Ch 1: Matter is our surrounding

Question 1. Which of the following are matter?
Chair, air, love, smell, hate, almonds, thought, cold, cold-drink, smell of perfume.
Answer: Chair, air, almonds, and cold-drink.

Question 2. Give reasons for the following observation:
The smell of hot sizzling food reaches you several meters away, but to get the smell from cold food you have to go close.
Answer: The smell of hot sizzling food reaches severed meters away, as the particles of hot food have more kinetic energy and hence the rate of diffusion is more than the particles of cold food.

Question 3. A diver is able to cut through water in a swimming pool. Which property of matter does this observation show?
Answer: A diver is able to cut through water in a swimming pool. This shows that the particles of water have intermolecular space and has less force of attraction.

Question 4. What are the characteristics of the particles of matter?
Answer. The characteristics of the particles of matter are:
(1) Particles have intermolecular space.
(2) Particles have intermolecular force.
(3) Particles of matter are moving continuously.

Question 5. The mass per unit volume of a substance is called density.
(density = mass/volume).
Arrange the following in order of increasing density: air, exhaust from chimneys, honey, water, chalk, cotton and iron.
Answer: Increasing density:
air < exhaust from chimneys < cotton < water < honey < chalk < iron.

Question 6. (a) Tabulate the differences in the characteristics of states of matter.
Answer: (a) Difference in the characteristics of 3 states of matter.

Characteristics	Solid	Liquid	Gas
1. Shape	fixed shape	no fixed shape	no fixed shape
2. Volume	fixed volume	fixed volume	no fixed volume
3. Rigidity/fluidity	are rigid, cannot flow	can flow, not rigid	can flow, not rigid
4. Intermolecular force	maximum	less than solids	very less
5. Intermolecular space	very less	more than solids	maximum and less than gas
6. Compressibility	negligible	compressible	highly compressible

(b) Comment upon the following: rigidity, compressibility, fluidity, filling a gas container, shape, kinetic energy and density.
Answer:(b) Comment on:
(i) Rigidity: The tendency of a substance to retain/maintain their shape when subjected to outside force.
(ii) Compressibility: The matter has intermolecular space. The external force applied on the matter can bring these particles closer. This property is called compressibility. Gases and liquids are compressible.

(iii) Fluidity: The tendency of particles to flow is called fluidity. Liquids and gases flow.
(iv) Filling of a gas container: Gases have particles which vibrate randomly in all the directions. The gas can fill the

container.

(v) Shape: Solids have maximum intermolecular force and definite shape.
Whereas liquids and gases takes the shape of container.

(vi) Kinetic energy: The energy possessed by particles due to their motion is called kinetic energy. Molecules of gases vibrate randomly as they have maximum kinetic energy.

(vii) Density: It is defined as mass per unit volume, the solids have highest density.

Question 7. Give reasons
A gas fills completely the vessel in which it is kept.
Answer: (a) The molecules of gas have high kinetic energy due to which they keep moving in all directions and hence fill the vessel completely in which they are kept.

(b) A gas exerts pressure on the walls of the container.
Answer : A gas exerts pressure on the walls of the container because the molecules of the gas are in constant random motion due to high kinetic energy. These molecules constantly vibrate, move and hit the walls of the container thereby exerting pressure on it.

(c) A wooden table should be called a solid.
Answer : The molecules/particles of wooden table are tightly packed with each
other, there is no intermolecular space, it cannot be compressed, it cannot flow, all these characteristics are of solid. So wooden table should be called a solid. '

(d) We can easily move our hand in air but to do the same through a solid block of wood we need a karate expert.
   Answer : We can easily move our hand in air but to do the same through a solid block of wood we need a karate expert. It is because the molecules of air has less force of attraction between them and a very small external force can separate them and pass through it. But in case of solids, the molecules have maximum force of attraction, the particles are tightly bound due to this force. Hence large amount of external force is required to pass through solid.

Question 8. Liquids generally have lower density as compared to solids. But you must have observed that ice floats on water. Find out why.
Answer: Ice is a solid but its density is lower than water due to its structure. The molecules in ice make a cage like structure with lot of vacant spaces, this makes ice float on water.

Question 9. Convert the following temperature to Celsius scale:
(a) 300 K (b) 573 K
Answer. (a) 300 – 273 = 27°C

   (b) 573 – 273 = 300°C

Question.10. What is the physical state of water at:
(a) 250°C (b) 100°C
Answer: (a) 250°C = gas (b) 100°C liquid as well as gas

Question 11. For any substance, why does the temperature remain constant during the change of state?
Answer: During the change of state of any matter heat is supplied to the substance. The molecules of this matter use heat to overcome the force of attraction between the particles, at this period of time, temperature remains constant. This extra heat is acquired by the molecules in the form of hidden heat called latent heat to change from one state of matter to the other state.

Question 12. Why does a desert cooler cool better on a hot dry day?
Answer: The outer walls of the cooler get sprinkled by water constantly. This water evaporates due to hot dry weather. Evaporation causes cooling of inside air of cooler. This cool air is sent in the room by the fan.

Question 13. How does the water kept in an earthen pot (matka) become cool during summer?
Answer: The earthen pot is porous with lot of pores on it, the water oozes out through these pores and the

water gets evaporated at the surface of the pot thereby causing cooling effect. This makes the pot cold and the water inside the pot cools by this process.

Question 14. Why does our palm feel cold when we put some acetone or petrol or perfume on it?
Answer: Acetone, petrol or perfume evaporate when they come into contact with air. The evaporation causes cooling sensation in our hands.

**Question 15. Why are we able to sip hot tea or milk faster from a saucer rather than a cup?**
Answer: Tea in a saucer has larger surface area than in a cup. The rate of evaporation is faster with increased surface area. The cooling of tea in saucer takes place sooner than in a cup. Hence we are able to sip hot tea or milk faster from a saucer rather than a cup.

Question 16. What type of clothes should we wear in summer?
Answe: We should wear light coloured cotton clothes in summer. Light colour because it reflects heat. Cotton clothes because it has pores in it, which absorbs sweat and allows the sweat to evaporate faster thereby giving cooling effect.

Question 17. Suggest a method to liquefy atmospheric gases?
Answer: The atmospheric gases are taken in a cylinder with piston fitted on it. By cooling and applying pressure on them, the gases can be liquefied.
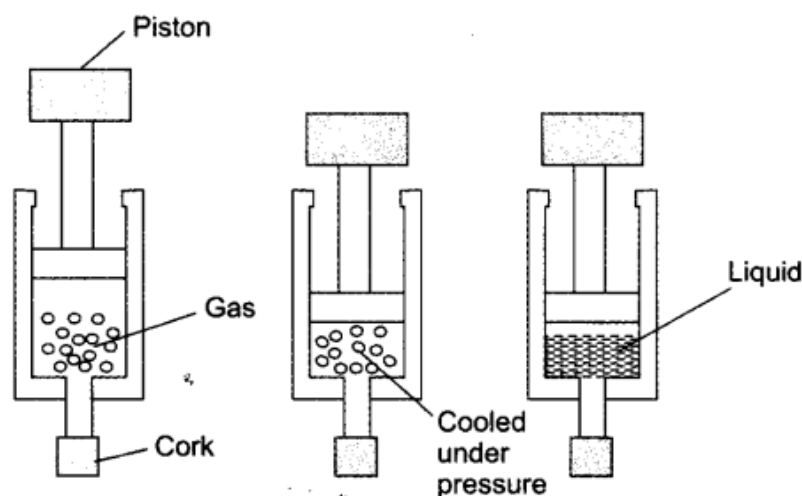
Question 18. Convert the following temperatures to the Celsius scale.
(a) 293 K (b) 470 K.
Answer: (a) 293 K into °C
293 – 273 = 20°C
(b) 470 K into °C 470 – 273 = 197°C

Question 19. Convert the following temperatures to the Kelvin scale.
(a) 25°C (b) 373°C.
Answer: (a) 25°C into K 25 + 273 = 298 K
(b) 373°C into K 4 373 + 273 = 646 K

Question 20. Give reason for the following observations.
(a) Naphthalene balls disappear with time without leaving any solid.
Answer: (a) Naphthalene balls disappear with time without leaving any solid, because naphthalene balls sublime and directly changes into vapour state without leaving any solid.

(b) We can get the smell of perfume sitting several metres away.
Answer : We can get the smell of perfume sitting several metres away because perfume contain volatile solvent and diffuse faster and can reach people sitting several metres away.

Question 21. Arrange the following substances in increasing order of forces of attraction between theparticles—water, sugar, oxygen.
Answer: Oxygen —> water —> sugar.

Question 22. What is the physical state of water at—
(a) 25°C Answer: (a) 25°C is liquid
(b) 0°C : 0°C is solid or liquid
(cj 100°C : 100°C is liquid and gas

Question 23. Give two reasons to justify
(a) water at room temperature is a liquid.
Answer : Water at room temperature is a liquid because its freezing point is 0°C and boiling point is 100°C.

(b) an iron almirah is a solid at room temperature.
Answer: An iron almirah is a solid at room temperature because melting point of iron is higher than room temperature.

Question 24. Why is ice at 273 K more effective in cooling than water at the same temperature?
Answer: Ice at 273 K will absorb heat energy or latent heat from the medium to overcome the fusion to become water. Hence the cooling effect of ice is more than the water at same temperature because water does not absorb this extra heat from the medium.

Question 25. What produces more severe bums, boiling water or steam?
Answer: Steam at 100°C will produce more severe bums as extra heat is hidden in it called latent heat whereas the boiling water does not have this hidden heat.

Question 26. Name A, B, C, D, E and F in the following diagram showing change in its state
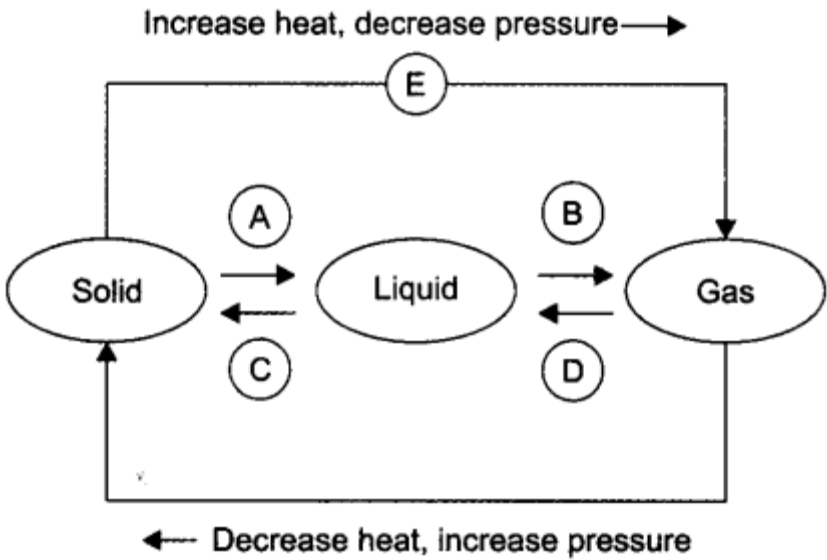
Answer: A —> Liquefication/melting/fusion B —> Vapourisation/evaporation C—>Condensation D—> Solidification E —> Sublimation F —> Sublimation

Chapter 2 : Matter around us Pure

Question 1. What is meant by a substance?
Answer: A pure substance consists of a single type of particles.

