

## 2

# THE NATURE OF MATTER

### I. Tick (✓) the most appropriate answer.

- Gases have
  - infinite free surfaces
  - two free surfaces
  - one free surface
  - no free surfaces
- Solids have
  - definite volume, but no definite shape
  - definite shape, but no definite volume
  - definite shape and definite volume
  - neither definite shape, nor definite volume
- The state of matter which can be easily compressed is
  - solid
  - liquid
  - gas
  - none of the above
- The intermolecular spaces are minimum in case of
  - solids
  - liquids
  - gases
  - only water
- The intermolecular forces are maximum in case of
  - copper
  - water
  - glycerine
  - hydrogen
- The kinetic energy of molecules at room temperature is minimum in
  - wood
  - alcohol
  - helium
  - carbon dioxide
- The constituents of a compound
  - cannot be separated
  - can be separated by physical means
  - can be separated by chemical means
  - none of the above
- The smallest independent unit of matter is a/an
  - element
  - atom
  - molecule
  - compound
- An element is made up of
  - two kinds of atoms
  - many kinds of atoms
  - one kind of atoms
  - one kind of molecules
- The symbol of a molecule of nitrogen is
  - N
  - N<sub>2</sub>
  - 2N
  - none of the above
- Which of the following substances is not miscible with water?
  - Milk
  - Honey
  - Alcohol
  - Oil
- Which of the following is a fluid?
  - Pen
  - Paper
  - Knife
  - Air
- Which of the following has a fixed shape and a fixed volume?
  - Milk
  - Water
  - Air
  - Sugar

14. Which of the following has a fixed volume but not a fixed shape?  
(a) A book (b) A brick (c) Oxygen (d) Milk
15. In which of the following are the intermolecular forces maximum?  
(a) Nitrogen (b) Ice (c) Water (d) Water vapour
16. Which of the following statements is true?  
(a) According to Dalton, atoms are divisible in nature.  
(b) Atoms do not take part in a chemical reaction.  
(c) The atoms of an element are different from those of other elements.  
(d) Atoms can be broken down into molecules.
17. The molecules of which of the following substances will contain the same kind of atoms?  
(a) Oxygen (b) Water (c) Carbon dioxide (d) Sulphur dioxide
18. The molecules of which of the following substances will contain atoms of more than one kind?  
(a) Hydrogen (b) Nitrogen (c) Oxygen (d) Water
19. Which of the following formulae represents a molecule of ozone?  
(a)  $O_2$  (b)  $O_3$  (c)  $H_2O_2$  (d)  $H_3PO_4$
20. The intermolecular spaces are negligible in  
(a) liquids (b) glycerine (c) solids (d) gases
21. The intermolecular forces of attraction are almost negligible in  
(a) water (b) wood (c) a gas (d) a solid
22. Which one of these undergoes sublimation?  
(a) Milk (b) Cement (c) Naphthalene (d) Honey
23. Which one of these can be compressed easily?  
(a) Egg (b) Soda (c) Hydrogen (d) Milk
24. The smallest unit of matter is  
(a) an atom (b) a molecule (c) an element (d) a compound
25. In a compound, elements are always present in a  
(a) fixed ratio (b) variable ratio (c) ratio of 1 : 2 (d) ratio of 2 : 1
26. Sodium chloride (common salt) is  
(a) an element (b) a compound (c) a mixture (d) a metalloid
27. A mixture can contain  
(a) two or more substances (b) only two substances  
(c) only one substance (d) none of the above
28. A pure substance has  
(a) the same physical state (b) the same colour  
(c) the same composition (d) different set of properties

