What Are Pure Substances and Mixtures?

Worksheet

A pure substance is a single chemical compound or element with fixed properties (melting/boiling points, density). A mixture blends two or more substances and is either homogeneous (one phase, e.g., salt water) or heterogeneous (multiple phases, e.g., sand and water).

Questions

1. Which is a pure substance?

A) Sugar water
B) Pure carbon dioxide (CO)
C) Air
D) Soil

2. Which is a homogeneous mixture?

A) Sand + water
B) Oil + water
C) Sugar + water (dissolved)
D) Pasta + sauce

3. How can salt be separated from salt water?

A) Melting
B) Freezing
C) Evaporation
D) Filtration

4. Which has a fixed melting point?

A) Mixture of ice and salt
B) Pure ice
C) Saltwater
D) Sugar syrup

5. Is salt water (sodium chloride + water) a pure substance or mixture?

6. Is pure oxygen gas (O) a pure substance or mixture?

7. Is air (N, O, Ar, CO, etc.) a pure substance or mixture?

8. Define: What is a pure substance?

9. Define: What is a mixture?

10. Define: Homogeneous vs heterogeneous mixture?

Answer Key

1. B) Pure carbon dioxide (CO) - Pure CO is a single compound with constant properties. Sugar water, air, and soil are mixtures.

2. C) Sugar + water (dissolved) - Dissolved sugar in water is uniform throughout (homogeneous). The others show visible phases (heterogeneous).

3. C) Evaporation - Heating evaporates water, leaving solid salt behind.

4. B) Pure ice - Pure ice melts at 0C. Mixtures do not have fixed melting points - they melt over a range.

5. Salt water is a MIXTURE (homogeneous). It contains two substances: NaCl and HO physically combined. Chemical bonds do not form between them. Salt and water can be separated by evaporation.

6. Pure O is a PURE SUBSTANCE (element). All particles are identical O molecules. It has constant properties: boiling point 183C, density 1.43 g/L. No separation needed; already pure.

7. Air is a MIXTURE (homogeneous). It contains multiple gases: ~78% N, ~21% O, ~1% Ar and trace gases. Composition varies slightly by location and altitude. These gases are not chemically bonded.

8. A substance with constant composition and uniform properties throughout, like pure water or pure gold.

9. A combination of two or more substances that are physically blended but not chemically bonded.

10. Homogeneous: uniform throughout (salt water). Heterogeneous: distinct phases visible (sand + water).