Question 2. List the points of differences between homogeneous and heterogeneous mixtures.
Answer:

Homogeneous mixtures	Heterogeneous mixtures
• It has uniform composition.	It does not have a uniform composition.
• No visible boundaries of separation.	Shows visible boundaries of separation.
• They consist of only one phase. Example: sugar + water → sugar solution.	They consist of more than one phase. Example: sugar + sand

Question 3. How are sol, solution and suspension different from each other?
Answer:

Sol. (colloid)	Solution	Suspension
1. Size of solute particles between 1 nm to 100 nm.	Size of solute particles less than 1 nm (10^{-9} m)	Size of solute particles is more than 100 nm.
2. It is stable.	Stable.	Unstable.
3. It scatters a beam of light.	It does not scatter light.	It scatters a beam of light.
4. Solute particles pass through filter paper.	Solute particles pass through filter paper.	Solute particles do not pass through filter paper.

Question 4. To make a saturated solution, 36 g of sodium chloride is dissolved in 100 g of water at 293 K. Find its concentration at this temperature.
Answer: Mass of solute (sodium chloride) = 36 g
Mass of solvent (water) = 100 g
Mass of solution = Mass of solute + Mass of solvent
= 36 g + 100 g = 136 g

$$\text{Concentration} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

$$= \frac{36}{136} \times 100 = 26.47\%$$

Question 5.How will you separate a mixture containing kerosene and petrol (difference in their boiling points is more than 25°C), which are miscible with each other?
Answer: A mixture of kerosene and petrol which are miscible with each other can be separated by distillation.
Method

- Take a mixture in a distillation flask.
- Fit it with a thermometer.
- Arrange the apparatus as shown in the figure.
- Heat the mixture slowly.
- Petrol vaporises first as it has lower boiling point. It condenses in the condenser and is collected from the condenser outlet.
- Kerosene is left behind in the distillation flask.

Distillation process
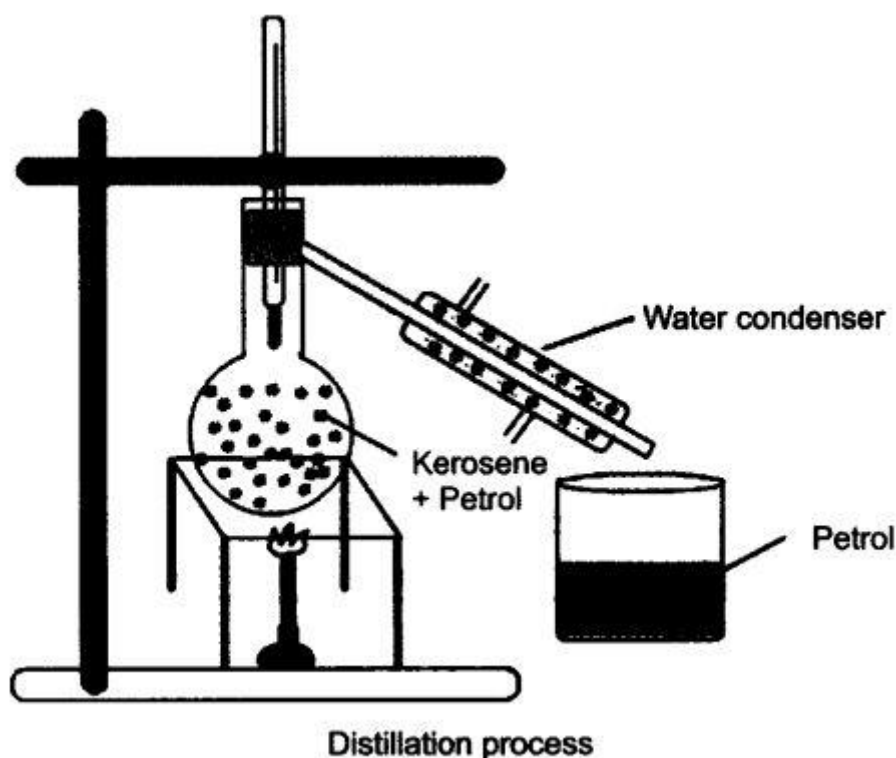
Question 6. Name the technique to separate
(i) butter from curd, : Centrifugation,
(ii) salt from sea-water : Evaporation,
(iii) camphor from salt. : Sublimation.

Question 7. What type of mixtures are separated by the technique of crystallisation?
Answer: Crystallisation technique is used to purify solid with some impurities in it. Example: Salt from sea-water.

Question 8. Classify the following as chemical or physical changes:

- **cutting of trees,**
- **melting of butter in a pan,**
- **rusting of almirah,**
- **boiling of water to form steam,**

- passing of electric current, through water and the water breaking down into hydrogen and oxygen gas,
- dissolving common salt in water,
- making a fruit salad with raw fruits and
- burning of paper and wood.

Physical Change	Chemical Change
● cutting of trees	● rusting of almirah
● melting of butter in a pan	● passing of electric current through water and then breaking down into hydrogen and oxygen gas
● boiling of water to form steam	
● dissolving common salt in water	
● making a fruit salad with raw fruits	● burning of paper and wood

-

Question 9. Try segregating the things around you as pure substances or mixtures
Answer: Pure substances—Water, bread, sugar and gold.
Mixtures—Steel, plastic, paper, talc, milk and air.

Question 10. Which separation techniques will you apply for the separation of the following?
(a) Sodium chloride from its solution in water. - Evaporation
(b) Ammonium chloride from a mixture containing sodium chloride and ammonium chloride. - Sublimation
(c) Small pieces of metal in the engine oil of a car. - Filtration
(d) Different pigments from an extract of flower petals. - Chromatography
(e) Butter from curd. - Centrifugation
(f) Oil from water. - Separating funnel
(g) Tea leaves from tea. - Filtration
(h) Iron pins from sand. - Magnetic separation
(i) Wheat grains from husk. - Winnowing/ sedimentation
(j) Fine mud particles suspended in water. - Decantation and filtration

Question 11. Write the steps you would use for making tea. Use the words, solution, solvent, solute, dissolve, soluble, insoluble, filtrate and residue.
Answer: 1. Take a cup of water in a container as solvent and heat it.
2. Add sugar in it which is solute. Heat it till all sugar dissolves.
3. You get a solution of water and sugar.
4. Sugar is soluble in water completely.
5. Add half a tea-spoon of tea-leaves, it is insoluble in water.
6. Boil the content, add milk which is also soluble in water, boil again.
7. Filter the tea with the help of strainer, the tea collected in cup is filtrate and the tea leaves collected on the strainer is residue.

Question 12. Pragya tested the solubility of three different substances at different temperatures and collected, the data as given below (results are given in the following table, as grams of substance dissolved in 100 grams of water to form a saturated solution).

Substance Dissolved	Temperature in K and Solubility				
	283	293	313	333	353
Potassium nitrate	21	32	62	106	167
Sodium chloride	36	36	36	37	37
Potassium chloride	35	35	40	46	54
Ammonium chloride	24	37	41	55	66

(a) **What mass of potassium nitrate would be needed to produce a saturated solution of potassium nitrate in 50 grams of water at 313 K?**
(b) **Pragya makes a saturated solution of potassium chloride in water at 353 K and leaves the solution to coo! at room temperature. What would she observe us the solution cools? Explain.**
(c) **Find the solubility of each salt at 293 K. Which salt has the highest solubility at this temperature?**
(d) **What is the effect of change of temperature on the solubility of a salt?**
Answer:

(a) Mass of KNO_3 to produce a saturated solution of KNO_3 in 100 grams water at 313 K = 62 g

∴ Mass of KNO_3 in 50 grams of water at 313 K

$$= \frac{62.0 \times 50}{100} = \textbf{31.0 g}$$

(b) Crystals of potassium chloride will be obtained on cooling the saturat solution.

(c) Solubility of each salt at 293 K is
(i) Potassium nitrate → 32 g
(ii) Sodium chloride → 36 g
(iii) Potassium chloride → 35 g
(iv) Ammonium chloride → 37 g

(d) On increasing the temperature, solubility of a salt increases.

Question 13.Explain the following giving examples:
(a) **Saturated solution:** In a given solvent when no more solute can dissolve further at a given temperature is called saturated solution.
(b) **Pure substance:** A pure substance consists of a single type of particles. E.g., gold, silver.
(c) **Colloid:** A colloid is a solution in which the size of solute particles are bigger than that of true solution. These particles cannot be seen with our naked eyes, they are stable, e.g., ink, blood.
(d) **Suspension:** It is a heterogeneous mixture in which the solute particles are big enough to settle down, e.g., chalk-water, paints, etc.

Question 14. Classify each of the following as a homogeneous or heterogeneous mixture:
s soda water, wood, air. soil, vinegar, filtered tea.
Answer: Homogeneous: Soda water, vinegar, filtered tea.
Heterogeneous: Wood, air, soil.

Question 15. How would, you confirm that a colourless liquid given to you is pure water?
Answer: By finding the boiling point of a given colourless liquid. If the liquid boils at 100°C at atmospheric pressure, then it is pure water. This is because pure substances have fixed melting and boiling point.

Question 16. Which of the following materials fall in the category of a "pure substance"?
(a) Ice   (b) Milk   (c) Iron   (d) Hydrochloric acid   (e) Calcium oxide
(f) Mercury   (g) Back   (h) Wood   (i) Air.
Answer: Pure substances are: Ice, iron, hydrochloric acid, calcium oxide and mercury.

Question 8. Identify the solutions among the following mixtures.
(a) Soil   (b) Sea water   (c) Air   (d) Coal   (e) Soda water.
Answer: Solutions are: Sea water soda water and air.

Question 9. Which of the following will show "Tyndall effect"?
(a) Salt solution   (b) Milk   (c) Copper sulphate solution   (d) Starch solution.
Answer: Milk and starch solution.