29. Sugar is a compound which contains the elements  
 (a) carbon and hydrogen (b) hydrogen and oxygen  
 (c) carbon, hydrogen and oxygen (d) carbon, hydrogen and sulphur
30. Atoms of different kinds combine to form molecules of  
 (a) an element (b) a compound (c) a mixture (d) all the above
31. Sulphur and carbon are  
 (a) metals (b) non-metals (c) metalloids (d) noble gases
32. Most of the substances known to us are in the form of  
 (a) compounds (b) elements (c) mixtures (d) metalloids
- Ans.** 1. (d) 2. (c) 3. (c) 4. (a) 5. (a) 6. (a) 7. (c) 8. (c) 9. (c) 10. (b)  
 11. (d) 12. (d) 13. (d) 14. (d) 15. (b) 16. (c) 17. (a) 18. (d) 19. (b)  
 20. (c) 21. (c) 22. (c) 23. (c) 24. (a) 25. (a) 26. (b) 27. (a) 28. (c)  
 29. (c) 30. (b) 31. (b) 32. (c).

**II. (a) Fill in the blank spaces by choosing the correct words from the following list :**

**List:** beaten, atom, molecule, independent, definite, wires, metals, inert gases, 82, non-metals, space, minimum, liquid, volume.

1. There are ..... normal elements.
2. Elements can be classified as ....., ..... and .....
3. Metals can be ..... into sheets and drawn into .....
4. An ..... is the smallest unit of matter, which may or may not have an ..... existence.
5. A pure substance whose ..... contain two or more atoms, combined together in a ..... ratio, is called a compound.
6. The intermolecular spaces in case of solids are .....
7. Any material which has a definite ..... but no definite shape is called a .....
8. Gases can fill the entire .....

**Ans.** 1. 82 2. non-metals, metals and inert gases 3. beaten, wires 4. atom, independent 5. molecules, definite 6. minimum 7. volume, liquid 8. space.

- (b)
1. A gas is ..... (compressible/incompressible).
  2. .... are fluids (gases/solids).
  3. On being ..... a solid changes into a liquid (heated/cooled).
  4. On being ..... a gas changes into a liquid (heated/cooled).
  5. A gas condenses as the intermolecular space ..... (increases/decreases).

6. The properties of a compound are ..... those of its constituent elements (different from/similar to).
7. Atoms of an element ..... all the properties of the element (show/do not show).

**Ans.** 1. compressible 2. Gases 3. heated 4. cooled 5. decreases 6. different from 7. show.

**III. Fill in the blanks.**

1. The state of matter can be changed by changing its ..... and .....
2. When a liquid is cooled it ..... to form a solid.
3. When a gas is cooled its molecules ..... energy.
4. Water ..... to form vapour.
5. .... and ..... can flow.
6. Matter is anything that has ..... and occupies .....
7. Same kind of atoms combine to form .....
8. .... and ..... are pure substances.
9. The constituents of mixture may be present in ..... ratio.
10. Compounds are made up of elements combined in a ..... ratio.
11. .... can flow.
12. The molecules are at a greater distance in ..... compared to liquids.
13. Water boils at ..... °C.
14. The physical state of a substance, which has a fixed volume but no fixed shape is a .....
15. .... refers to the number of atoms in the molecule of an element.
16. The most abundant element in the earth's crust is .....
17. The most abundant element in the atmosphere is .....
18. A non-metal which is a liquid is .....
19. A metal which is a good conductor of heat and electricity is .....
20. A diatomic gaseous element is .....

**Ans.** 1. temperature, pressure 2. freezes 3. lose 4. evaporates 5. Liquids, gases 6. mass, space 7. molecule 8. Sugar, salt 9. varying 10. fixed 11. Fluids 12. gases 13. 100 14. liquid 15. Atomicity 16. oxygen 17. nitrogen 18. bromine 19. copper 20. nitrogen/oxygen/hydrogen.

