

1. Matter and Its Compositions

Worksheet

A. State whether the following statements are true or false.

1. A solid has a definite volume but no definite shape.
2. Solids can be compressed.
3. Gases have very low density.
4. Water is a compound that consists of carbon and oxygen combined together in a fixed ratio of 1:2.
5. The properties of a compound are different from those of its constituent elements.

B. Name the following.

1. What is the force of attraction existing between the particles in the matter called?
2. Name the state of matter in which the intermolecular forces of attraction between the particles are very strong.
3. Name the substance that cannot be broken into simpler substances by a chemical process.
4. Name the elements that exist as single atoms and do not form molecules.
5. Name the compound that consists of hydrogen and oxygen elements combined together in a fixed atomic ratio of 2:1.

C. Choose the correct answer.

1. Which of the following objects is a solid?
(a) Water (b) Kerosene
(c) Nitrogen (d) Chalk
2. Which of the following gases is a compressed gas?
(a) Hydrogen (b) Krypton
(c) LPG (d) Radon
3. Which of the following refers to a molecule?
(a) Atoms of elements that combine together to form particles.
(b) A substance that consists of two or more elements combined together chemically in a fixed proportion.
(c) A substance that cannot be broken into simpler substances by a chemical process.
(d) Smallest unit of an element.
4. Which of the following cannot flow?
(a) Liquids (b) Gases
(c) Solids (d) Noble gases
5. Which of the following refers to the smallest unit of an element?
(a) Molecule (b) Compound
(c) Particle (d) Atom

D. Fill in the blanks.

1. Anything that has mass and occupies space is known as _____.
2. The measure of quantity of matter contained in a substance is called _____.
3. _____ is used as a clean fuel in vehicles.
4. There are _____ known elements.
5. The interparticle force of attraction is _____ in gases.

E. Answer the following.

1. Explain the arrangement of particles in the three states of matter.
2. Write a short note on liquids.
3. Differentiate between compressed gases and noble gases.
4. Define a pure substance.
5. What are compounds? Explain with the help of examples.

Answers to Worksheet

- A.**
1. False
 2. False
 3. True
 4. False
 5. True
- B.**
1. Interparticle or intermolecular force
 2. Solids
 3. Elements
 4. Noble gases
 5. Water
- C.**
1. (d)
 2. (c)
 3. (a)
 4. (c)
 5. (d)
- D.**
1. Matter
 2. mass
 3. CNG
 4. 118
 5. very weak
- E.**
1. Arrangement of Particles in Solids: Strong interparticle or intermolecular force of attraction exists in solids that hold particles together. The interparticle space between the particles or atoms in solids is very less due to which the particles do not change their position but vibrate to and fro at their respective mean positions.
Arrangement of Particles in Liquids: The interparticle or intermolecular force of attraction is weaker in liquids as compared to solids. The interparticle space between the particles in liquids is more than that in solids due to which the particles in liquids can change their position by sliding over each other.
Arrangement of Particles in Gases: The interparticle or intermolecular force of attraction between the particles in gases is very small and the interparticle space is very large. Due to this, the particles in gases move away from each other and travel in all directions.
 2. Liquid
 - A liquid has a definite volume but no definite shape. It takes up the shape of the container it is stored in.
 - Liquids can flow. Liquids can be poured or spilled which does not occur in solids. The intermolecular forces of attraction in liquids are weaker than solids. The molecules in liquids are loosely packed and the intermolecular space between the molecules is more as compared to solids. Due to this, the molecules move freely in liquids.
 - Liquids cannot be compressed. There is no effect of forces of compression on the volume of liquids. Hence, liquids are incompressible.
 - Liquids have low density. Due to the presence of more intermolecular space between the molecules of liquids, they possess lower density than solids.
 - Water, milk, juice, kerosene and petrol are some examples of liquids.

3.

Compressed Gases	Noble Gases
Gases are highly compressible. Since molecules remain far apart due to weak intermolecular forces, these molecules can be brought closer on applying pressure. That is, gases can be compressed.	Some elements exist as single atoms and don't form molecules. These are called noble gases.
Compressed Natural Gas (CNG) and Liquefied Petroleum Gas (LPG) are examples of compressed gases. CNG is used as a clean fuel in vehicles. LPG is used as a cooking gas in gas cylinders in the kitchen	Helium, neon, argon, krypton, radon and xenon are some examples of noble gases.

