

Chapter 6: Composition of matter

Question. 1. Fill in the blanks:

- (1) **Liquids** have no definite shape, but have a definite volume.
- (2) **Gases** have neither a definite shape nor a definite volume.
- (3) The properties of a **compound** are different than those of the constitute elements.
- (4) The part of matter having uniform composition is called **phase**
- (5) The heterogeneous mixture of a liquid and a solid is called a **suspension**
- (6) A colloid is a **heterogeneous mixture**

Question. 2. Choose the appropriate option and rewrite the following statements:

- (1) The intermolecular force is **maximum** in the particles of solid.
(a) minimum (b) moderate
(c) maximum (d) indefinite
- (2) Solids retain their volume even when external pressure is applied. This property is called **incompressibility**
(a) plasticity (b) incompressibility
(c) fluidity (d) elasticity
- (3) Matter is classified into the types mixture, compound and element, by applying the criterion **chemical composition of matter**
(a) states of matter (b) phases of matters
(c) chemical composition of matter (d) all of these
- (4) Matter that contain two or more constituent substances is called **mixture**
(a) mixture (b) compound
(c) element (d) metalloid
- (5) Milk is an example of type of matter called **homogeneous mixture**
(a) solution (b) homogeneous mixture
(c) heterogeneous mixture (d) suspension
- (6) Water, mercury and bromine are similar to each other, because the three are **liquids**
(a) liquids (b) compounds
(c) nonmetals (d) elements

(7) Valency of carbon is 4 and that of oxygen is 2. From this, we understand that there are **2** bond/bonds between the carbon atom and one oxygen atom in the compound-carbon dioxide. chemical

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

Question. 3. State whether the following statements are True or False:

- (1) Liquids do not have a definite shape. **True**
(2) Gases have a definite shape and volume. **False**
(3) The crystals of blue vitriol form a single phase. **True**
(4) Water is a mixture. **False**
(5) Milk is a colloid. **True**

Question. 4. Identify the odd term:

- (1) Gold, silver, copper, brass. **Brass**
(2) Hydrogen, hydrogen peroxide, carbon dioxide, water vapour. **Hydrogen**
(3) Milk, lemon juice, carbon, steel, **Carbon**
(4) Water, mercury, bromine, petrol, **Petrol**
(5) Sugar, salt, baking soda, blue vitriol. **Sugar**
(6) Hydrogen, sodium, potassium, carbon. **Carbon**

(3) Match the column:

[1] Column I	Answer	Column II
(1) Potassium dichromate	Compound	(a) Complex compound
(2) Cyanocobalamine	Complex compound	(b) Element
(3) Air	Mixture	(c) Compound
(4) Silver	Element	(d) Mixture

[2] Column I	Answer	Column II
(1) Milk	Colloid	(a) Alloy
(2) Lemonade	Solution	(b) Colloid
(3) Sand and water	Suspension	(c) Solution
(4) Brass	Alloy	(d) Suspension

Question. 6. Answer the following questions in one sentence:

(1) Why does a solid have definite volume?

Answer: A solid has a definite volume because its particles are tightly packed and fixed in place, allowing little movement.

(2) Why does a liquid have indefinite shape?

Answer: A liquid has an indefinite shape because its particles can move past each other, allowing it to take the shape of its container.

(3) Why does a gas have indefinite volume and shape?

Answer: A gas has indefinite volume and shape because its particles are far apart and move freely, filling any available space.

(4) What can you say about the distance between the neighbouring particles of solid?

Answer: The distance between neighboring particles of a solid is very small, as the particles are closely packed together.

(5) State whether the mixture of oil in water is a homogeneous or heterogeneous mixture.

Answer: The mixture of oil in water is a heterogeneous mixture because the two substances do not mix uniformly.

(6) Give two examples of gas in liquid.

Answer: Two examples of gas in liquid are carbon dioxide in soda water and oxygen in water.

(7) Give molecular formulae of (1) potassium chloride (2) sodium sulphide.

Answer: The molecular formula of potassium chloride is KCl, and the molecular formula of sodium sulphide is Na₂S.

(8) State the molecular formula and number of hydrogen atoms in methane.

Answer: The molecular formula of methane is CH₄, and it has 4 hydrogen atoms.

(9) Identify the valency of chlorine in (i) KCl and (ii) CaCl₂.