**IV. Statements given below are incorrect. Write correct statements:**

1. Smallest unit of matter which may or may not have an independent existence, is called a molecule.

**Ans.** Smallest unit of matter which may or may not have an independent existence is called an atom.

2. Noble gases can react with each other.

**Ans.** Noble gases do not react either with each other or any other elements.

3. A molecule of a compound contains atoms of different elements, combined together in different ratios.

**Ans.** A molecule of a compound contains atoms of different elements, combined together in a definite ratio.

4. Non-metals are generally solids and good conductors of electricity.

**Ans.** Non-metals may be solids, liquids or gases and are generally bad conductors of heat and electricity.

5. Elements can be divided into three classes, i.e., metals, non-metals and gases.

**Ans.** Elements can be divided into three classes:

(i) Metals      (ii) Non-metals      (iii) Noble gases

6. A gas can have any number of free surfaces.

**Ans.** Gases have no free surfaces.

7. The intermolecular forces are very small in case of solids. Solids can flow and liquids can be heaped.

**Ans.** Maximum intermolecular forces are present in case of solids. Liquids can flow and solids can be heaped.

**V. State whether the following statements are true or false.**

1. A gas can have any number of free surfaces.

2. The intermolecular forces in solids are very large.

3. Liquids can flow but solids can be heaped.

4. The weakest intermolecular forces are in the case of gases.

5. Liquids are fairly compressible.

6. All normal elements give out radioactive radiations.

7. Two or more atoms of different elements combine in a definite ratio to form a compound.

8. Noble gases can react with each other.

9.  $H_2$  represents one molecule of hydrogen.

10.  $2N_2$  represents two molecules of nitrogen.

11. Air is not matter.

12. A liquid expands more than a solid on being heated.

13. Gases freely mix with one another.
14. Solids can be compressed easily.
15. Naphthalene sublimes on heating.
16. The molecules in a solid are loosely packed.
17. The intermolecular spaces in gases are negligible.
18. The same substance can exist in different states at different temperatures and pressures.
19. A change of state from liquid to gas is called condensation.
20. Elements and compounds are mixtures.
21. Elements combine in any ratio to form compounds.
22. Elements present in carbon dioxide gas are carbon and oxygen.
23. The constituents of a mixture are separated chemically.
24. There is no difference between evaporation and boiling.
25. All solids, on heating first change to the liquid and then to the gaseous state.
26. Only water can exist in three different states.
27. If the container in which a gas is collected has an opening, the gas will flow out and spread itself indefinitely.
28. A compound is made up of just one kind of atoms.
29. Metals reflect light and are good conductors of electricity.
30. Metals can be polished.
31. Elements are made up of compounds.
32. All elements are artificially prepared.
33. Molecules can exist independently.
34. Molecules combine to form atoms.

**Ans.1.** F 2. T 3. T 4. T 5. T 6. F 7. T 8. F 9. T 10. T 11. F 12. T 13. T  
14. F 15. T 16. F 17. F 18. T 19. F 20. F 21. F 22. T 23. F 24. F  
25. F 26. F 27. T 28. F 29. T 30. T 31. F 32. F 33. T 34. F.

**VI. Find the odd one out. Give a reason for your answer.**

1. Magnesium, mercury, manganese and silver.

**Ans. Mercury:** Magnesium, manganese and silver are solids at room temperature and mercury is in the liquid state.

2. Hydrogen, oxygen, nitrogen and helium.

**Ans. Helium:** Helium is a noble gas while hydrogen, oxygen and nitrogen are not noble gases.

3. Cu, Fe, He and H<sub>2</sub>  
**Ans. Helium:** Helium is an inert gas while copper, iron and hydrogen are reactive elements.
4. Sulphur, phosphorus, graphite and silicon.  
**Ans. Graphite:** Graphite is a form of carbon which is a good conductor of electricity while sulphur, phosphorus and silicon are elements which are bad conductors of electricity.
5. Solid, vacuum, liquid and gas  
**Ans. Vacuum:** Solid, liquid and gas are the three states of matter while vacuum is a space with no substances.
6. Solid, vapour, liquid, gas  
**Ans. Vapour:** Solid, liquid and gas are the three states of matter while vapour is the gaseous form of a substance which exists as a liquid at room temperature.
7. Air, smoke, mercury, hydrogen, nitrogen  
**Ans. Mercury:** Mercury is liquid metal at room temperature while air, smoke, hydrogen and nitrogen are gases or substances in the gaseous state.
8. Oxygen, honey, nitrogen, iron, water  
**Ans. Iron:** Oxygen, honey, nitrogen, water are fluids while iron is in the solid form.
9. Condensation, evaporation, sublimation, solidification  
**Ans. Sublimation:** Sublimation is the process of changing of a solid directly into gaseous state without undergoing the intermediate liquid state on heating and vice versa. While condensation is the process of changing of a gas into liquid state, evaporation is the process of changing of a liquid into gaseous state and solidification is the process of changing of a liquid into solid state.
10. Water, wood, air, sound  
**Ans. Sound:** Water, wood and air the forms of matter while sound is a form of energy.
11. Gold, silver, sulphur, copper, iron  
**Ans. Sulphur:** Gold, silver, copper and iron are metals while sulphur is a non-metal.
12. Boron, silicon, arsenic, antimony, iron  
**Ans. Iron:** Boron, silicon, arsenic and antimony are non-metals while iron is a metal.