4. Matter around us consists of substances combined together in different forms. A substance having fixed chemical properties (changes observed when a substance reacts with other substances) and fixed physical properties (colour, taste, smell, state, boiling and melting points) is called a pure substance. A pure substance can be an element or a compound.
5. A compound is a substance which consists of two or more elements combined together chemically in a fixed proportion. For example, water is a compound which consists of hydrogen and oxygen elements combined together in a fixed atomic ratio of 2:1. Similarly, carbon dioxide is a compound that consists of carbon and oxygen combined together in a fixed ratio of 1:2. Some other examples of compounds are ammonia consisting of nitrogen and hydrogen, and sulphur dioxide consisting of sulphur and oxygen. Each element is present in a fixed amount in a compound. The properties of a compound are different from those of its constituent elements.

2. Physical and Chemical Changes

Worksheet

A. State whether the following statements are true or false.

1. The changes that take a longer duration to occur are called fast changes.
2. The changes that do not take place at regular intervals of time are called non-periodic changes.
3. No new substance is formed in a physical change.
4. The process in which a solid on heating changes into liquid is called freezing.
5. Rusting of iron is a physical change as a new substance is formed.

B. Define the following.

1. Exothermic change
2. Dissolving
3. Solidification
4. Respiration
5. Digestion

C. Match the columns.

Column A

1. Evaporation
2. Condensation
3. Rusting
4. Freezing
5. Melting

Column B

- (a) Liquid on cooling changes into solid
- (b) Iron objects when exposed to air develops a brown flaky layer on its surface
- (c) Solid on heating changes into liquid
- (d) Responsible for formation of clouds and rain
- (e) Vapour on cooling changes into liquid

D. Fill in the blanks.

1. A change that we want to take place and is useful to us is called a _____ change.
2. Burning of a candle, bursting a balloon and cooking of an egg are some examples of _____ changes.
3. The process in which a liquid on heating changes into vapour is called _____.
4. Melting is also known as _____.
5. Freezing is also known as _____.

E. Answer the following.

1. List down a few characteristics of a physical change.
2. What are the various factors that affect the rate of evaporation?
3. List down a few characteristics of a chemical change.
4. Describe curdling.
5. "Chemical changes are important." Give reasons.

Answers to Worksheet

- A. 1. False 2. True 3. True 4. False 5. False
- B. 1. Exothermic change: A change in which heat is released is called an exothermic change. Burning of a candle, and burning of fuels and fireworks are some examples of exothermic changes.
2. Dissolving: The process in which a solid such as salt or sugar when added to a liquid like water disappears in it to form a homogeneous mixture is called dissolving. Dissolving is a physical change. This is because no new substance is formed. When a solid is dissolved in a liquid then the solid breaks up into individual molecules which occupy the empty intermolecular space of the liquid molecules. It is a reversible change as the solid can be obtained by evaporation. Also, there is no change in energy.
3. Solidification: The process in which a liquid on cooling changes into a solid is called freezing or solidification. During freezing, the temperature remains constant.
4. Respiration: Respiration is the process of breaking down food to release energy, carbon dioxide and water. It is a chemical change that is desirable, irreversible and exothermic.
5. Digestion: It is the process by which the food that we eat is broken down into small molecules which can be easily absorbed. It is a chemical change which is desirable, irreversible and endothermic.
- C. 1. (d) 2. (e) 3. (b) 4. (a) 5. (c)
- D. 1. desirable
2. irreversible
3. boiling
4. fusion
5. solidification
- E. 1. Characteristics of a Physical Change
- No new substance is formed in a physical change.
 - The change is temporary and it can be reversed by changing the conditions in most cases.
 - The chemical composition of the original substance does not change.
 - There may or may not be a change in the properties such as state, size, shape, colour and smell of the substance that undergoes physical change.
 - There may or may not be a change in the energy possessed by the original substance.
2. There are certain factors that affect the rate of evaporation. They are as follows.
- Surface area: Evaporation is a surface phenomenon, therefore, the rate of evaporation increases with increase in surface area. For example, if you keep water in a wide-mouth bowl and a glass, and place both of them under the sun, water will evaporate faster from the bowl than the glass because the former has greater surface area.

