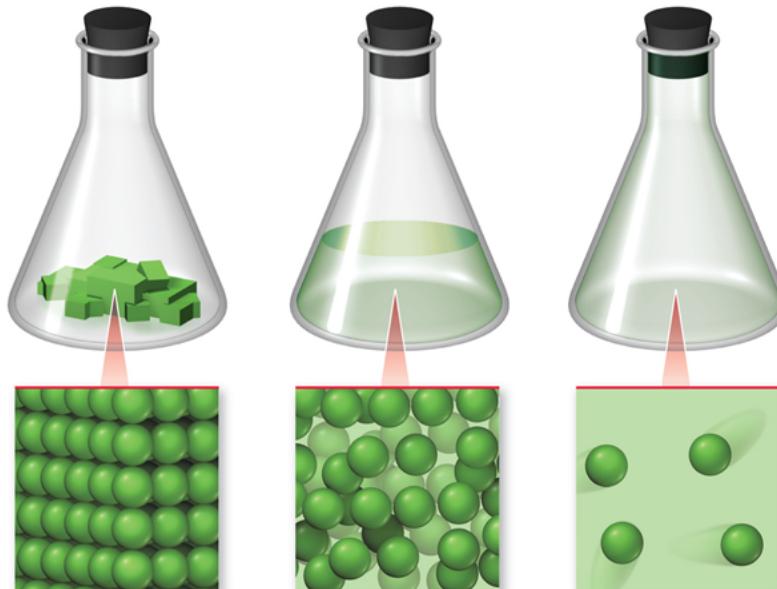


Module-4 Properties of Matter



◆ Three phases of matter: Discuss how intermolecular forces, density, molecular motions and physical properties change from one phase to another.

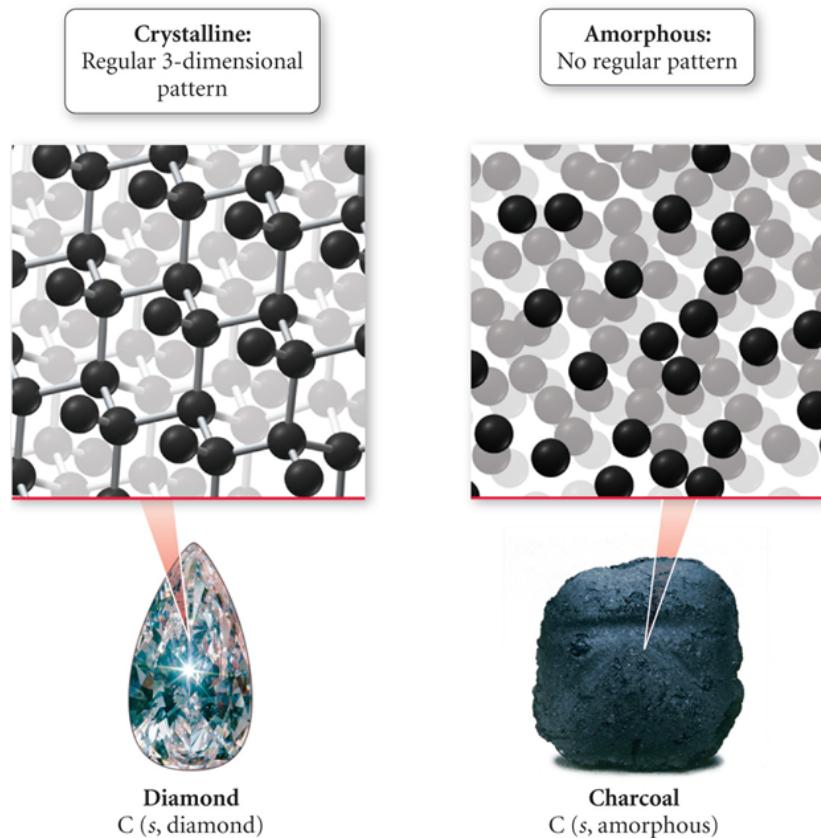


Solids have a fixed shape and volume. Particles are close together and have restricted motion.

Liquids have indefinite shape but fixed volume. Particles are close together but are able to flow

Gases have indefinite shape and volume. Particles are separated by lots of empty space.

Note: Solid matter may be crystalline or amorphous. Table salt, sodium chloride is a crystalline solid but glass is an amorphous solid.



◆ Physical changes can be observed **without** changing the chemical makeup of the substance.

Melting of the element gallium is an example for a physical change.