**VII. Match the statements in Column A with those in Column B.**

(a)	<i>Column A</i>	<i>Column B</i>
	<ol style="list-style-type: none"> <li>Smallest unit of matter which may or may not have an independent existence.</li> <li>Elements which are generally good conductors of electricity.</li> <li>Elements which are chemically inactive.</li> <li>Elements which are generally bad conductors of electricity.</li> <li>An acid of nitrogen.</li> <li>Smallest unit of a substance which can exist independently.</li> <li>A liquid metal at room temperature.</li> <li>A non-metal which conducts heat and electricity.</li> <li>A molecule containing similar atoms.</li> <li>A noble gas used for filling weather observation balloons.</li> </ol>	<ol style="list-style-type: none"> <li>Nitric acid</li> <li>Atom</li> <li>Metals</li> <li>Noble gases</li> <li>Non-metals</li> <li>Graphite</li> <li>Oxygen</li> <li>Molecule</li> <li>Helium</li> <li>Mercury</li> </ol>

**Ans.** 1. (b) 2. (c) 3. (d) 4. (e) 5. (a) 6. (h) 7. (j) 8. (f) 9. (g) 10. (i)

(b)	<i>Column A</i>	<i>Column B</i>
	<ol style="list-style-type: none"> <li>Melting</li> <li>Evaporation</li> <li>Condensation</li> <li>Sublimation</li> <li>Solidification</li> </ol>	<ol style="list-style-type: none"> <li>change from vapour to liquid</li> <li>change from liquid to solid</li> <li>change from solid to liquid</li> <li>change from solid to gas</li> <li>change from liquid to gas</li> </ol>

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

(c)	<i>Column A</i>	<i>Column B</i>
	<ol style="list-style-type: none"> <li>Solids</li> <li>Sublimation</li> <li>Boiling point</li> <li>Gases</li> <li>Intermolecular space</li> </ol>	<ol style="list-style-type: none"> <li>Can flow in all directions.</li> <li>The temperature at which a liquid changes to its gaseous state.</li> <li>Any number of free surfaces.</li> <li>Gaps between particles.</li> <li>Change of state from solid to gas.</li> </ol>

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



(d)	<i>Column A</i>	<i>Column B</i>
	<ol style="list-style-type: none"> <li>1. Metals</li> <li>2. Molecules</li> <li>3. Non-metals</li> <li>4. Noble gases</li> </ol>	<ol style="list-style-type: none"> <li>a. Unreactive</li> <li>b. Brittle</li> <li>c. Lustrous</li> <li>d. Smallest unit of a compound</li> </ol>

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

**VIII. Complete the following table:**

<i>Formula of compounds</i>	<i>Elements present in the compound</i>
CO <sub>2</sub>	Carbon and Oxygen
CaO	..... and .....
PbO	..... and .....
PbS	..... and .....
CuS	..... and .....
FeS	..... and .....

**Ans.** CO<sub>2</sub> — Carbon and oxygen      CaO — Calcium and oxygen  
 PbO — Lead and oxygen      PbS — Lead and sulphur  
 CuS — Copper and sulphur      FeS — Iron and sulphur.