Answer: The valency of chlorine is 1 in both (i) KCl and (ii) CaCl₂.

Question. 7. Answer the following questions:

(1) State any three characteristics of solids.

Answer:

1. Solids have a definite shape and volume.
2. The particles in solids are closely packed in a fixed arrangement.
3. Solids are generally incompressible and have high density.
4. Solids resist deformation and maintain their shape under external forces.

(2) What is meant by rigidity of solids?

Answer: Rigidity of solids refers to their ability to maintain a fixed shape and resist deformation when an external force is applied.

(3) What is meant by elasticity of solids?

Answer: Elasticity of solids is the property by which a solid can return to its original shape and size after the force causing deformation is removed.

(4) What is meant by plasticity?

Answer: Plasticity is the property of solids that allows them to permanently change shape when a force is applied, without returning to their original shape.

(5) Solids have a high density and negligible compressibility. Explain.

Answer: Solids have high density because their particles are tightly packed, leaving little empty space, and they are incompressible because the particles cannot be pushed closer together easily.

(6) State any three characteristics of liquids.

Answer:

1. Liquids have a definite volume but no definite shape, taking the shape of their container.
2. They have lower density compared to solids but higher than gases.
3. Liquids can flow and have fluidity.
4. They are almost incompressible, but slightly more compressible than solids.

(7) Liquids have fluidity and they do not have a definite shape. Explain.

Answer: Liquids can flow because their particles are less tightly packed than in solids, allowing them to move past each other, and they take the shape of their container due to this free movement.

(8) State any three characteristics of gases.

Answer:

1. Gases have no definite shape or volume and expand to fill their container.
2. They have very low density because the particles are spread far apart.
3. Gases are highly compressible due to the large spaces between particles.
4. Gases can diffuse and mix quickly due to the rapid movement of particles.

(9) What is an element? Give two examples.

Answer: An element is a pure substance made of only one type of atom, and cannot be broken down into simpler substances. Two examples are oxygen (O) and iron (Fe).

(10) What is a compound? Give two examples.

Answer: A compound is a substance made from two or more different elements chemically bonded together. Two examples are water (H₂O) and carbon dioxide (CO₂).

(11) What is a mixture? Give two examples.

Answer: A mixture is a combination of two or more substances that are physically combined and can be separated by physical means. Two examples are air (a mixture of gases) and saltwater (a mixture of salt and water).

(12) Sea water tastes salty due to the dissolved salt. The salinity (the proportion of salts in water) of some water bodies Lonar lake 7.9%, Pacific Ocean 3.5%, Mediterranean sea 3.8%, Dead sea 33.7%. Explain two characteristics of mixtures from the above information.

Answer:

1. Variable Composition: The salinity of water varies across different bodies of water, showing that mixtures can have variable proportions of components.
2. Components Retain Properties: Despite being mixed with water, the salt retains its property of being salty, demonstrating that the substances in mixtures retain their individual properties.

(13) Chemical composition of some matter is given in the following table. Identify the main type of matter from them.

Name of matter.	Chemical composition	Main type of matter
Sea water	H ₂ O+NaCl+MgCl ₂ +...	Mixture
Distilled water.	H ₂ O	Compound

Hydrogen gas filled in a balloon	H_2	Element
The gas in LPG cylinder	$CH_4 + C_2H_6$	Mixture
Baking soda	$NaHCO_3$	Compound
Pure gold	Au	Element
The gas in oxygen cylinder	O_2	Element
Bronze	$Cu + Sn$	Mixture
Diamond	C	Element
Heated white powder of blue vitriol	$CuSO_4$	Compound
Limestone	$CaCO_3$	Compound
Dilute hydrochloric acid	$HCl + H_2O$	Mixture

(14) Write the composition of the following materials by means of chemical formulae and classify them accordingly. (Can you tell? Textbook page 40)

Name of the material	Chemical formulae/composition	Type of matter
Water	H_2O	Compound
Carbon	C	Element
Oxygen	O_2	Element
Air	$O_2 + N_2 + CO_2 + \text{other gases}$	Mixture
Aluminium	Al	Element
Brass	$Cu + Zn$	Mixture
Carbon dioxide	CO_2	Compound

(15) Plants synthesize glucose in sunlight with the help of chlorophyll from carbon dioxide and water and give away oxygen. Identify the four compounds in this process and name their types.