Question 10. Classify the following into elements, compounds and mixtures.
(a) **Sodium** : Elements   (b) **Soil** : Mixtures   (c) **Sugar solution** : Mixtures
(d) **Silver** : Elements   (e) **Calcium carbonate :** Compounds   (f) **Tin** : Elements
(g) **Silicon** : Elements   (h) **Coal** : Mixtures   (i) **Air** : Mixtures
(j) **Soap** : Compounds   (k) **Methane** : Compounds   (l) **Carbon dioxide** : Compounds
(m) **Blood :** Mixtures

Question 11. Which of the following are chemical changes?
(a) **Growth of a plant**   (b) **Rusting of iron**   (c) **Mixing of iron filings and sand**   (d) **Cooking of food**
(e) **Digestion of food**   (f) **Freezing of water**   (g) **Burning of a candle.**
Answer: Chemical changes are:
(a) Growth of a plant   (b) Rusting of iron   (c) Cooking of food   (d) Digestion of food
(e) Burning of a candle

Question 12.**Choose the correct option:**
1. Fog, clouds are an example of   answer :[a]
(a) **aerosol**   (b) **colloid**   (c) **suspension**   (d) **emulsion**
2. Sponge can be compressed, it is a   answer :[a]
(a) **solid**   (b) **liquid**   (c) **gas**   (d) **foam**
3. An impure sample of potash alum can be purified by   answer :[b]
(a) **evaporation**   (b) **crystallisation**   (c) **centrifugation**   (d) **filtration**
4. Chalk dissolved in water is an example of   answer :[c]
(a) **true solution**   (b) **colloid**   (c) **suspension**   (d) **saturated solution**
5. 50 gm sugar is dissolved in a glass of water at 30°C. On heating this solution it will   answer :[c]
(a) **crystallise**   (b) **evaporate**   (c) **become unsaturated**   (d) **sugar will char**
6. Which of the following shows tyndall effects?   answer :[c]
(a) **salt solution**   (b) **sugar solution**   (c) **starch solution**   (d) **copper sulphate solution**
7. Pick up the odd one out.   answer :[d]
(a) **brass**   (b) **air**   (c) **sand**   (d) **graphite**
8. Which of the following is liquid-liquid solution?   answer :[d]
(a) **face-cream**   (b) **emulsion**   (c) **milk**   (d) **all of these**
9. To separate two miscible liquids by fractional distillation, it should have one of the
following condition   answer :[c]
(a) **should be miscible**   (b) **should be immiscible**
(c) **difference in the boiling point should be less than 25 K**   (d) **none of these**
10. To obtain toned and double toned milk from full-cream milk we can   answer :[d]
(a) **filtrate it**   (b) **sediment it**   (c) **distillate it**   (d) **centrifuge it**
11. The separation technique which involves the difference in their densities is   answer :[d]
(a) **sublimation**   (b) **separation by separating funnel**
(c) **centrifugation**   (d) **both (b) and (c)**

Question 13. Define solvent.
Answer: The component of the solution that dissolves the other component in it is called the solvent.

Question 14. Define solute.
Answer: The component of the solution that is dissolved in the solvent is called solute.

Question 15. What is 'tincture of iodine'?
Answer: A solution of iodine in alcohol is known as tincture of iodine. It has iodine (solid) as the solute and alcohol (liquid) as the solvent.

Question 16. What are alloys?
Answer: The homogeneous mixture of two or more metals or a metal and non-metal is called an alloy. E.g., steel is an alloy of iron and carbon.

Question 17. Give one example of gas in liquid solution.
Answer: Cold-drinks, carbon dioxide gas as solute is mixed with water as a solvent.

Question 18. How can a solution be dilute or concentrated?
Answer: The amount of solute dissolving in a solvent decides whether the solution is dilute or concentrated.

Question 19. What is "concentration of a solution"?
Answer: The concentration of a solution is the amount of solute present in a given amount of solution or the amount of solute dissolved in a given mass or volume of solvent.

Question 20. State the difference between aqueous and, non-aqueous solution.
Answer: Aqueous solutions have water as solvent and non-aqueous solutions do not haVe water as solvent.

Question 21. What is "solubility" of a solute?
Answer: The amount of the solute present in the saturated solution at the given temperature is called its solubility.

Question 22. What is saturated solution?
Answer: The maximum amount of solute dissolved in a solvent at given temperature is called saturated solution, where no more solute can dissolve further.

Question 23. What is unsaturated solution?
Answer: If the amount of solute contained in a solution is less than the saturation level, it is called an unsaturated solution.

Question 24. How can you convert saturated solution into unsaturated or vice-versa?
Answer: Saturated solution on heating becomes unsaturated and unsaturated solution on cooling becomes saturated.

Question 25. Why water is called universal solvent?
Answer: Water can dissolve large number of substances in it.

Question 26 . What is Tyndall effect?
Answer. The scattering of light by colloidal particles is known as Tyndall effect.

Question 27. How can we separate colloidal mixtures?
Answer: By centrifugation, in a centrifuge machine the colloidal solution is kept in a test tube, rotated very fast and due to centrifugal force the colloidal particles are separated.

Question 28. What is emulsion?
Answer: When both the dispersed phase and dispersing medium is liquid, it is called emulsion. E.g., milk, face cream.

Question 29. What is aerosol?
Answer. When the solid or liquid is dispersed in a gas it is called aerosol. E.g., smoke, fog.

Question 30. What is the principle for separation of immiscible liquids?
Answer: The principle of separating immiscible liquids into layers depending on their densities. The less denser liquid collects at the top and more denser liquid at the bottom. '

Question 31. What is chromatography?
Answer: Chromatography is the technique used for separation of those solutes that dissolve in the same solvent.

Question 32. What is distillation?
Answer: Distillation is the separation technique of two miscible liquids that boils without decomposition and have sufficient difference in their boiling points.

Question 33. How can you separate two liquids that have less than 25 K difference of boiling points?
Answer: To separate a mixture of two or more miscible liquids for which the difference in boiling points is less than 25 K, is fractional distillation.

Question 34. What is condenser?
Answer: It is an apparatus used to convert gas into liquid by cooling it.

Question 35. What is crystallisation?
Answer: When a saturated solution is heated and allowed to cool slowly, crystal of the solute dissolved in the saturated solution are separated from it. It is used to purify solids.

Question 36. Why is mixture called impure substance?
Answer: Mixture consists of different components which retain their properties and can be easily separated by physical processes, hence it is called as impure substance.

Question 37. Give the differences between mixture and compound.
Answer:

Mixture	Compound
1. Impure matter	1. Pure matter.
2. Constituents combine in any ratio to form mixture.	2. Constituents combine in fixed ratio to form a compound.
3. Constituents retain their properties.	3. Constituents do not retain their properties as a new substance is formed.
4. Constituents can be separated by physical processes.	4. Constituents cannot be separated by physical processes.

Question 38. Distinguish between a physical change and chemical change.
Answer:

Physical Change	Chemical Change
1. No new substance is formed.	1. New substance is formed.
2. It is a reversible change.	2. It is irreversible change.
3. The properties of constituents are retained.	3. The properties of constituents are not retained.
4. No new substance is formed.	4. Completely new substance is formed.

Question 39. State the properties of a solution.
Answer: Properties of a solution are:

1. A solution is a homogeneous mixture.
2. Particles of a solution are smaller than 1 nm and cannot be seen by naked eyes.
3. Do not scatter beam of light.
4. Solute particles cannot be separated from the mixture by the process of filtration and thus, solution is stable.

Question 40. State the properties of a suspension.
Answer: Properties of a suspension

- Suspension is a heterogeneous mixture having particle size greater than 100 nm.
- The particles of a suspension can be seen by naked eyes.
- Particles can scatter a beam of light.
- It is unstable.

Question 41. What is a colloidal solution?
Answer: It is a heterogeneous solution which appears to be homogeneous, particles size is very small and so cannot be seen with naked eyes but it is stable. E.g., milk and blood.

Question 42. State the properties of colloidal solution.
Answer: Properties of colloidal solution.

- It is a heterogeneous mixture having particle size between 1 nm to 100 nm.
- Size of particles is very small, cannot be seen with naked eyes.
- It scatters a beam of light.
- They are stable as the particles do not settle when left undisturbed.

Question 43. Give the applications of centrifugation.
Answer: Application of centrifugation are:

1. Used in diagnostic laboratories for blood and urine test.
2. Used in dairies and home to separate butter from cream.
3. Used in a washing machines to squeeze out water from wet clothes.

Question 44. Give the applications of chromatography.
Answer: Applications of chromatography are

1. To separate colours in a dye.
2. To separate pigments from natural colours.
3. To separate drugs from blood.

Question 45. Why is crystallisation better than evaporation?
Answer: Crystallisation is a process that separates a pure solid in the form of its crystals from a solution. Crystallisation is better than evaporation because during Evaporation

- Some solids decompose or some, like sugar may get charred on heating to dryness.
- Some impurities may remain dissolved in the solution even after filtration which on evaporation contaminates the solid.

Question 46. How will you separate a mixture of oil and water?
Answer: To separate a mixture of oil and water, we need a separating funnel as both are immiscible liquids. Pour the mixture in separating funnel and let the funnel stand undisturbed for sometime. So that separate layer of oil and water are formed. Open the stopcock of the separating funnel and pour out the lower layer of water carefully.

Question 47. A student is given a mixture of naphthalene ball's powder and common salt. He need to separate this mixture. How will he do this?
Answer: The properties of both naphthalene and common salt should be known, before we choose the separation technique.
Naphthalene is a sublimate which on heating changes to gaseous state directly. Hence to separate a volatile compound (sublimate) from a non-volatile compound (non-sublimate), the sublimation process is used.
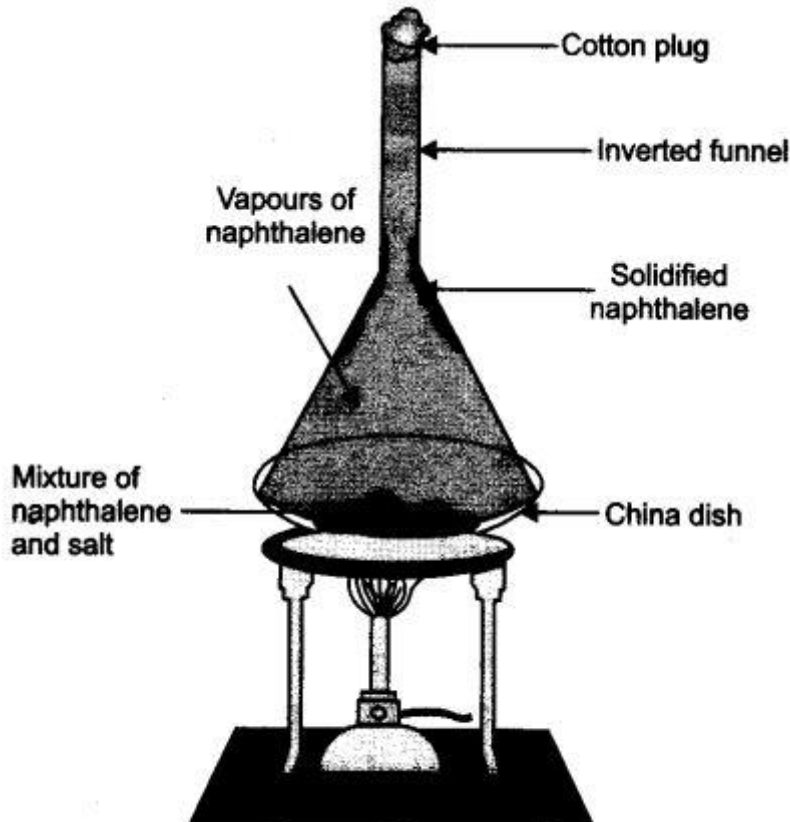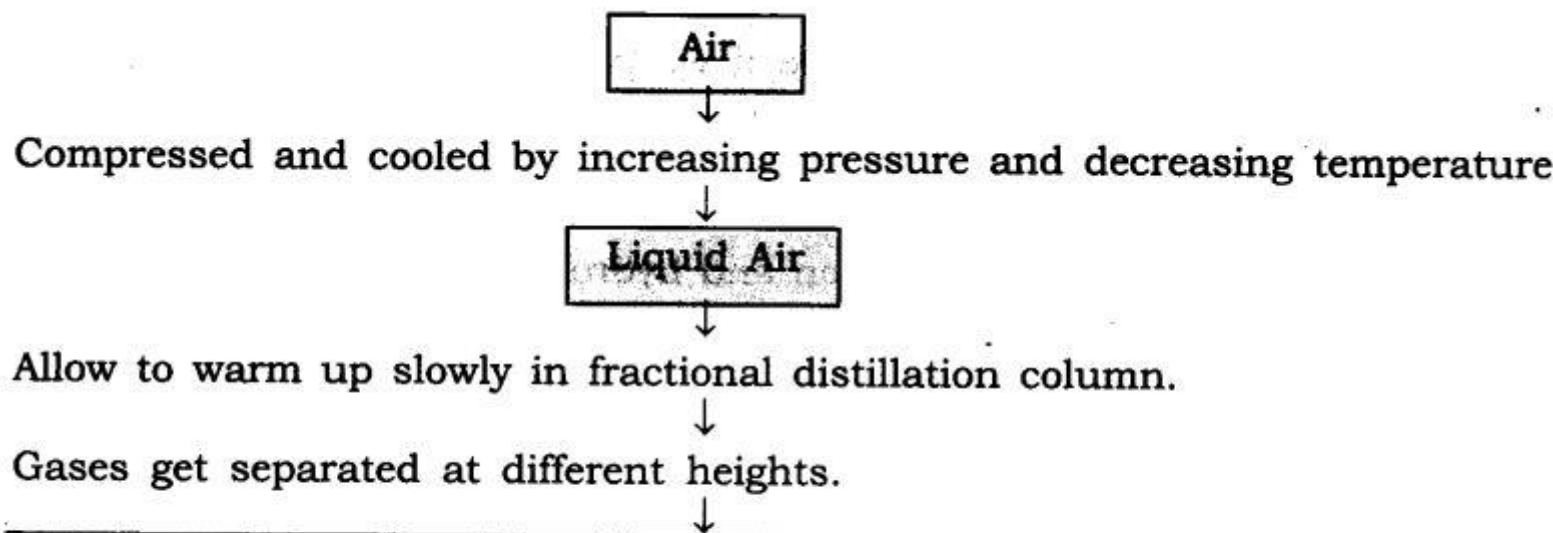
Sublimation of naphthalene