**IX. Give reasons for the following:**

1. We need to classify matter.  
**Ans.** We have a variety of things around us and to study all these individually, it is an impossible task. To simplify the process, we need to classify or group them together. Thus classification makes the study of matter easy, systematic and more scientific.
2. Electricity is not considered as matter.  
**Ans.** Electricity is not considered as matter because it neither has mass nor occupies space.
3. Milk is a mixture.  
**Ans.** Milk is an impure substance formed by the physical combination of lactose, sugar, fat and water. So it is a mixture.
4. Mixtures do not have fixed melting or boiling points.  
**Ans.** Mixtures do not have fixed melting and boiling points because their constituents can be mixed in varying ratios.
5. Constituents of a mixture can be easily separated by physical methods.

**Ans.** Constituents of a mixture can be easily separated by physical methods because they are not combined chemically.

**X. Answer the following questions:**

1. (i) Define solid.  
(ii) On the basis of molecular theory, explain why solids have definite shape and definite volume.

**Ans.** (i) Solids are substances which have definite shape and definite volume such that it can have any number of free surfaces.  
(ii) In solids, molecules are closely packed and arranged in a fixed pattern. The intermolecular spaces between the molecules are very small and they have strong intermolecular forces of attraction. Thus, solids have definite shape and volume.

2. (i) Define liquid.  
(ii) On the basis of molecular theory, explain why liquids have definite volume but do not have definite shape.

**Ans.** (i) Liquids are substances which have definite volume, but no definite shape and have only one free surface.  
(ii) In liquids, intermolecular space between the molecules is more as compared to solids. Thus, there are no strong intermolecular forces of attraction between the molecules and they can interchange their positions. Therefore liquids do not have definite shape. Due to this reason liquids have definite volume.

3. (i) Define gas.  
(ii) On the basis of molecular theory, explain why gases have neither definite shape nor definite volume.

**Ans.** (i) Gases are substances which have neither definite shape nor definite volume, are easily compressible and have no free surface.  
(ii) In gases, molecules are very far apart from each other and the intermolecular spaces between the molecules are large. Therefore intermolecular forces between the molecules are almost negligible. Due to this, gases do not have definite shape or definite volume.

4. Why can liquids flow, whereas solids can be heaped?

**Ans.** In liquids, particles are not very close to each other. So, the molecules do not possess strong intermolecular forces of attraction but they can move freely within the bulk. Due to this reason, liquids flow on the surface.

In solids, molecules are very close to each other and are arranged in a fixed pattern. Thus, the molecules vibrate in a fixed position and do not show free movement due to strong intermolecular force of attraction. Thus, solids can be heaped.

5. Why can liquids easily take the shape of a container but not solids?

**Ans.** In liquids, molecules are loosely packed hence, they can interchange their positions. Therefore, liquids easily take the shape of the container. Solids have strong intermolecular forces of attraction between their molecules and they cannot interchange their positions. So, they cannot take the shape of the container.

6. Why a cylinder can not be filled with a gas?

**Ans.** In gases, the molecules are very far apart from each other. Due to the large intermolecular spaces, intermolecular forces are almost negligible. So, the molecules of gases can move freely in all possible directions and spread out in all directions. Due to this reason gases cannot be filled in a cylinder.

7. (i) State four important properties of metals.

(ii) Write the symbols of the following metals:

- (a) Magnesium      (b) Potassium      (c) Iron  
(d) Silver            (e) Lead                (f) Sodium

(iii) Name the metals with the following symbols :

- (a) Na (b) Al (c) Mn (d) Ni (e) Pt (f) Au

**Ans.** (i) **Four important properties of metals are:**

- (i) They are generally solids at room temperature.  
(ii) They are lustrous.  
(iii) Metals produce a sonorous sound on being hit.  
(iv) Metals are good conductors of heat and electricity.

(ii) Magnesium — Mg, Potassium — K, Iron — Fe, Silver — Ag,  
Lead — Pb, Sodium — Na

(iii) Na — Sodium, Al — Aluminium, Mn — Manganese  
Ni — Nickel, Pt — Platinum, Au — Gold

8. (i) State four important properties of non-metals.

