is called as photoperiod. It affects the growth, flowering and maturation of crops.

**29.** (a) Flowering of plants
(b) June to October
(c) November to April
(d) Kharif
(e) Rabi

**30.** Different crops and cultivation practices require different climatic conditions, temperature, photoperiod for their growth and completion of life cycle. There are some crops which are grown in rainy season (Kharif crops) while some others are grown during winter season (Rabi crops).

**31.** (a) 16
(b) Carbon and Oxygen
(c) Hydrogen
(d) 13.
(e) Six, macronutrients
(f) seven, micronutrients

**32.** Compost— Compost formation is the process in which farm waste materials like livestock excreta, vegetable wastes, animal refuse, domestic waste, straw, eradicated weeds are decomposed and used as manure.
Vermicompost— The compost prepared from organic matter by using earthworm which hastens the process of decomposition.

**33.** (b) → (c) → (a) → (d)

**34.** Merits of Italian bee variety *A. mellifera* are—

(a) It stings less.

(b) It has high honey collection capacity.

(c) It stays in given bee-hive for long periods and breeds very well.

**35.** In agricultural practices, higher input gives higher yield. This means higher money input to raise the yield. Financial conditions of the farmers allows them to take up different farming practices and technologies. The farmer's purchasing capacity for input decides cropping system and production practices.

**36.** Hybridisation refers to crossing between genetically dissimilar plants. It may be inter varietel, inter specific and inter generic. Two crops of good characters (desired character) are selected and crossed to obtain a new crop having desired characters of parental crops. This method of hybridisation improves crops with respect to yield, disease resistance, pest resistance etc.

**37.** (a) *Vermicompost* — Compost is a kind of manure which is rich in organic matter and nutrients. The compost prepared by using earthworms to hasten the process of decomposition of plants and animals refuse is called as Vermicompost.

(b) *Green manure* — The manure which is prepared by decomposing green plants in field itself is called green manure. For example — sun hemp is grown in fields, mulched by ploughing and allowed to decompose in field for the preparation of green manure.

(c) *Bio fertilizer*— Living organisms which are used as fertilizer to supply the nutrients to plants, are called as biofertilizers. For example, blue green algae, which fix nitrogen in soil, rice fields, are called as biofertilizer.

**38.** Various modes of weed control are

(a) mechanical removal

(b) proper seed bed preparation to avoid the weed growth

(c) timely sowing of crop to avoid the growth of weed.

(d) intercropping and crop rotation also help in weed control.

**39.** (a) Capture fishery is the method of obtaining fish from natural resources while culture fishery is the method of obtaining fish by fish farming.

(b) Mixed cropping is growing two or more crops simultaneously on the same piece of land; while intercropping is growing two or more crops simultaneously on the same field in a definite pattern. i.e., in different rows.

(c) Bee keeping is the practice to rear the honey bee for obtaining honey; while poultry farming is the practice to raise the domestic fowl for egg and meat production.

**40.** **Hint— Demerits** (i) threat to bio-diversity (ii) only economically important and valued fishes will be cultured.

**Merits** (i) large amount of desired fishes can be obtained in small area (ii) improvement can be done.

**41.** Composite fish culture is the method to culture five or six species, both indegenous and exotic, together in a single fish pond. These species are selected so that they do not compete for food among themselves having different types of food habits. As a result food available in all the parts of the pond is used. For example— Catlas are surface feeders, Rohu is middle zone feeder and Mrigals and common carps are bottom feeders.

**42.** Because good pasturage provides more quantity and quality of nectar for honey to honey bees.

**43.** **Hint—**Cutting plant parts, sucking cell sap, borers.

**44.** Pesticides are used in very accurate concentration and in a very appropriate manner, because if used in excess it

(a) harms the soil and causes loss of fertility

(b) checks the replenishment of organic matter

(c) kills the micro organism of soil

(d) causes air, water and soil pollution.

**45.** **Hint—** (i) Roughage is largely fibre. (ii) Concentrates are rich in proteins and nutrients.

**46.** Maintenance of temperature is needed for better egg production by poultry birds. Therefore, larger size (increase in surface area of body) and no adaptability of summer may cause decline in egg production. To obtain the smaller size and higher summer adaptability, cross breeding of poultry birds are done. Small size is also needed for better housing and low feed.

**47.** Some preventive measures of poultry bird diseases are

(a) cleaning of poultry farms

(b) proper sanitation of poultry farms

(c) spraying of disinfectants at regular intervals

(d) appropriate vaccination of birds.

**48.** (i) With addition of chemical fertilizer there is sudden increase in yield due to release of nutrients N,P,K etc in high quantity. The gradual decline in the graph may be due to continuous use and high quantity of chemicals which kills microbes useful for replenishing the organic matter in the soil. This decreases the soil fertility.

(ii) Manures supply small quantities of nutrients to the soil slowly as it contains large amounts of organic matter [Hint: importance of organic matter can be included]. It enriches soil with nutrients thereby increasing soil fertility continuously.

(iii) The difference in the two graphs indicate that use of manure is beneficial for long duration in cropping as the yield tends to remain high when the quantity of manure increases.

In case of Plot B the chemical fertilizers may cause various problems when used continuously for long time. Loss of microbial activity reduces decomposition of organic matter and as a result soil fertility is lost that affects the yield.

**49.** Crossword.

| | | | | | | | | | |
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