In a China dish the mixture is kept, and is placed on a stand. An inverted funnel is kept over the mixture in China dish with plugged stem. The sublimate on heating gets collected on the funnel and common salt remains in the China dish.

Question 48. How can we obtain different gases from air?
Answer: Air is a homogeneous mixture and its components can be separated by fractional distillation.

The flow diagram shows the steps involved in the process.

Air

↓

Compressed and cooled by increasing pressure and decreasing temperature

↓

Liquid Air

↓

Allow to warm up slowly in fractional distillation column.

↓

Gases get separated at different heights.

↓

	Oxygen	Argon	Nitrogen
Boiling Point (°C)	− 183	− 186	− 196
% Air by volume	20.9	0.9	78.1

Question 49. Draw a flow diagram to show the water purification system in water works.
Answer:

Water purification system in water works
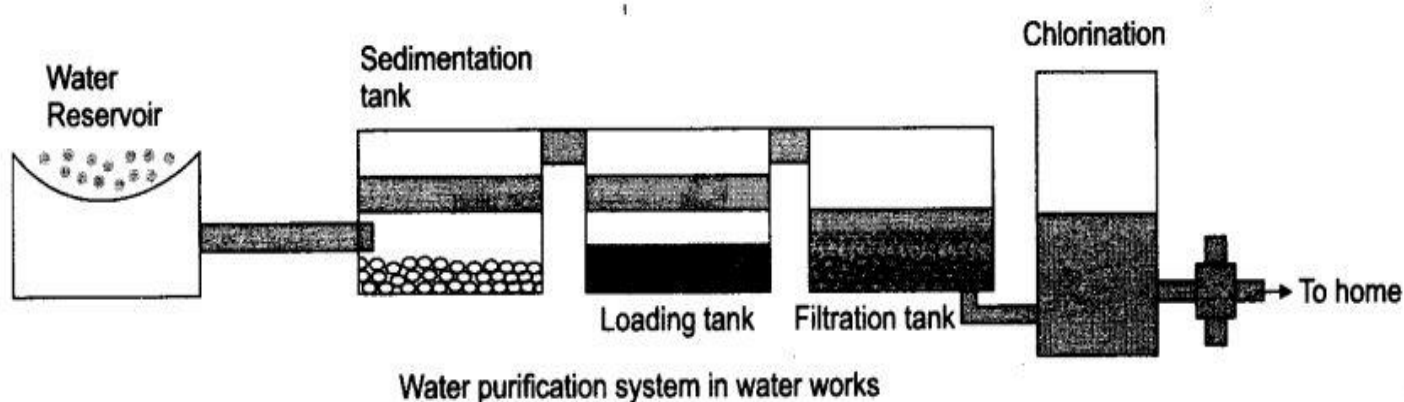
Water is collected in the reservoir ⟶ The water is sent to sedimentation tank to allow solids to settle ⟶

It is then passed to 2nd tank i.e., loading tank, so that the suspended impurities are loaded to settle down as sediment. ⟶ Then water reaches the filtration tank

In filtration tank water passes through different layers of sand and gravel as shown in the above figure this is for adsorption of impurities.

The clear water reaches a chlorinated tank where water is mixed with bleaching powder/chlorine to kill bacteria and then supplied to houses.

Question 50. Why is air considered as a mixture and not compound?
Answer: Air is considered as a mixture because it exhibits following properties:

1. Each component present in air retains its properties.
2. Each component can be separated by simple physical processes.
3. The components do not have any fixed proportion. All gases are present in different amount. Example, in greener area—more oxygen and water vapour is present; near industrial area—air consists of lot of impurities and smoke suspended in it.

Question 51. How can you prove that water is a compound?
Answer: Water is a compound because if we pass electricity through it then at two different electrodes, we get two different gases i.e., oxygen and hydrogen during electrolysis of water. The ratio of oxygen: hydrogen is 1 : 2 by number of molecules.

- The properties of oxygen and hydrogen gases sire entirely different from that of liquid water.
- The ratio of oxygen: hydrogen combination is always constant i.e., 1: 2 by volume.
- To separate the components of water, we need electrolytic cell, and it is not a simple process.

Question 52. How can we convert saturated solution into unsaturated by heating?
Answer: Saturated solution is said to be saturated at a given temperature when there is no more scope of solute particles to dissolve /dissociate into water. It is because the solute particle has taken all the inter molecular space present in the solvent.

On heating, the molecules of solvent gain kinetic energy, start vibrating and try to move away from each other thereby accommodating some more solute particle in this space and hence it becomes an unsaturated solution.

Question 53. What is the difference in fog and smoke?
Answer: Fog is a colloidal solution with liquid dispersed in gas.

Smoke is a colloidal solution with solid dispersed in gas.

Question 54. If 20g of salt is present is 220 g of solution, calculate the concentration of solution:

$$\text{Concentration of solution} = \frac{\text{Mass of solute}}{(\text{Mass of solute} + \text{Mass of solvent})} \times 100$$

$$\text{Mass solute} = 20 \text{ g}$$

$$\text{Mass of solute} + \text{solvent} = 220 \text{ g}$$

$$\therefore \quad \text{Concentration of solution} = \frac{20}{220} \times 100 = 9.09\%$$

Question 55. Give the difference between true solution, colloidal solution and suspension.
Answer: The difference between true solution, colloidal solution and suspension

Property	True Solution	Colloidal Solution	Suspension
1. Particle size	less than 1nm.	between 1nm and 100 nm.	more than 100 nm.
2. State	Stable	Stable	Unstable
3. Tyndall effect (Scattering of light)	No	Yes	Yes
4. Separation by filtration	Not possible	Not possible	Is possible
5. Nature	Transparent	Translucent	Translucent/opaque

Question 56. State the different types of colloids with examples.
Answer: Different colloids are formed due to different dispersed phase and dispersing

Dispersed Phase	Dispersing Medium	Type	Examples
Liquid	Gas	Aerosol	Fog, clouds, mist
Solid	Gas	Aerosol	Smoke, automobile exhaust
Gas	Liquid	Foam	Shaving cream
Liquid	Liquid	Emulsion	Milk, face cream
Solid	Liquid	Sol	Milk of magnesia, mud
Gas	Solid	Foam	Sponge, pumice
Liquid	Solid	Gel	Jelly, cheese, butter
Solid	Solid	Solid sol	Coloured gemstone, milky glass

Question 57. (a) Define solution.
Solution: It is a homogeneous mixture of two or more substances. It consists of solute and solvent.

(b) Give different types of solutions with one example each.
Answer: **(b) Different types of solution:**
(i) Based on solvent—Aqueous and non-aqueous Aqueous solution has water as solvent (sugar + water) Non-aqueous solution has some other solvent but not water. Example, (sulphur + carbon disulphide)
(ii) Depending on the amount of solute dissolved in solvent—Dilute solution and concentrated solution
Dilute solution—Less amount of solute particles are present in a solvent.
Concentrated solution—Amount of solute present in its maximum capacity in a solvent.
(iii) Amount of solute present in its maximum capacity at a given temperature—Saturated and unsaturated solution.
Saturated solution—It is a solution in which no more solute can further dissolve in a given solvent at a given

temperature.

Unsaturated solution—It is a solution in which some more solute can dissolve in a solvent at a given temperature.

(iv) Depending on the size of solute particles

True solution	Suspension	Colloid
Size is very small and particles cannot be seen through naked eyes	Size is very big and can be seen through naked eyes	Size is intermediate between true solution and suspension

Question 58. Anil's sister acddentally added some water into the bottle containing olive oil and she was afraid of the scolding. Anil helped his sister and separated the water from olive oil using bottle as separating funnel.

> **(a) What is the principle of using and working of separating funnel?**
> Answer : The principle of separating funnel is difference in the densities of two liquids.

> **(b) Suggest two separation techniques used to separate liquid mixtures.**
> Answer : Liquid mixtures can be separated by distillation and fractional distillation.

> **(c) What value of Anil is seen in the above case?**
> **Answer:** Anil showed the value of helping, caring and responsible behaviour.

Question 59.How can you separate the following mixtures?
(a) Sand + iron (b)Cream from milk
(c) Salt + water (d) Ammonium chloride + NaCl
(e) Copper sulphate + water (f) Rice and dal (uncooked)
(g) Gases from air (h) Petrol and diesel from crude oil
(i) Drugs from blood (j) Acetone from water
Answer:

(a) Sand + iron	–	magnetic separation
(b) Cream from milk	–	centrifugation
(c) Salt + water	–	evaporation
(d) Ammonium chloride + NaCl	–	sublimation
(e) Copper sulphate + water	–	crystallisation
(f) Rice and dal (uncooked)	–	hand picking
(g) Gases from air	–	fractional distillation
(h) Petrol and diesel from crude oil	–	fractional distillation
(i) Drugs from blood	–	chromatography
(j) Acetone from water	–	distillation

Question 60. Preeti saw a labour entering into the sewage manhole immediately after removing the lid. She promptly stopped the labour from entering into the manhole and told him to wait for some time before he enters into it.