(ii) Write the symbols of the following atoms of non-metals :

- (a) Silicon (b) Hydrogen (c) Chlorine (d) Nitrogen

(iii) What do the following symbols stand for?

- (a) I                    (b) O                    (c) S  
(d) Br                  (e) P                    (f) F

**Ans. (i) Four important properties of non-metal.**

(i) Non-metals are gases or liquids or solids at room temperature.

(ii) They have no lustre.

(iii) They do not produce any sonorous sound on being hit.

(iv) They are generally bad conductors of heat and electricity.

(ii) **Non-metals** **Symbols (atoms)**

Silicon ..... Si

Hydrogen ..... H

Chlorine ..... Cl

Nitrogen ..... N

(iii) **Symbols** **Name** **Symbols** **Name**

I ..... Iodine O ..... Oxygen

S ..... Sulphur Br ..... Bromine

P ..... Phosphorus F ..... Fluorine

**9. (i) What do you understand by the following terms?**

(a) Atom (b) Molecule

(ii) Write the symbols for the molecules of the following non-metals:

(a) Hydrogen (b) Oxygen (c) Ozone

(d) Phosphorus (e) Sulphur (f) Iodine

**Ans. (i) (a) Atom.** The smallest particle of an element which may or may not have independent existence but always takes part in a chemical reaction is called an atom.

(b) **Molecule.** The smallest unit of a substance which always exists independently and can retain all the chemical and physical properties of that substance is called a molecule.

(ii) **Non-metals** **Symbols (molecules)**

Hydrogen ..... H<sub>2</sub>

Oxygen ..... O<sub>2</sub>

Ozone ..... O<sub>3</sub>

Phosphorus ..... P<sub>4</sub>

Sulphur ..... S<sub>8</sub>

Iodine ..... I<sub>2</sub>

**10. (i) Define the term compound.**

(ii) Define the term chemical formula.

(iii) What does a chemical formula represent?

- Ans.** (i) **Compound.** When two or more atoms of different elements combine together in a definite ratio, then it is said to be a molecule of a compound.
- (ii) **Chemical formula.** A symbolic representation of one molecule of a compound which represents the number of atoms of various elements present in it is called formula of a compound.
- (iii) A chemical formula represents the number of atoms of various elements present in a compound.

**11.** What does each of the following formulae represent?

- (i) 2H                      (ii) O<sub>2</sub>                      (iii) 4H<sub>2</sub>O                      (iv) CuSO<sub>4</sub>

- Ans.** 2H                      • 2 atoms of hydrogen  
 O<sub>2</sub>                      • One molecule of oxygen  
 4H<sub>2</sub>O                      • 4 molecules of water  
 CuSO<sub>4</sub>                      • One molecule of copper sulphate.

**12.** Write the number of atoms of each element in the following molecules :

- (i) Na<sub>2</sub>CO<sub>3</sub>                      (ii) CuSO<sub>4</sub>                      (iii) Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>                      (iv) H<sub>2</sub>SO<sub>4</sub>

- Ans.** (i) **Sodium carbonate (Na<sub>2</sub>CO<sub>3</sub>)** has two atoms of sodium, one atom of carbon and three atoms of oxygen.
- (ii) **Copper sulphate (CuSO<sub>4</sub>)** has one atom of copper, one atom of sulphur and four atoms of oxygen.
- (iii) **Aluminium sulphate Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub>** has two atoms of aluminium, three atoms of sulphur and twelve atoms of oxygen.
- (iv) **Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>)** has two atoms of hydrogen, one atom of sulphur and four atoms of oxygen.