Answer:

- Glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) – Compound, product.
- Carbon dioxide (CO_2) – Compound, reactant.
- Water (H_2O) – Compound, reactant.
- Oxygen (O_2) – Element, by-product.

(16) State the characteristics of a solution.

Answer:

1. A solution is a homogeneous mixture where the solute is completely dissolved in the solvent.
2. The particles of a solution are very small and cannot be seen with the naked eye.
3. Solutions are stable, meaning the solute does not settle out over time.
4. Solutions do not scatter light, as the particles are too small to affect light passage.

(17) State the characteristics of a suspension.

Answer:

1. A suspension is a heterogeneous mixture where the particles are larger and do not completely dissolve.
2. The particles in a suspension can be seen with the naked eye or under a microscope.
3. Suspensions are unstable; the particles settle down over time if left undisturbed.
4. Suspensions scatter light, causing a visible path of light, known as the Tyndall effect.

(18) State the characteristics of a colloid.

Answer:

1. A colloid is a mixture where the particle size is intermediate between a solution and a suspension.
2. The particles are too small to be seen with the naked eye but large enough to scatter light.
3. Colloids are stable, and the particles do not settle out over time.
4. Colloids are heterogeneous but often appear homogeneous to the naked eye.

(19) Give two examples of each of the following:

(1) Phase (2) Homogeneous matter (3) Heterogeneous matter (4) Homogeneous mixture (5) Heterogeneous mixture (6) Solution (7) Suspension (8) Colloid

Answer:

- | | | |
|---------------------------|-----------------------|------------------------------|
| (1) Phase: | (a) Ice (solid phase) | (b) Water vapor (gas phase) |
| (2) Homogeneous matter: | (a) Air | (b) Sugar dissolved in water |
| (3) Heterogeneous matter | (a) Salad | (b) Sand and gravel mixture |
| (4) Homogeneous mixture | (a) Saltwater | (b) Vinegar |
| (5) Heterogeneous mixture | (a) Oil and water | (b) Concrete |
| (6) Solution | (a) Sugar solution | (b) Alcohol in water |
| (7) Suspension | (a) Muddy water | (b) Flour in water |
| (8) Colloid | (a) Milk | (b) Fog |

(20) State the different types of solutions. Give one example.

Answer: The different types of solutions include:

- Solid solution (e.g., alloys like brass).
- Liquid solution (e.g., saltwater).
- Gas solution (e.g., air).

(21) In one sample of brass, the following ingredients were found: copper (70%) and zinc (30%). Identify the solvent, solute, and solution from these.

Answer: In this sample of brass, copper (Cu) is the solvent, zinc (Zn) is the solute, and brass is the solution.

(i) Liquid element.

Answer: Mercury (Hg), Bromine (Br)

(ii) Gaseous element.

Answer: Oxygen (O₂), Nitrogen (N₂)

(iii) Solid element.

Answer: Iron (Fe), Gold (Au)

(iv) Homogeneous mixture.

Answer: Air, Saltwater

(v) Colloid.

Answer: Milk, Fog

(vi) Organic compound.

Answer: Ethanol (C₂H₅OH), Glucose (C₆H₁₂O₆)

(vii) Complex compound.

Answer: Hemoglobin (C₂₉₅₂H₄₆₆₄N₈₁₂O₈₃₂S₈Fe₄), Chlorophyll (C₅₅H₇₂MgN₄O₅)

(viii) Inorganic compound.

Answer: Sodium chloride (NaCl), Water (H₂O)

(ix) Metalloid.

Answer: Silicon (Si), Boron (B)

(x) Element with valency 1.

Answer: Sodium (Na), Potassium (K)

(xi) Element with valency 2.

Answer: Calcium (Ca), Magnesium (Mg)

(23) Write the names and symbols of the constituent elements and identify their valencies from their molecular formulae given below:

KCl, HBr, MgBr₂, K₂O, NaH, CaCl₂, CCl₄, HI, H₂S, Na₂S, FeS, BaCl₂.