(a) What will happen if the labour immediately enters into the manhole for cleaning) after removing the lid?
Answer : If the labour immediately enters the manhole on removing its lid he would die due to suffocation and inhalation of poisonous gases which are compressed and released by sewage.

(b) Name main gases that are released from the manhole.

Answer : Gases released from the sewage manhole are methane, carbon dioxide and hydrogen sulphide.

(c) What value of Preeti is seen in the above act?

Answer: Preeti shows the value of moral responsible behaviour and aware citizen.

Question 61. Prasanna wanted to buy a deodorant from the shop. While buying a bottle he felt that it was slightly heavier than usual deodorant bottle that he purchased everytime. He read the weight mentioned on the bottle and told the shopkeeper to weigh the same. He found the bottle was heavy and on opening the deodorant bottle he found it half-filled with water. He complained the matter to the consumer authority.
(a) Define density.
(b) Apart from water what is the other substance that some shopkeepers add into the deodorant.
(c) What value of Prasanna is reflected in this act?
Answer: (a) Density of any substance is defined to be the mass of the substance per unit volume.
(b) One can add some cheap gases or compressed air in the deodorant bottles.
(c) Prasanna showed the value of being having leadership quality, rightful, aware and responsible citizen.

Question 62. Rita's father always got his vehicle checked for pollution control. He got it tested for the aerosol if released by his car. He also uses unleaded petrol and makes use of public transport wherever possible. He sparingly use his car.
(a) What is aerosol?
Answer : When the solid or liquid is dispersed in a gas it is called aerosol e.g. smoke

(b)What happens when smoke released from vehicle mixes with fog?
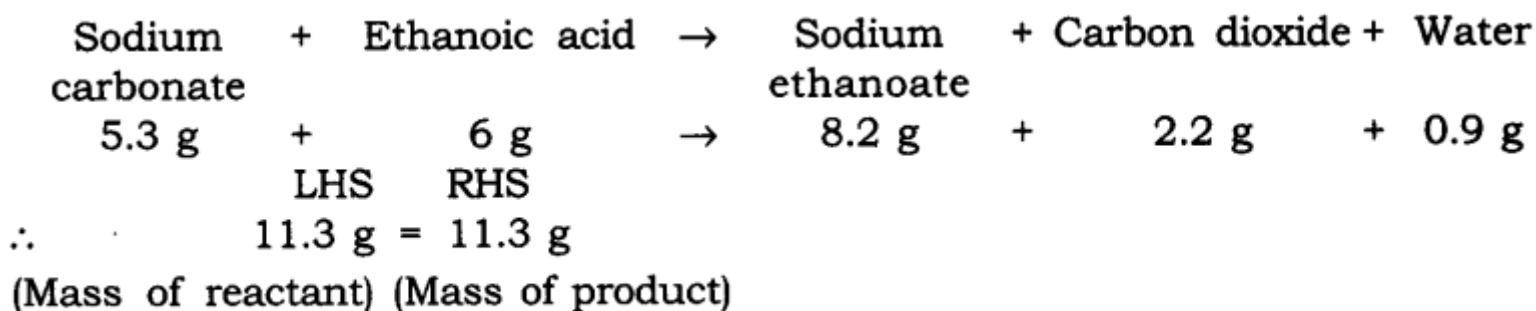Answer :When smoke mixes with fog it forms smog.

(c) What are the values of Rita's father is reflected here?
Answer: Rita's father is an aware citizen, environmentally concerned and dutiful.

Chapter 3: Atom and Molecules

Question 1. In a reaction 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass carbonate.
**Answer.**

$$\text{Sodium carbonate} + \text{Ethanoic acid} \rightarrow \text{Sodium ethanoate} + \text{Carbon dioxide} + \text{Water}$$

$$\underset{\text{LHS}}{5.3\text{ g} + 6\text{ g}} \rightarrow \underset{\text{RHS}}{8.2\text{ g} + 2.2\text{ g} + 0.9\text{ g}}$$

$$\therefore \quad 11.3\text{ g} = 11.3\text{ g}$$

(Mass of reactant) (Mass of product)

This shows that during a chemical reaction mass of reactant = mass of product.

(b) Aluminium oxide

Symbol → Al ⤨ O

Valency → +3 ⤬ -2

Formula → Al_2O_3
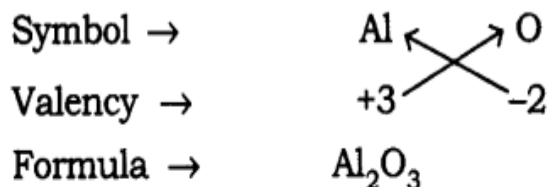
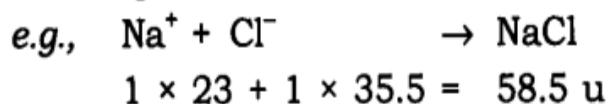## • Molecular Mass

It is the sum of the atomic masses of all the atoms in a molecule of the substance. It is expressed in atomic mass unit (u).

e.g.,
$$2H^+ + O_2 \quad H_2O \qquad [H = 1, O = 16]$$
$$1 \times 2 + 16 = 18 \text{ u}$$
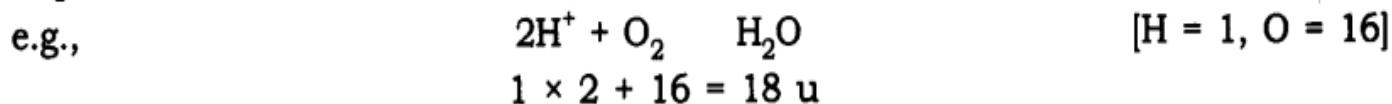
• Formula Unit Mass

It is the sum of the atomic masses of all atoms in a formula unit of a compound. The constituent particles are ions.

e.g.,
$$Na^+ + Cl^- \rightarrow NaCl$$
$$1 \times 23 + 1 \times 35.5 = 58.5 \text{ u}$$

• Mole Concept

Definition of mole: It is defined as one mole of any species (atoms, molecules, ions or particles) is that quantity in number having a mass equal to its atomic or molecular mass in grams.

$$1 \text{ mole} = 6.022 \times 10^{23} \text{ in number}$$

Molar mass = mass of 1 mole → is always expressed in grams, and is also known as gram atomic mass.

1u of hydrogen has → 1 atom of hydrogen

1g of hydrogen has → 1 mole of hydrogen

$$= 6.022 \times 10^{23} \text{ atoms of hydrogen}$$

Question 2. In a reaction 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium etkanoate. Show that these observations are in agreement with the law of conservation of mass carbonate.

Answer:

Sodium carbonate	+	Ethanoic acid	→	Sodium ethanoate	+ Carbon dioxide + Water
5.3 g	+	6 g	→	8.2 g +	2.2 g + 0.9 g
	LHS	RHS			

∴ 11.3 g = 11.3 g

(Mass of reactant) (Mass of product)

This shows that during a chemical reaction mass of reactant = mass of product.

Question 3. Hydrogen and oxygen combine in the ratio of 1 : 8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas?

Answer: Ratio of H : O by mass in water is:

Hydrogen : Oxygen —> H_2O

∴ 1 : 8 = 3 : x

x = 8 x 3

x = 24 g

∴ 24 g of oxygen gas would be required to react completely with 3 g of hydrogen gas.

Question 4. Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?

Answer: The postulate of Dalton's atomic theory that is the result of the law of conservation of mass is—the relative number and kinds of atoms are constant in a given compound. Atoms cannot be created nor destroyed in a chemical reaction.

Question 5. Which postulate of Dalton's atomic theory can explain the law of definite proportions?

Answer: The relative number and kinds of atoms are constant in a given compound.

Question 6. Define the atomic mass unit.

Answer: One atomic mass unit is equal to exactly one-twelfth (1/12th) the mass of one atom of carbon-12. The relative atomic masses of all elements have been found with respect to an atom of carbon-12.

Question 7. Why is it not possible to see an atom with naked eyes?

Answer: Atom is too small to be seen with naked eyes. It is measured in nanometres. $1 m = 10^9$ nm

Question 8 . Write down the formulae of

(i) Sodium oxide   **(ii) Aluminium chloride**   **(iii) Sodium sulphide**   **(iv) Magnesium hydroxide**

Answer: The formulae are

(i) Formula of Sodium Oxide

Symbol → Na   O

Charge → +1   –2

Formula → Na_2O

(ii) Formula of aluminium chloride

Symbol → Al   Cl

Charge → +3   – 1

Formula → $AlCl_3$

(iii) Formula of Sodium Oxide

Symbol → Na   S

Charge → +1   –2

Formula → Na_2S

(iv) Formula of magnesium hydroxide

Symbol → Mg   OH

Charge → +2   1

Formula → $Mg(OH)_2$

Question 9. What is meant by the term chemical formula?

Answer: The chemical formula of the compound is a symbolic representation of its composition, e.g., chemical formula of sodium chloride is NaCl.

Question 10 . How many atoms are present in a

(i) H₂S molecule and

(ii) P0₄³⁻ ion?

Answer: (i) H_2S —> 3 atoms are present

(ii) PO_4^{3-} —> 5 atoms are present

Question 11. Calculate the molecular masses of H_2, O_2, Cl_2, CO_2, CH_4, C_2H_2, NH_3, CH_3OH.

Answer: The molecular masses are:

$$H_2 \Rightarrow 1 \times 2 \rightarrow 2 \text{ u}$$

$$O_2 \Rightarrow 16 \times 2 \rightarrow 32 \text{ u}$$

$$Cl_2 \Rightarrow 35.5 \times 2 \rightarrow 71 \text{ u}$$

$$CO_2 \Rightarrow 1 \times 12 + 2 \times 16 = 12 + 32 = 44 \text{ u}$$

$$CH_4 \Rightarrow 1 \times 12 + 4 \times 1 = 16 \text{ u}$$

$$C_2H_6 \Rightarrow 2 \times 12 + 6 \times 1 = 30 \text{ u}$$

$$C_2H_4 \Rightarrow (2 \times 12) + (4 \times 1) = 28 \text{ u}$$

$$NH_3 \Rightarrow (1 \times 14) + (3 \times 1) = 17 \text{ u}$$

$$CH_3OH \Rightarrow 12 + (3 \times 1) + 16 + 1 = 32 \text{ u}$$

Question 12. Calculate the formula unit masses of ZnO, Na₂O, K₂CO₃, given atomic masses of Zn = 65 u, Na = 23 u, K = 39 u, C = 12 u, and O = 16 u.

Answer: The formula unit mass of

(i) ZnO = 65 u + 16 u = 81 u

(ii) Na_2O = (23 u x 2) + 16 u = 46 u + 16 u = 62 u

(iii) K_2CO_3 = (39 u x 2) + 12 u + 16 u x 3 = 78 u + 12 u + 48 u = 138 u

Question 13. If one mole of carbon atoms weigh 12 grams, what is the mass (in grams) of 1 atom of carbon?