**13.** Write the chemical name of the following compounds:

- (i) HCl (ii) NaOH (iii) CaO (iv) NaCl (v) Na<sub>2</sub>CO<sub>3</sub> (vi) CuSO<sub>4</sub>

<b>Ans. Formula</b>		<b>Compound</b>
HCl	....	Hydrochloric acid
NaOH	....	Sodium hydroxide
CaO	....	Calcium oxide
NaCl	....	Sodium chloride
Na <sub>2</sub> CO <sub>3</sub>	....	Sodium carbonate
CuSO <sub>4</sub>	....	Copper sulphate

**14.** Write the chemical formula of each of the following compounds:

- (i) Nitric acid, (ii) Calcium oxide, (iii) Sodium bicarbonate  
 (iv) Silver nitrate (v) Ferrous sulphide (vi) Copper sulphate

<b>Ans. Formula</b>		<b>Compound</b>
Nitric acid	....	HNO <sub>3</sub>
Calcium oxide	....	CaO
Sodium bicarbonate	....	NaHCO <sub>3</sub>
Silver nitrate	....	AgNO <sub>3</sub>
Ferrous sulphide	....	FeS
Copper sulphate	....	CuSO <sub>4</sub>

15. Define matter.

**Ans.** Matter is anything that has mass and occupies spaces. For example, a chair, a table, etc.

16. Classify the following as solid, liquid or gas:

(i) A book (ii) Water (iii) A pen (iv) Water vapour (v) Milk (vi) Ice

**Ans. Solid** • A book, a pen, ice

**Liquid** • Water, milk

**Gas** • Water vapour

17. Arrange solids, liquids and gases in order of increasing intermolecular forces and decreasing intermolecular space.

**Ans.** Increasing order of intermolecular force in solids, liquids and gases.

Gases < Liquid < Solid

Decreasing order of intermolecular space in solids, liquids and gases.

Gases > Liquid > Solid

18. What are the following changes in state called?

(i) Gas to liquid (ii) Liquid to gas (iii) Solid to liquid

**Ans. Change in state** **Name**

Gas to liquid Condensation

Liquid to gas Vapourisation

Solid to liquid Melting

19. Name a substance that sublimates.

**Ans.** Naphthalene.

20. Define and explain an element.

**Ans.** An element is a substance that cannot be split into simpler substances by chemical means.

21. Classify the following elements into metals and non-metals:

(i) Carbon (ii) Nitrogen (iii) Copper (iv) Iron

(v) Oxygen (vi) Zinc (vii) Lead (viii) Hydrogen

**Ans. Metals.** Iron, copper, zinc, lead.

**Non-metals.** Carbon, nitrogen, oxygen, hydrogen.

22. Name a metal which exists in (i) solid and (ii) liquid state at room temperature.

**Ans.** (i) Iron exists in the solid state.

Mercury exists in the liquid state.

23. Name a non-metal which exists in (i) solid, (ii) liquid and (iii) gaseous state.

**Ans.** Carbon exists in the solid state, bromine exists in the liquid state. Hydrogen exists in the gaseous state.

24. What determines the state of matter? Explain the three states of matter.

**Ans.** Molecular arrangement of matter determines the state of matter.

Three states of matter are:

**Solid state.** The molecules in a solid are packed close to each other. Intermolecular spaces are almost negligible in a solid. The molecules are held together with strong intermolecular forces of attraction.

**Liquid state.** The molecules in a liquid are less tightly packed as compared to a solid. The intermolecular spaces between the molecules are larger than that in a solid and intermolecular force between the molecules are greater than that of a solid. So, the molecules can move in the bulk.

**Gaseous state.** In gases, the molecules are far apart from each other. So, they have large intermolecular space and less intermolecular force between the molecules. These molecules can move freely in all directions and collide with each other.

25. Name two factors which influence the molecular arrangement of matter.

**Ans.** Intermolecular force and intermolecular space influence the arrangement of molecules in solids, liquids and gases.

26. How does a change in temperature affect the state of matter?

**Ans.** When we heat a solid we supply energy to its molecules. These molecules then move faster, thus decreasing the intermolecular forces of attraction and increasing the intermolecular spaces. The molecules of the solid then attain the molecular arrangement of a liquid. Now further heating of the liquid makes the molecules free from intermolecular forces of attraction and the liquid changes into the gaseous state.