- Temperature: The rate of evaporation increases with the increase in temperature. Water evaporates faster on a hot day than on a cold day.
 - Humidity: Humidity is the amount of water vapour or moisture present in the air. The rate of evaporation decreases with increase in humidity. In other words, if air already has sufficient amount of moisture, then it cannot absorb more of it. Hence, the rate of evaporation decreases.
 - Speed of air: The rate of evaporation increases with increase in the speed of air. In other words, evaporation is faster on a windy day than on a calm day.
3. Characteristics of a Chemical Change
- A chemical change is permanent and irreversible.
 - It always involves formation of one or more new substances.
 - There is a change in the net energy of the system during a chemical change.
 - The composition and properties of the new substance formed are completely different from the original substance.
 - There is a change in the mass of the substance undergoing a chemical change.
4. Curdling is the process by which a liquid transforms into semisolid mass. For example, curdling of milk occurs on adding lime juice or vinegar to the milk. The curd which is formed consists of different composition as compared to the milk. It is a new substance formed that cannot be converted back into milk. The curdling of milk to form curd is desirable, irreversible and endothermic.
5. Chemical changes are of vital importance in our everyday life. Some of these changes are natural and some are man-made.
- A number of processes which take place in living things are chemical changes. These changes are important to sustain life.
Examples:
 - Plants prepare their own food by a process called photosynthesis.
 - Respiration helps us to release energy needed by the cells of the body.
 - During the process of digestion, food undergoes a number of chemical changes and provides energy to our body.
 - Combustion is a type of chemical change which produces heat energy used for both domestic and industrial purposes.
 - Soaps and detergents are produced due to chemical changes.
 - A number of useful metals like iron, aluminium, copper, etc. are extracted from their combined states by chemical processes.

3. Elements, Compounds and Mixtures

Worksheet

A. State whether the following statements are true or false.

1. A suspension is a heterogeneous mixture in which particles of one liquid are dispersed in another liquid.
2. The process by which a liquid is converted into its vapour state is called evaporation.
3. Immiscible liquids can be separated using a separating funnel.
4. Chromatography consists of a stationary phase in which a solvent moves through the column.
5. Paper chromatography is used to separate amino acids.

B. Choose the correct answer.

1. Which of these elements is a metal?
(a) Sulphur (b) Carbon
(c) Iron (d) Phosphorus
2. Which of these elements is a non-metal?
(a) Gold (b) Copper
(c) Iron (d) Chlorine
3. Which of these symbols is used to represent bromine?
(a) B (b) Bi
(c) Br (d) Ba
4. Which of the following is a diatomic molecule?
(a) Nitrogen (b) Ozone
(c) Sulphur (d) Phosphorus
5. Which of these compounds is in a solid state?
(a) Water (b) Sodium Chloride
(c) Sulphuric acid (d) Hydrochloric acid

C. Match the columns.

Column A

1. Magnesium oxide
2. Calcium
3. Fluorine
4. Sodium chloride
5. Glucose

Column B

- (a) $C_6H_{12}O_6$
- (b) NaCl
- (c) MgO
- (d) Ca
- (e) F_2

D. Fill in the blanks.

1. Noble gases are also known as _____ gases.
2. The number of atoms contained in a molecule of an element is called its _____.

3. A _____ is the symbolic representation of a compound since it represents the molecule of a compound.
4. The substance which is dissolved is called a _____.
5. A substance is said to be _____ if it passes from the solid state directly into the gaseous state without changing into a liquid.

E. Answer the following.

1. Define compound. What are the characteristics of a compound?
2. Write a short note on homogeneous mixtures.
3. Define molecular formula. Why do we use this formula?
4. Define mixtures. What are the characteristics of a mixture? Name the two types of mixture.
5. Name the two techniques used to separate liquid-liquid mixtures. Explain any one in detail.