Answer:

1 mole of carbon atoms 6.022×10^{23} atoms = 12 g

Mass of 1 atom = ?

$\therefore$ Mass of 1 atom of carbon = $\dfrac{12}{6.022 \times 10^{23}}$

$$= 1.99 \times 10^{-23} \text{ g}$$

Question 14. What are poly atomic ions? Give examples.

Answer: The ions which contain more than one atoms (same kind or may be of different kind) and behave as a single unit are called polyatomic ions e.g., OH^-, SO_4^{2-}, CO_3^{2-}.

Question 15. Which has more number of atoms, 100 grams of sodium or 100 grams of iron (given atomic mass of Na = 23 u, Fe = 56 u)?

Answer:

$$23 \text{ g of Na} = 6.022 \times 10^{23} \text{ atoms (1 mole)}.$$

$$\therefore \quad 100 \text{ g of Na} = ?$$

$$= \frac{100 \times 6.022 \times 10^{23}}{23} = \frac{602.2}{23} \times 10^{23}$$

$$= 26.182 \times 10^{23} = 2.6182 \times 10^{24} \text{ atoms}$$

$$56 \text{ g of Fe} = 6.022 \times 10^{23} \text{ atoms}$$

$$100 \text{ g of Fe} = ?$$

$$= \frac{100 \times 6.022 \times 10^{23}}{56} = \frac{602.2 \times 10^{23}}{56}$$

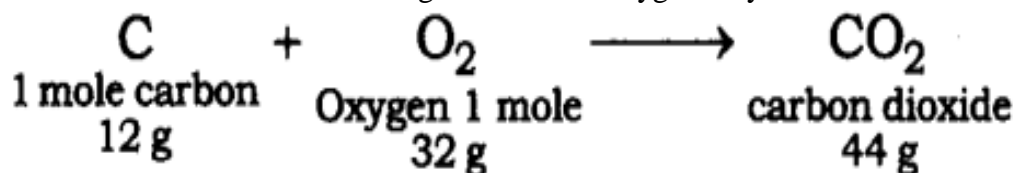$$= 10.753 \times 10^{23} = 1.075 \times 10^{24}$$

$$100 \text{ g of Na contain} \rightarrow 2.618 \times 10^{24} \text{ atoms}$$

$$100 \text{ g of Fe contain} \rightarrow 1.075 \times 10^{24} \text{ atoms}$$

$$\therefore \ 100 \text{ g of Na contains more atoms.}$$

Question 16. When 3.0 g of carbon is burnt in 8.00 g oxygen, 11.00 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.00 g of carbon is burnt in 50.00 g of oxygen? Which law of chemical combination will govern your answer?

Answer: The reaction of burning of carbon in oxygen may be written as:

$$
\underset{\substack{\text{1 mole carbon} \\ \text{12 g}}}{C} \quad + \quad \underset{\substack{\text{Oxygen 1 mole} \\ \text{32 g}}}{O_2} \quad \longrightarrow \quad \underset{\substack{\text{carbon dioxide} \\ \text{44 g}}}{CO_2}
$$

It shows that 12 g of carbon bums in 32 g oxygen to form 44 g of carbon dioxide. Therefore 3 g of carbon reacts with 8 g of oxygen to form 11 g of carbon dioxide. It is given that 3.0 g of carbon is burnt with 8 g of oxygen to produce 11.0 g of CO_2. Consequently 11.0 g of carbon dioxide will be formed when 3.0 g of C is burnt in 50 g of oxygen consuming 8 g of oxygen, leaving behind $50 - 8 = 42$ g of O_2. The answer governs the law of constant proportion.

Question 14. Write the chemical formulae of the following:
(a) Magnesium chloride
(b) Calcium oxide
(c) Copper nitrate
(d) Aluminium chloride
(e) Calcium carbonate.

Answer:

	(a) Magnesium chloride		(b) Calcium oxide	
Symbol —>	Mg	Cl	Ca	O
Change —>	+2	-1	+2	-2
Formula —>	MgCl$_2$		CaO	

	(c) Copper nitrate		(d) Aluminium chloride	
Symbol —>	Cu	NO	Al	Cl
Change	+2	-1	+3	-1
Formula ->	CU(N0$_3$)$_2$		AlCl$_3$	

Question 15. Give the names of the elements present in the following compounds:
(a) Quick lime : Quick lime —> Calcium oxide
                Elements —> Calcium and oxygen
(b) Hydrogen bromide : (b) Hydrogen bromide
                        Elements —> Hydrogen and bromine

(c) Baking powder : Baking powder —> Sodium hydrogen carbonate
                        Elements —> Sodium, hydrogen, carbon and oxygen
(d) Potassium sulphate : Potassium sulphate
                        Elements —> Potassium, sulphur and oxygen

(d) **Question 16. Calculate the molar mass of the following substances.**
(a) Ethyne, C$_2$H$_2$
(b) Sulphur molecule, S$_8$
(c) Phosphorus molecule, P$_4$ (Atomic mass of phosphorus = 31)
(d) Hydrochloric acid, HCl
(e) Nitric acid, HNO$_3$
Answer: The molar mass of the following: [Unit is 'g']
(a) Ethyne, C$_2$H$_2$ = 2 x 12 + 2 x 1 = 24 + 2 = 26 g
(b) Sulphur molecule, S$_8$ = 8 x 32 = 256 g
(c) Phosphorus molecule, P$_4$=4 x 31 = i24g
(d) Hydrochloric acid, HCl = 1 x 1 + 1 x 35.5 = 1 + 35.5 = 36.5 g
(e) Nitric acid, HNO$_3$ = 1 x 1 + 1 x 14 + 3 x 16 = 1 + 14 + 48 = 63 g

Question 17. What is the mass of
(a) 1 mole of nitrogen atoms?
(b) 4 moles of aluminium atoms (Atomic mass of aluminium = 27)?
(c) 10 moles of sodium sulphite (Na$_2$SO$_3$)?
Answer: (a) Mass of 1 mole of nitrogen atoms = 14 g
(b) 4 moles of aluminium atoms
Mass of 1 mole of aluminium atoms = 27 g
∴ Mass of 4 moles of aluminium atoms = 27 x 4 = 108 g
(c) 10 moles of sodium sulphite (Na$_2$SO$_3$)
Mass of 1 mole of Na$_2$SO$_3$ = 2 x 23 + 32 + 3 x 16 = 46 + 32 + 48 = 126 g
∴ Mass of 10 moles of Na$_2$SO$_3$ = 126 x 10 = 1260 g

Question 18. Convert into mole.
(a) 12 g of oxygen gas
(b) 20 g of water
(c) 22 g of Carbon dioxide.
Answer: (a) Given mass of oxygen gas = 12 g
Molar mass of oxygen gas (O$_2$) = 32 g
Mole of oxygen gas 12/32 = 0.375 mole
(b) Given mass of water = 20 g
Molar mass of water (H$_2$O) = (2 x 1) + 16 = 18 g
Mole of water = 20/18 = 1.12 mole
(c) Given mass of Carbon dioxide = 22 g
Molar mass of carbon dioxide (CO$_2$) = (1 x 12) + (2 x 16)
= 12 + 32 = 44 g
∴ Mole of carbon dioxide = 22/44 = 0.5 mole

Question 19. What is the mass of:
(a) 0.2 mole of oxygen atoms?
(b) 0.5 mole of water molecules?

Answer: (a) Mole of Oxygen atoms = 0.2 mole
Molar mass of oxygen atoms = 16 g
Mass of oxygen atoms = 16 x 0.2 = 3.2 g
(b) Mole of water molecule = 0.5 mole
Molar mass of water molecules = 2 x 1 + 16= 18 g .
Mass of H_2O = 18 x 0.5 = 9 g

Question 20. Calculate the number of molecules of sulphur (S_8) present in 16 g of solid sulphur.
Answer: Molar mass of S_8 sulphur = 256 g = 6.022 x 10^{23} molecule
Given mass of sulphur = 16 g

$$\text{Molecules of sulphur} = \frac{16 \times 6.022 \times 10^{23}}{256} = \frac{96.35 \times 10^{23}}{256}$$
$$= 0.376 \times 10^{23}$$
$$= 3.76 \times 10^{22} \text{ molecules}$$

Question 21. Calculate the number of aluminium ions present in 0.051 g of aluminium oxide. (Hint: The mass of an ion is the same as that of an atom of the same element. Atomic mass of Al = 27 u)
Answer: Molar mass of aluminium oxide Al_2O_3
= (2 x 27) + (3 x 16)
= 54 + 48 = 102 g.

$\therefore$ 102 g of Al_2O_3 contains = $2 \times 6.022 \times 10^{23}$ aluminium ions

$\therefore$ 0.051 g of Al_2O_3 contains = $\dfrac{2 \times 6.022 \times 10^{23}}{102} \times 0.051$

$$= \frac{12.044 \times 10^{23} \times 0.051}{102} = \frac{0.614 \times 10^{23}}{102}$$
$$= 0.006022 \times 10^{23}$$
$$= 6.022 \times 10^{20} \; Al^{3+} \text{ ions}$$

Question 21: Choose the correct option:
1. The atomicity of $K_2Cr_2O_7$ is   answer : [b]
(a) 9   (b) 11   (c) 10   (d) 12
2. The formula for quick lime is   answer : [d]
(a) $CaCl_2$ (b) $CaCO_3$ (c) $Ca(OH)_2$ (d) CaO
3. The symbol of cadmium is   answer : [d]
(a) Ca   (b) Cu   (c) Cm   (d)Cd
4. All noble gas molecules are   answer : [a]
(a) monoatomic   (b) diatomic   (c) triatomic
5. The valency of nitrogen in NH_3 is   answer : [b]
(a) 1   (b)3   (c) 4   (d) 5
6. The formula of ethanol is C_2H_5—OH. Its molecular mass is   answer : [a]
(a) 46 u   (b) 34 u   (c) 34 g   (d) 46 g
7. How many moles are present in 28 g of nitrogen atoms?   answer : [d]
(a) 1 mole   (b) 2.3 moles   (c) 0.5 mole   (d) 2 moles
8. The molecular mass of x is 106. x among the following is   answer : [c]
(a) $CaCO_3$ (b) SO_3 (c) Na_2CO_3 (d) NaCl
9. Which among the following is not a postulate of Dalton's atomic theory?   answer : [c]
(a) Atoms cannot be created or destroyed.
(b) Atoms of different elements have different sizes, masses and chemical properties.
(c) Atoms of same elements can combine in only one ratio to produce more than one compound.

(d) Atoms are very tiny particles which cannot be divided further.

10. Pick up the wrong pairs/combination answer : [c]

(a) 6.022×10^{23} molecules of oxygen = 32 g of oxygen (b) 6.022×10^{23} ions of sodium = 23 g of Na

(c) 6.022×10^{23} atoms of C = 24 g of carbon (d) 6.022×10^{23} atoms of H = 1 g of H atoms

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

Question 22. Define law of conservation of mass.
Answer: In a chemical reaction mass can neither be created nor destroyed.
E.g., $2Na + Cl_2 \longrightarrow 2NaCl$
$2 \times 23 + 2 \times 35.5 \longrightarrow 2(23 + 35.5)$

Question 23. Explain law of constant proportion.
Answer: In a chemical substance the elements are always present in definite proportions by mass.
E.g., In water, the ratio of the mass of hydrogen to the mass of oxygen H : O is always 1:8

Question 24. Who coined the term atom?
Answer: John Dalton coined the term atom.