◆ Chemical properties involve a chemical change and result in *different* substances.
Chemical changes are described by *chemical reactions*.

Consider the following reaction, the substances on the left side of the equation are different from the substances on the right side of the equation. This reaction represents a chemical change.



1. HOW WOULD YOU CLASSIFY THE FOLLOWING CHANGES?

I. Ice melting to liquid water

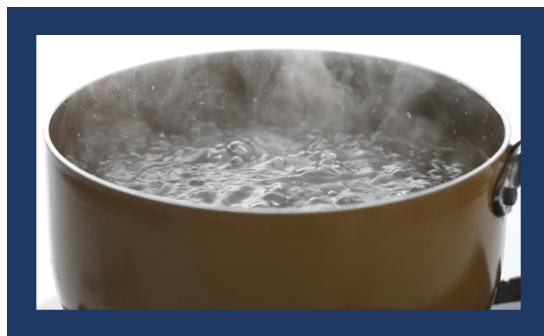


(a) Chemical change

(b) Physical change

Reason for choosing the answer: _____

II. Steam produced by the boiling of water.



(a) Chemical change

(b) Physical change

Reason for choosing the answer: _____

III. Iron nail rusting on exposure to atmosphere.



(a) Chemical change

(b) Physical change

Reason for choosing the answer: _____

IV. Cooking gas (mostly methane) burning in the excess oxygen.



(a) Chemical change

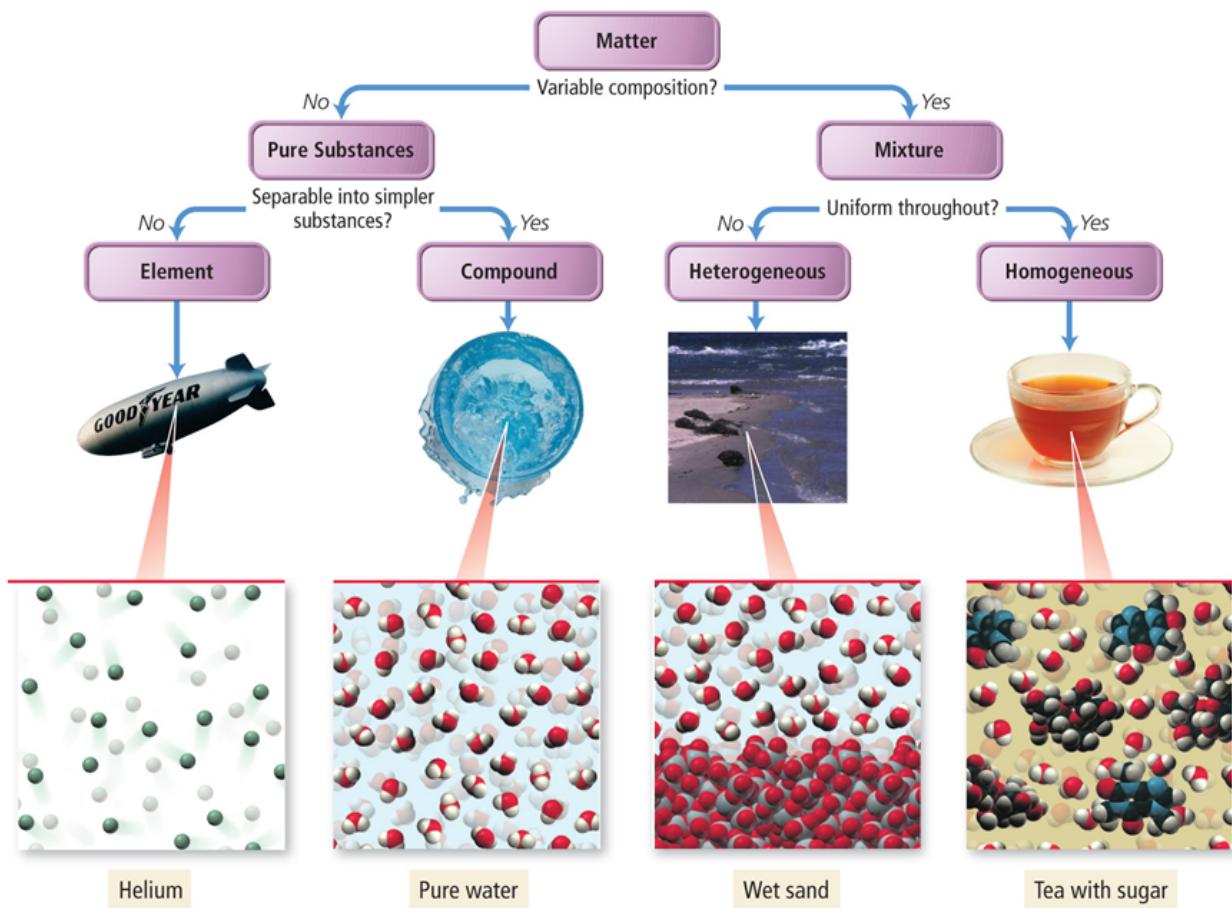
(b) Physical change

Reason for choosing the answer: _____

CLASSIFICATION OF MATTER



The following flow chart illustrates how the composition relates to classification of matter.



