

## Activity 1: Introduction to Matter and the Periodic Table

### *Learning Objectives*

- Part 1      *Distinguish the following:*  
                 *Pure substances and mixtures*  
                 *Homogeneous and heterogeneous mixtures*  
                 *Atoms and molecules*
- Part 2      *Gain familiarity with the periodic table and chemical formulas*
- Part 3      *Distinguish physical change and chemical reaction*  
                 *Recognize the parts of a chemical equation*
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**Estimated Completion Time**      45 Minutes

### **Instructor Information**

This activity is the first one of the semester and is designed to ease the student into the semester of chemistry learning.

### **ANSWERS TO QUESTIONS**

#### **Part 1. Classifying Matter**

1. Element formulas contain a single element; compound formulas contain more than one element.
2. Yes. Yes.
3. Matter that can be made up of a single element or compound with a distinct composition. A mixture is made up of several pure substances (distinct items) mixed together.

4.

Matter	Element or Compound	Atom or Molecule
He	Element	Atom
N <sub>2</sub>	Element	Molecule
CH <sub>2</sub> O (formaldehyde)	Compound	Molecule
CH <sub>3</sub> COOH (vinegar)	Compound	Molecule

5. A compound is a pure substance containing more than one element combined with a distinctive composition.
6. A homogeneous mixture has a uniform consistency throughout. A heterogeneous mixture has a nonuniform consistency.
7. 

a. Compound	b. Element
c. Mixture, heterogeneous	d. Mixture, homogeneous
8. Solid, liquid, gas, and aqueous mixture

## Part 2. The Periodic Table

- 1A (1)
  - 6A (16)
  - 2A (2)
  - 4A (14)
- 1
  - 2
  - 3
  - 3
- Copper, metal
  - Magnesium, metal
  - Chlorine, nonmetal
  - Carbon, nonmetal
  - Potassium, metal
  - Cobalt, metal
- There are over 100, ~117.
- Carbon, 6; hydrogen, 12; oxygen, 6
  - Sodium, 1; oxygen, 1; hydrogen, 1
  - Sodium, 1; hydrogen, 1; carbon, 1; oxygen, 3
  - Carbon, 15; hydrogen, 21; nitrogen, 2; oxygen, 1
- Most of the elements are metals, however, living organisms are made up primarily of carbon-containing compounds, so this could seem surprising.

## Activity 1: Skill Development - Parts 1 and 2

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Instructors should indicate to students the elements they will be required to recognize by name and symbol.

1. a. Pure substance                      b. Mixture  
c. Pure substance                      d. Mixture
2. a. Homogeneous; each injection of gasoline into an engine provides the same amount of mechanical energy.  
b. Homogeneous; each dose of mouthwash contains the same ingredients.  
c. Heterogeneous; each bite of pancake can contain different amounts of blueberries and other ingredients.  
d. Heterogeneous; each bite of salad can contain different amounts of vegetables.
3. a. Element; aluminum is element number 13 on the periodic table.  
b. Compound; the name of the compound contains the element sodium and other items, so it is a mixture.  
c. Element; hydrogen is element number 1 on the periodic table.  
d. Compound; the name of the compound contains the element potassium and another element, so it is a compound.
4. a. Element                      b. Compound                      c. Element                      d. Compound
5. Use the periodic table to supply the missing information in the following chart.  
(Answers in bold)

Name	Elemental Symbol	Group	Period	Metal or Nonmetal
Fluorine	<b>F</b>	<b>17 or 7A</b>	<b>2</b>	<b>Nonmetal</b>
<b>Lithium</b>	<b>Li</b>	1 or 1A	2	<b>Metal</b>
<b>Chlorine</b>	Cl	<b>17 or 7A</b>	<b>3</b>	<b>Nonmetal</b>
<b>Silicon</b>	<b>Si</b>	14 or 4A	3	Nonmetal

### Part 3. Identifying Changes in Matter

1. a. physical change  
b. physical change (matter does not chemically react; it just changes forms—sugar is still sugar, water is still water).  
c. chemical reaction

2. Solid water is changing to liquid water, or melting.
3. Reactant  $\text{H}_2\text{O}(s)$ ; Product  $\text{H}_2\text{O}(l)$ .
4. Physical change. The water is not changing into another chemical (it is not chemically reacting; it is just changing states, which is a physical change).

### Activity 1: Skill Development—Part 3

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1.
  - a. The reactants are on the left side of the arrow,  $\text{C}_6\text{H}_{12}\text{O}_6(aq) + 6\text{O}_2(g)$ , the products are on the right side of the arrow,  $6\text{H}_2\text{O}(l) + 6\text{CO}_2(g)$ .
  - b. 6 C, 12 H, 18 O; the same, 6 C, 12 H, 18 O.
  - c. Chemical reaction; because the reactants and products are different compounds.
2.
  - a. Physical change
  - b. Chemical reaction
  - c. Physical change