Question 25. Define atom.
Answer: The smallest particle of matter, which can take part in a chemical reaction is called atom.

Question 26. Define molecule.
Answer: The smallest particle of an element or compound which can exist independently is called molecule.

Question 27. Define atomicity.
Answer: The number of atoms constituting a molecule is known as its atomicity.

Question 28. What is atomic mass unit?
Answer: The sum of the atomic masses of all the atoms in a molecule of the substance is expressed.in atomic mass unit.
E.g., $H_2O = 1 \times 2 + 16 = 18$ amu

Question 29. How do atoms exist?
Answer: Atoms exist in the form of atom, molecule or ions.

Question.30. Give the atomicity of phosphorous and nitrogen.
Answer. The atomicity of phosphorus is P_4 i.e., 4.
The atomicity of nitrogen is N_2 i.e., 2.

Question 31. What is an ion?
Answer: Charged atom is called as an ion. The ion can be positively charged called cation or negatively charged called anion.

Question 32. Give one example of cation and anion.
Answer: Cation => Na^+ Anion => Cl^-

Question 33. Give one difference between cation and anion.
Answer: Cations are positively charged ion.
Anions are negatively charged ion.

Question 34. Give the chemical formula for ammonium sulphate.
Answer: Ammonium sulphate
$NH_4^+ SO_4^{2-}$
Chemical formula ——> $(NH_4)_2SO_4$.

Question 35. What is Avogadro's constant?
Answer: The Avogadro's constant (6.022×10^{23}) is defined as the number of atoms that are present in exactly 12 g of carbon-12.

Question 36. Find the molecular mass of H_2O.
Answer: Molecular mass of $H_2O = (2 \times 1) + (16) = 2 + 16 = 18$ u

Question 37. Give the unit to measure size of atom and give size of hydrogen atom.
Answer: The unit to measure size of atom, is nanometer, size of hydrogen atom is 10^{-10}m.

Question 38. What is IUPAC, give its one function?
Answer: IUPAC is International Union for Pure and Applied Chemistry. It approves the names of elements.

Question 39. Give the Latin name for sodium, potassium, gold and mercury.
Answer: Sodium —> Natrium, Gold —> Aurum
Potassium —> Kalium, Mercury —> Hydrargyrum

Question 40. What is the ratio by mass of combining elements in H_2O, CO_2 and NH_3?
Answer: H_2O ratio by mass of combining elements 2 : 16 —>1 : 8 (H : O)
CO_2 ratio by mass of combining elements 12 : 32—> 3 : 08 (C : O)
NH_3 ratio by mass of combining elements 14 : 3—>14 : 3 (N : H)

Question 41. Define valency and give the valency for the following elements:
Magnesium, Aluminium, Chlorine and Copper.
Answer: Valency: The combining capacity of an element is called its valency. Valency of the following elements:
Magnesium – 2
Aluminium – 3
Chlorine – 1
Copper – 2

Question 42. What is polyatomic ton? Give one example.
Answer: A group of atoms carrying a charge is known as a polyatomic ion.
E.g., Ammonium – NH_4^+
Nitrate – NO_3^-

Question 43. Write down the formula for:
Copper nitrate, calcium sulphate and aluminium hydroxide.
Answer: Chemical formula: Copper nitrate —> $Cu(NO_3)$ Calcium sulphate —> $CaSO_4$
                                          Aluminium hydroxide $Al(OH)_3$

Question 44. What is formula unit mass? How is it different from molecular mass?
Answer: The formula unit mass of a substance is a sum of the atomic masses of all atoms in a formula unit of a compound. The constituent particles of formula unit mass are ions and the constituent particles of molecular mass are atoms.

Question 45. Find the number of moles in the following:
(i) 50 g of H_2O
(ii) 7 g of Na
Answer: Number of moles in
(i) Molar mass of H_2O = 18 g
Given mass of H_2O = 50 g

$$\therefore \text{ No. of moles in } 50\,g \text{ of } H_2O = \frac{50}{18} = 2.78 \text{ moles.}$$

$$(ii) \qquad \text{Molar mass of Na} = 23\,g$$
$$\text{Given mass of Na} = 7\,g$$

$$\therefore \qquad \text{No. of moles in } 7\,g \text{ of Na} = \frac{7}{23} = 0.304 \text{ moles.}$$

Question 46. Find the number of atoms in the following:
(i) 0.5 mole of C atom
Answer : 0.5 mole of C atom:
        Number of atoms in 1 mole of C atom = 6.022 x 10^{23} atoms
          Number of atoms in 0.5 mole of C atom = 6.022 x 10^{23} x 0.5

= 3.011 x 10²³ atoms
(ii) 2 mole of N atom
Answer: 2 mole of N atom:
Number of atoms in 1 mole of N atom = 6.022 x 10²³ atoms
Number of atoms in 2 mole of N atom = 6.022 x 2 x 10²³
= 1.2044 x 10²⁴ atoms

Question 47. Find the mass of the following:
(i) 6.022 x 10²³ number of O₂ molecules
Answer :6.022 x 10²³ number of 02 molecules:
Mass of 1 mole of O_2 molecule = 6.022 x 10²³ molecules = 32 g
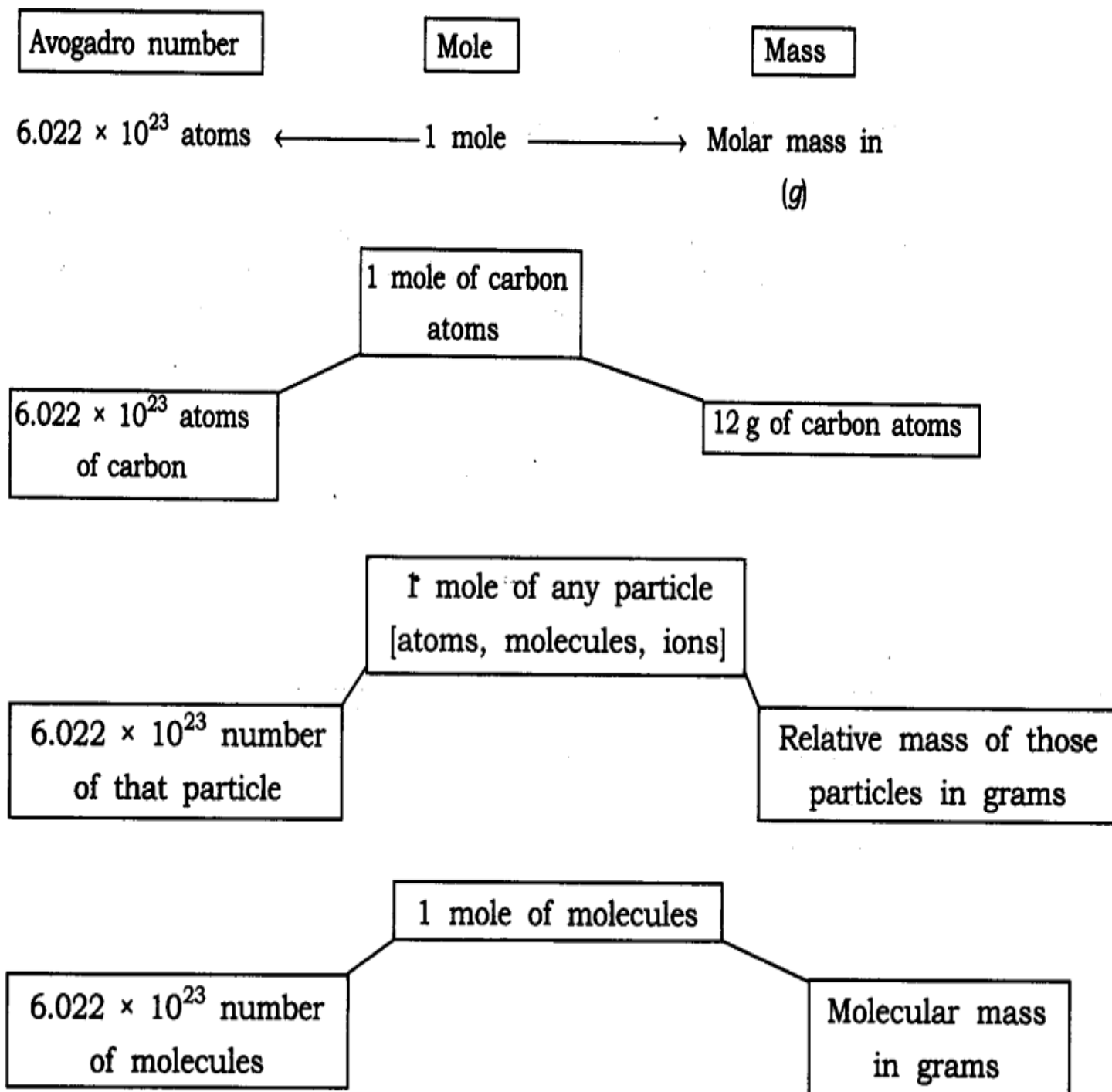**(ii) 1.5 mole of CO₂ molecule**
Aswer: 1.5 mole of CO₂ molecule:
Mass of 1 mole of C0₂ molecule = 6.022 x 10²³ molecules = 44 g
Mass of 1.5 mole C0₂ molecule = 44 x 1.5 = 66 g

Question 48. Show the relationship between mole, Avogadro number and mass.
Answer:

Avogadro number		Mole		Mass

6.022 × 10²³ atoms ⟵————1 mole ————⟶ Molar mass in
(g)

1 mole of carbon atoms

6.022 × 10²³ atoms of carbon

12 g of carbon atoms

1 mole of any particle [atoms, molecules, ions]

6.022 × 10²³ number of that particle

Relative mass of those particles in grams

1 mole of molecules

6.022 × 10²³ number of molecules

Molecular mass in grams

Question 49. What are the rules for writing the symbol of an element?
Answer: IUPAC —> International Union of Pure and Applied Chemistry approves name of elements.

Symbols are the first one or two letters of the element's name in English. The first letter of a symbol is always written as a capital letter (upper case) and the second letter as a small letter (lower case).
e.g., Hydrogen —> H Helium —> He
Some symbols are taken from the names of elements in Latin, German or Greek.
e.g., Symbol of iron is Fe, its Latin name is Ferrum.
Symbol of sodium is Na, its Latin name is Natrium.

Question 50. Explain relative atomic mass and relative molecular mass.
Answer: Relative atomic mass: It can be defined as the number of times one atom of given element is heavier than 1/12 th of the mass of an atom of carbon-12. Relative Molecular Mass: It is defined as the number of times one molecule of a substance or given element is heavier than 1/12 th of the mass of one atom of carbon-12.

Question 51. The formula of carbon-dioxide is CO_2. What information do you get from this formula?
Answer: (i) CO_2 represents carbon-dioxide.
(ii) CO_2 is one molecule of carbon-dioxide.
(iii) CO_2 is one mole of carbon-dioxide i.e., it contains 6.022×10^{23} molecules of carbon dioxide.
(iv) CO_2 contains 1 atom of carbon and two atoms of oxygen.
(v) CO_2 represents 44 g of molar mass.