Practice Problems

1. How would you classify a gold nugget?



- (A) an element (B) a compound (C) homogeneous mixture (D) heterogenous mixture

2. Which one is a pure substance?

- (A) coffee (B) donuts (C) sulfur dioxide (D) milk

3. A solution containing table salt and water is an example for,

- (A) homogenous mixture (B) heterogenous mixture
(C) a substance (D) crystalline solid

4. Among the list of pure substances identify the one which is an element.

- (A) sugar (sucrose) (B) tungsten (C) calcium chloride (D) ethanol

5. Identify the element that exists as a gas at room temperature (20 °C)?

- (A) bromine (B) calcium (C) carbon dioxide (D) nitrogen

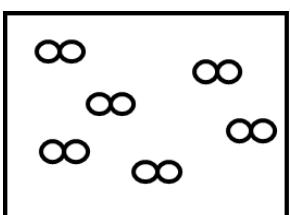
6. Identify the crystalline solid.

- (A) potassium chloride (B) soot (C) leaf (D) pencil

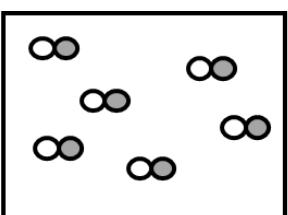
7. Density of water is 1.0 g/cm³, is this an extensive or intensive property?

- (A) extensive property (B) intensive property

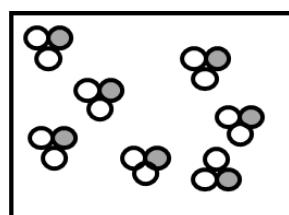
8. Identify the container that has the pure element.



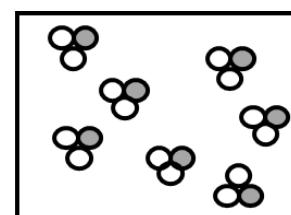
(A)



(B)

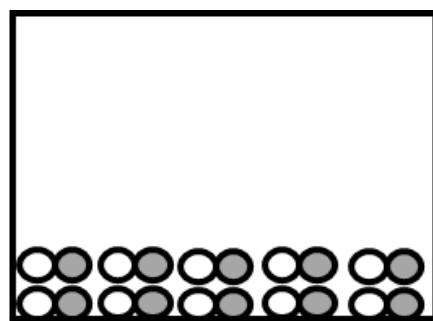
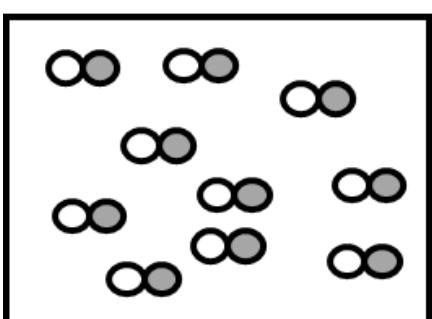


(C)



(D)

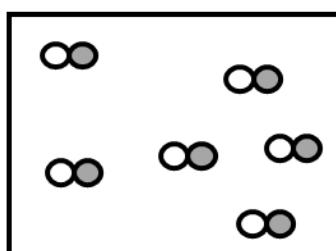
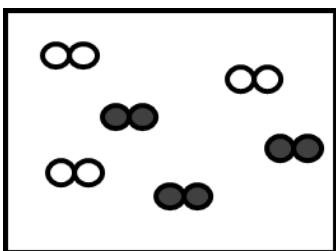
9. The following figure represents a



(A) a chemical change

(B) physical change

10. The following figure represents a



(A) a chemical change

(B) physical change

11. A 25.0-g sample of potassium is completely burned in air to form potassium oxide. The mass of potassium oxide must be

- (A) 25.0 g
(C) lower than 25.0 g

- (B) greater than 25.0 g

- (D) lower than the mass of oxygen consumed in the reaction