27. Are metalloids a mixture of metals and non-metals? Give reasons.

**Ans.** Metalloids are not a mixture of metals and non-metals. These are the

elements which have properties of both metals and nonmetals, e.g., silicon, arsenic.

**28.** Name five compounds and give their constituents.

**Ans.** Compounds are substances which are made up of two or more elements. It means a compound has atoms of at least two different elements.

Compounds	Formula	Constituents
1. Common salt	... NaCl	... Sodium + Chloride
2. Water	... H <sub>2</sub> O	... Hydrogen + Oxygen
3. Sulphur dioxide	... SO <sub>2</sub>	... Sulphur + Oxygen
4. Copper sulphate	... CuS	... Copper + Sulphur
5. Nitric acid	... HNO <sub>3</sub>	... Hydrogen + Nitrogen + Oxygen

**29.** What are the differences between compounds and mixtures?

Compound	Mixture
(1) They are made of two or more elements combined chemically.	(1) They are made of two or more elements combined physically.
(2) The constituents of a compound are present in a fixed ratio.	(2) The constituents of a mixture are present in varying ratios.
(3) The constituents of a compound can be separated by chemical means only.	(3) The constituents of a mixture can be separated by physical means only.
(4) Compounds have fixed properties.	(4) Mixtures do not have fixed properties.

**30.** A glass tumbler kept on a table appears to be empty. How can you prove that it is not actually empty?

**Ans.** A glass tumbler, which is kept on the table, is not empty. It is full of air. It can be proved by an experiment. Take an empty glass tumbler and lower it vertically downward in a trough of water. We will observe that the level of water inside the tumbler is lower as compared to the water outside. It proves that something is present in the glass tumbler.

If we tilt the glass tumbler to one side, some bubbles rush out and water flows into the tumbler. This proves that air is present in the glass tumbler that occupies space.

**31.** For each of the following statements, say whether it describes a solid, a liquid or a gas.



- (i) Particles move about very quickly, (ii) Particles are quite close together, (iii) Particles are far apart and move in all directions.
- Ans.** (i) It describes a liquid as well as a gas because in liquid and gases particles move about very quickly.  
(ii) It describes a solid because in solid, particles are very close to each other.  
(iii) It describes a gas because in gas, particles are far apart and move in all directions.
- 32.** Mention three gaseous elements and their symbols.  
**Ans.** Hydrogen .... H, Oxygen .... O, Helium .... He
- 33.** How do molecules of compounds differ from molecules of elements?  
**Ans.** Molecules of a compound contain atoms of two or more elements while molecules of an element contain atoms of the same element. For example,  $H_2O$  is a compound that contains atoms of two different elements — hydrogen and oxygen.  
A molecule of oxygen ( $O_2$ ) contains two atoms of oxygen.
- 34.** State the number of atoms and the kinds of atoms present in  $C_6H_{12}O_6$ .  
**Ans.** In  $C_6H_{12}O_6$  total number of atoms are 24. It has three kinds of atoms 6 atoms of carbon, 12 of hydrogen and 6 of oxygen.
- 35.** What are the elements present in common salt?  
**Ans.** Common salt (sodium, chloride,  $NaCl$ ) contains two elements — sodium (Na) and chlorine (Cl).
- 36.** Into how many groups are elements divided? Name them.  
**Ans.** Elements are divided into four groups:  
(i) Metals (ii) Non-metals (iii) Metalloids (iv) Noble (or inert) gases
- 37.** Name two substances which dissolve in water.  
**Ans.** Common salt and sugar dissolve in water.
- 38.** What is the importance of a symbol?  
**Ans.** In modern chemistry, each element is denoted by a symbol. With the help of symbols, it is easy to study all elements in a single time. A symbol also represents an atom of that element.
- 39.** How do the following differ from each other:  
(i)  $2H$  and  $2H_2$ ? (ii)  $O$  and  $O_2$ ?  
**Ans.**  $[2H]$  represents two atoms of hydrogen  
 $[2H_2]$  represents two molecules of hydrogen.  
 $[O]$  represents an atom of oxygen.  
 $[O_2]$  represents a molecule of oxygen.

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