Question.52. State 3 points of difference between an atom and an ion.
Answer.

Atom	Ion
1. An atom has no charge.	An ion has either positive or negative charge.
2. Number of electrons = number of protons.	Number of electrons ≠ number of protons.
3. Atom is reactive.	Ion is stable.

Question 53. Calculate the formula unit mass of NaCl and $CaCl_2$.
(Na = 23, Cl = 35.5, Ca = 40)
Answer: Formula unit mass of NaCl = 23 + 35.5= 58.5 u
Formula unit mass of $CaCl_2$ = 40 + (2 x 35.5)= 40 + 71 = 111 u

Question 54. The ratio by mass for hydrogen and oxygen in water is given as 1 : 8 respectively. Calculate the ratio by number of atoms for a water molecule.
Answer: The ratio by number of atoms for a water molecule are:

Element	Ratio by mass	Atomic mass	Mass ratio Atomic mass	Simplest ratio
H	1	1	$\dfrac{1}{1} = 1$	2
O	8	16	$\dfrac{8}{16} = \dfrac{1}{2}$	1

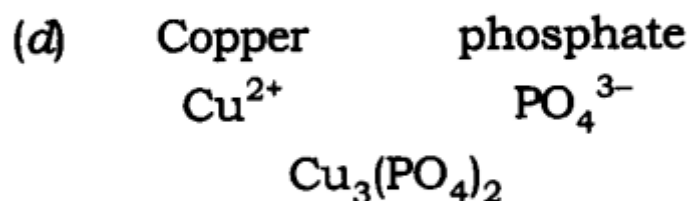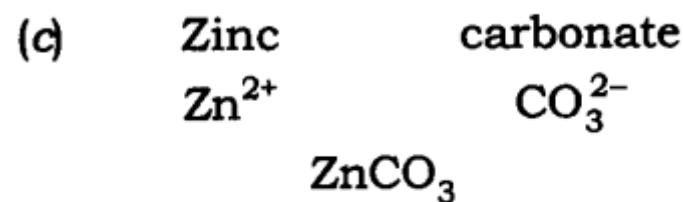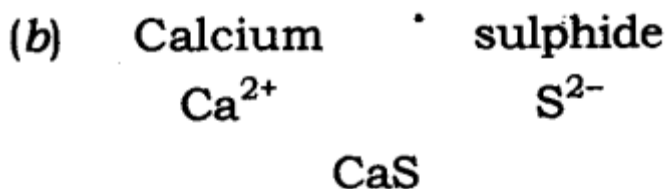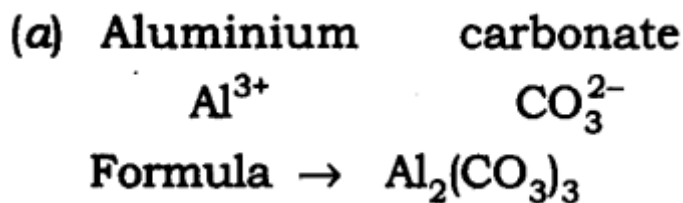Thus, the ratio by number of atoms for water is H : O = 2 : 1.

Question 55. Write down the chemical formula for the following compounds:
(a) Aluminium carbonate
(b) Calcium sulphide

(c) Zinc carbonate
(d) Copper phosphate
(e) Magnesium bicarbonate
(f) Aluminium hydroxide.
Answer: The chemical formula are:

(a) Aluminium   carbonate

$$Al^{3+} \qquad\qquad CO_3^{2-}$$

$$\text{Formula} \rightarrow Al_2(CO_3)_3$$

(b) Calcium   sulphide

$$Ca^{2+} \qquad\qquad S^{2-}$$

$$CaS$$

(c) Zinc   carbonate

$$Zn^{2+} \qquad\qquad CO_3^{2-}$$

$$ZnCO_3$$

(d) Copper   phosphate

$$Cu^{2+} \qquad\qquad PO_4^{3-}$$

$$Cu_3(PO_4)_2$$

(e) Magnesium   bicarbonate

$$Mg^{2+} \qquad\qquad HCO_3^{-}$$

$$Mg(HCO_3)_2$$

(f) Aluminium   hydroxide

$$Al^{3+} \qquad\qquad OH^{-}$$

$$Al(OH)_3$$
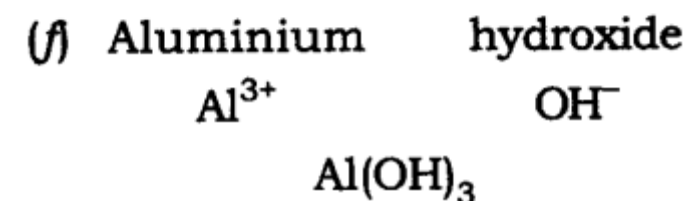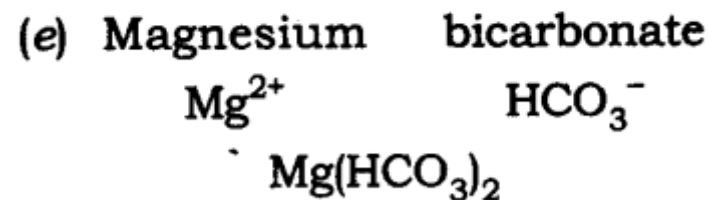
Question 20. Explain the difference between 2O, O_2 and O_3.
Answer: $2O$ —> It represents 2 atoms of oxygen (cannot exist independently).
O_2 —> It represents one molecule of oxygen (made up of 2 atom) can exist freely.
O_3 —> It represents one molecule of ozone (made up of 3 atoms) it can exist independently.

Question 21.What is meant by atomic mass, gram atomic mass of an element? Why is the mass have different expressions i.e., 'u' and 'g'?
Answer: The atoms are very tiny and their individual mass cannot be calculated as it is negligible. Hence the mass of atoms is expressed in units with respect to a fixed standard. Initially hydrogen atom with mass 1 was taken as standard unit by Dalton. Later, it was replaced by oxygen atom (0=16). But due to the isotopes the masses were found in fractions instead of whole number. Hence, carbon (C=12) isotope was taken as standard unit and was universally accepted.
The atomic mass unit is equal to one twelfth (1/12) the mass of an atom of carbon-12, its unit is u.
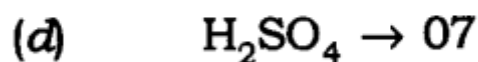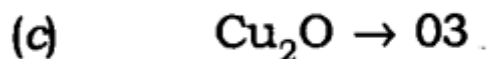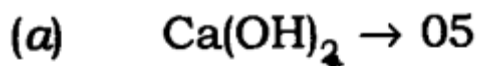**Gramatomic mass:** When the atomic mass of an element is expressed in grams, it is called the gramatomic mass of the element.
The mass of atoms, molecules is expressed in 'u' and the mass of moles i.e., molar mass is expressed in g.

Question 22. Give the atomicity of the following compounds:
(a) Ca(OH)₂   (b) Mg(HC0₃)₂   (c) Cu₂0   (d) H₂S0₄   (e) Al₂(S0₄)₃   (f) MgCl₂
Answer: The atomicity of the molecules are:

(a) $Ca(OH)_2 \rightarrow 05$

(b) $Mg(HCO_3)_2 \rightarrow 11$

(c) $Cu_2O \rightarrow 03$

(d) $H_2SO_4 \rightarrow 07$

(e) $Al_2(SO_4)_3 \rightarrow 17$

(f) $MgCl_2 \rightarrow 03$

Question 23. (a) How do atoms exist?
Answer: (a) Atoms of some elements are not able to exist independently. For such elements atoms form molecules and ions. In case of metals and inert gases atoms can exist independently.

Atoms of metals and inert gases: *E.g.*, $\underline{\text{Na, Mg, Al,}}$ $\underline{\text{He, Ne, Ar}}$

                                                                    Metals   Inert gases

Non-metals: *E.g.*, H_2, Cl_2, P_4, S_8
Exceptional non-metal C

(b) What is atomicity?
Answer : (b) The number of atoms constituting a molecule is known as its atomicity.
E.g., $O_3 \longrightarrow$ atomicity is 3 $O_2 \longrightarrow$ atomicity is 2

(c) What are polyatomic ions?
Answer: (c) Polyatomic ions: When more than two atoms combine together and act like an atom with a charge on it is called polyatomic ion.
E.g., OH^-, NO_3^-, NH_4^+

Question 24. Define a mole. Give the significance of the mole.
Answer: Mole-One mole of any species (atoms, molecules, ions or particles) is that quantity or number having a mass equal to its atomic or molecular mass in grams.
1 mole = 6.022 x 10²³ in number (atoms, molecules, ions or particles)
Significance of the mole
1. A mole gives the number of entities present i.e, 6.022 x 10²³ particles of the substance.

2. Mass of 1 mole is expressed as M grams.
3. Mass of 1 mole $=$ mass of 6.022×10^{23} atoms of the element.
     E.g.,   1 mole of $O_2 = 6.022 \times 10^{23}$ atoms
                           $2 \times 16 = 32\,g$
                 $6.022 \times 2 \times 10^{23} = 1.2044 \times 10^4$ atoms
       1 mole of (compound) $HCl = 6.022 \times 10^{23}$ atoms of H and Cl atoms
       $(1 + 35.5 = 36.5\,g)$ $(6.022 \times 10^{23}$ molecules of HCl)

Question 25. Calculate
(a) the mass of one atom of oxygen
(b) the mass of one molecule of oxygen
(c) the mass of one mole of oxygen gas
(d) the mass of one ion of oxygen
(e) the number of atoms in 1 mole of oxygen molecule
Answer:

(a) Mass of one atom of oxygen

1 mole of oxygen atom = 16 gm = 6.022×10^{23} atoms.

∴ Mass of one atom of oxygen = $\dfrac{16}{6.022 \times 10^{23}}$ = 2.65×10^{-23}

(b) Mass of one molecule of oxygen

1 molecule of oxygen = O_2

= 2 × 16

= 32 u

(c) Mass of one mole of oxygen gas

1 mole of oxygen gas is O_2 = 32 u

(d) Mass of one ion of oxygen

One mole of oxygen = 6.022×10^{23} atoms = 16g.

Mass of one ion of oxygen = $\dfrac{16}{6.022 \times 10^{23}}$

= 2.65×10^{-23}

(e) Number of atoms in one mole of oxygen molecule

1 mole of oxygen molecule i.e.,

O_2 = 6.022×10^{23} molecules.

1 molecule of O_2 = 2 atoms.

∴ Number of atoms in 1 mole of oxygen molecule = $6.022 \times 10^{23} \times 2$ atoms

= 1.2044×10^{24} atoms

(a) 1 gram of gold will contain $\dfrac{90}{100}$ = 0.9g of gold.

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

$= \dfrac{0.9}{197}$

$= 0.0046$

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

$= 2.77 \times 10^{21}$ atoms

(b) Ratio of gold : copper = 90 : 10

(c) Values of customer are responsible behaviour and self awarenes