Answers to Worksheet

- A. 1. False 2. True 3. True 4. False 5. True
- B. 1. (c) 2. (d) 3. (c) 4. (a) 5. (b)
- C. 1. (c) 2. (d) 3. (e) 4. (b) 5. (a)
- D. 1. inert 2. atomicity
3. molecular formula 4. solute
5. sublime
- E. 1. A compound is a pure substance that is formed when two or more elements chemically combine in a definite proportion by mass. In other words, a compound is formed when atoms or molecules of different elements combine.
- 2H_2 + O_2 \longrightarrow $2\text{H}_2\text{O}$
molecule molecule compound
 - 2Na + Cl_2 \longrightarrow 2NaCl
two atoms molecule compound

Characteristics of a Compound

- A compound can be broken down into its constituent elements by chemical reactions.
 - The properties of a compound are entirely different from those of its constituent elements.
 - For example, both hydrogen (H_2) and oxygen (O_2) are gases, but their compound water (H_2O) is a liquid.
 - A compound has a fixed composition of its own.
 - During the formation of a compound, energy is either absorbed or liberated.
 - Just as elements are represented by symbols, compounds are represented by chemical formulae.
2. A mixture which is uniform in its composition and whose every part has the same properties is known as a homogeneous mixture. For example, sugar solution is a homogeneous mixture. It is equally sweet from top to bottom. Similarly, sea water, alloys such as steel, bronze, brass and solder are homogeneous mixtures.
- Most of the homogeneous mixtures are solutions. A solution is a form of a mixture in which one constituent dissolves in another constituent. The substance which is dissolved is called a solute. The constituent in which the solute is dissolved is called a solvent. The homogeneous mixture of a solvent and a solute is a solution. For example, when common salt is dissolved in water, they combine and form a solution. Here, common salt is the solute and water is the solvent.
3. A molecular formula is the symbolic representation of a compound since it represents the molecule of a compound. It indicates the number of atoms of each kind of element present in one molecule of a compound. The molecular formula is also known as the chemical formula.

Significance of a Formula

- A formula indicates the elements present in a compound.

- It indicates the number of atoms of each kind of element present in the compound.
- It makes the calculation of mass of one molecule of a compound easier.

Example: A molecule of ammonia gas is represented as NH_3 . It indicates that a molecule of ammonia is formed by combining two elements, i.e., nitrogen and hydrogen. There is one nitrogen atom and three hydrogen atoms in one molecule of ammonia.

4. Mixtures are combinations of two or more elements or compounds. The substances in a mixture retain their own properties and can be separated using various techniques. The formation of a mixture does not involve any chemical change as no new atoms or molecules are formed. Air, rocks, wood, lemonade and milk are some examples of mixtures.

Characteristics of a Mixture

- The constituents of a mixture are not present in a definite ratio. The composition of a mixture is variable. For instance, the amount of carbon dioxide and water vapour present in the air may vary from place to place.
- There is no chemical reaction taking place amongst the constituents of a mixture. The forces of attraction holding the constituents are weak due to which the constituents can be separated using simple methods. For example, we can separate a mixture of sand and water by filtration.
- The constituents of a mixture retain their original properties. For example, air supports combustion due to the presence of oxygen which is one of its constituents.
- A mixture does not have a fixed melting or boiling point.
- A mixture does not have definite physical and chemical properties.
- There is no energy absorbed or released during the formation of a mixture.

There are two types of mixtures—homogeneous and heterogeneous.

5. The two techniques used to separate liquid-liquid mixtures are as follows.
 - Fractional Distillation
 - Using a Separating Funnel

Fractional Distillation

Principle: This process works on the basis of difference in the boiling points of different liquids.

Miscible liquids can be separated by the process of fractional distillation. The separation of mixture of liquids by distillation is called fractional distillation. This is based on the principle that different liquids have different boiling points. A mixture of alcohol and water can be separated by fractional distillation. Alcohol has a lower boiling point than water and therefore evaporates first. The vapour of alcohol gets condensed in the condenser and alcohol is collected in the flask. Water having higher boiling point is left behind in the distillation flask. This technique is used when the difference between boiling points of two liquids is 25°C or more.

Petrol, diesel and kerosene are obtained from crude petroleum by the process of fractional distillation.