

## Chapter 3

### Supplementary Check for Understanding Problems

#### Classification of Matter

1. Identify each of the following as a pure substance or a mixture.
  - a) air
  - b) 14-karat gold
  - c) propane
  - d) milk
  - e) aluminum foil
  - f) sewing thread
  - g) gasoline
2. A classmate claims that brass and silver are both pure substances because they have a uniform composition throughout. Do you agree or disagree? Explain why.
3. Distinguish between a pure substance and a heterogeneous mixture at (a) the macroscopic level and (b) at the microscopic level.
4. Is a sample containing two or more substances necessarily heterogeneous? Explain.
5. How would you classify an element that is a gas at room temperature?

#### Chemical and Physical Changes

1. Identify each of the following as a physical or a chemical property.
  - a) chromium conducts heat
  - b) zinc generates a colorless gas in acid
  - c) carbon crystallizes as diamond
  - d) white phosphorus ignites in air
2. Identify each of the following as primarily a physical or a chemical change.
  - a) sawing wood
  - b) a penny tarnishing
  - c) stirring cake batter
  - d) formation of a snowflake
  - e) formation of bubbles when a pot of water is first heated
  - f) etching glass with an etching cream
  - g) disappearance of dry ice as it warms
  - h) fizzing of hydrogen peroxide when it is applied to a cut

S.3.2 CHAPTER 3 SUPPLEMENTARY CHECK FOR UNDERSTANDING PROBLEMS

3. You are given a mixture of sugar and sand and are asked to separate the two components of the mixture? Explain how you would do this. Is your approach based on physical or chemical properties. Explain.

Atomic Structure and Chemical Elements

- Describe the general arrangement of the subatomic particles in an atom.
- If the nucleus of an atom were the size of a golf ball (diameter ~ 4 cm), what would be the diameter of the atom?
  - 4000 cm
  - 4000,000 m
  - 4000 m
  - 40 km
- Write the shorthand notation for an atom containing:
  - 27 protons, 32 neutrons and 27 electrons
  - 82 protons, 125 neutrons and 82 electrons
- Which of the following contains the fewest number of neutrons per atom?
  - $^{112}\text{Cd}$
  - $^{114}\text{Sn}$
  - $^{115}\text{I}$
  - $^{110}\text{Ag}$

**S.3.3**    **CHAPTER 3**    **SUPPLEMENTARY CHECK FOR UNDERSTANDING PROBLEMS**

5. Write the name or symbol, as appropriate, for each of the following chemical elements.

P _____	gold _____
Mg _____	arsenic _____
Sr _____	potassium _____
Pt _____	tin _____
Mn _____	mercury _____

6. What are the differences between an atom and an ion?

7. Write the chemical formula for an ion containing:

a) 56 protons and 54 electrons

b) 34 protons and 36 electrons

8. What arrangements of elements in the periodic table have similar chemical properties? What part of the atom's structure has the largest influence on its chemical properties?

Compounds and Chemical Nomenclature

1. What is the basis for distinguishing one chemical compound from another?

2. Which of the following are diatomic molecules?

a) H <sub>2</sub>	d) H <sub>2</sub> O	g) CCl <sub>4</sub>
b) SO <sub>2</sub>	e) NO	h) FeS
c) HBr	f) KCl	

3. How many total atoms constitute each formula unit of the following compounds?

a) H <sub>3</sub> PO <sub>4</sub>	b) Ca(NO <sub>3</sub> ) <sub>2</sub>	c) (NH <sub>4</sub> ) <sub>2</sub> S <sub>2</sub> O <sub>3</sub>
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4. What physical state is expected for an ionic compound?

S.3.4 CHAPTER 3 SUPPLEMENTARY CHECK FOR UNDERSTANDING PROBLEMS

5. Write the chemical formula and name for the ionic compound formed from each combination of cations and anions below.

	$\text{OH}^-$	$\text{CO}_3^{2-}$	$\text{S}^{2-}$	$\text{PO}_4^{3-}$
$\text{NH}_4^+$				
$\text{Mg}^{2+}$				
$\text{Ag}^+$				
$\text{Fe}^{3+}$				

6. Write the chemical formula and name for each of six oxoacids.

Coulomb's Law

1. Arrange the following combinations of electric charges in order of increasing electrostatic attraction.