Sr. No.	Molecular formula	Constituent element/ Name symbol	Valency
1	KCl	Pottasium (K) Chlorine (Cl)	1 1
2	HBr	Hydrogen (H) Bromine (Br)	1 1
3	MgBr ₂	Magnesium (Mg) Bromine (Br)	2 1
4	K ₂ O	Pottasium (K) Oxygen (O)	1 2
5	NaH	Sodium (Na) Hydrogen (H)	1 2
6	CaCl ₂	Calcium (Ca) Chlorine(Cl)	2 1
7	CCl ₄	Carbon (C) Chlorine(Cl)	4 1

8	HI	Hydrogen (H) Iodine (I)	1 1
9	H ₂ S	Hydrogen (H) Sulphur (S)	1 2
10	Na ₂ S	Sodium (Na) Sulphur (S)	1 2
11	FeS	Iron (Fe) Sulphur (S)	2 2
12	BaCl ₂	Barium (Ba) Chlorine (Cl)	2 1

(24) Deduce the molecular formulae of the compound obtained from the following pairs of elements by the cross multiplication method.

Answer: Do it from Digest (If you can else omit) (Extra)

Question. 8. Give Reason

(1) Hydrogen is combustible, oxygen helps combustion, but water helps to extinguish fire.

Answer: Hydrogen is a highly flammable gas that burns in the presence of oxygen, which supports combustion; however, water is effective in extinguishing fires because it cools the flames and reduces the temperature below the ignition point, thus preventing combustion.

(2) The constituent substances of a colloid cannot be separated by ordinary filtration.

Answer: The particles in a colloid are too small to be trapped by ordinary filter paper, as they typically range from 1 nanometer to 1 micrometer in size, allowing them to pass through while the liquid remains, making filtration ineffective.

(3) Lemon sherbet has sweet, sour, and salty taste, and it can be poured in a glass.

Answer: Lemon sherbet contains dissolved sugars (sweet), citric acid (sour), and sometimes salt (salty), forming a homogeneous solution that retains liquid properties, allowing it to be poured.

(4) A solid matter has the properties of definite shape and volume.

Answer: Solids have closely packed particles arranged in a fixed structure, which gives them a definite shape and volume, preventing them from flowing like liquids or gases.

(5) A potassium permanganate solution in water is a homogeneous mixture, while a mixture of oil and water is a heterogeneous mixture.

Answer: In a potassium permanganate solution, the solute is completely dissolved in the solvent, creating a uniform composition; however, oil and water do not mix due to differences in density and polarity, resulting in distinct layers, making it a heterogeneous mixture.

Question. 9. Distinguish between the following:

(1) Solids and Liquids:

Solids	Liquids
Solids have a definite shape and volume.	Liquids have a definite volume but no definite shape.
The particles in solids are closely packed and fixed in place.	The particles in liquids are loosely packed and can move past each other.
Solids are rigid and cannot flow.	Liquids can flow and take the shape of their container.
Compressibility is negligible.	Liquids are slightly compressible.

(2) Liquids and Gases:

Liquids	Gases
Liquids have a definite volume but no definite shape.	Gases have neither a definite shape nor volume.
Particles in liquids are loosely packed but still close together.	Particles in gases are far apart and move freely.
Liquids flow and take the shape of the container but do not expand to fill it.	Gases expand to fill the entire volume of the container.

Liquids have lower compressibility	Gases are highly compressible.
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(3) Compound and Mixture:

Compound	Mixture
A compound is a pure substance formed by chemically combining two or more elements.	A mixture is a combination of two or more substances that are physically combined.
Compounds have a fixed composition and definite chemical properties.	Mixtures have variable composition and retain the properties of their components.
The components of a compound cannot be separated by physical methods.	The components of a mixture can be separated by physical methods.
Example: Water (H ₂ O)	Example: Saltwater

(4) Colloids and Suspension

Colloids	Suspensions
Colloids have particles that are smaller than in suspensions, typically ranging from 1 nm to 1 μ m.	Suspensions have larger particles, usually greater than 1 μ m in size.
The particles in a colloid do not settle out over time.	The particles in a suspension settle out over time if left undisturbed.
Colloids appear homogeneous but are heterogeneous at the microscopic level.	Suspensions are heterogeneous, with distinct phases visible to the naked eye or under a microscope.
Colloids cannot be separated by ordinary filtration.	Suspensions can be separated by filtration.
Example: Milk, fog.	Example: Muddy water, sand in water.