

MIXED REVIEW continued

4. Use the periodic table to identify the name, group number, and period number of the following elements:

- _____ a. Cl
- _____ b. Mg
- _____ c. W
- _____ d. Fe
- _____ e. Sn

5. What is the difference between extensive and intensive properties?

6. Consider the burning of gasoline and the evaporation of gasoline. Which process represents a chemical change and which represents a physical change? Explain your answer.

7. Describe the difference between a heterogeneous mixture and a homogeneous mixture, and give an example of each.

8. Construct a concept map that includes the following terms: *atom, element, compound, pure substance, mixture, homogeneous, and heterogeneous.*

CHAPTER 2 REVIEW*Measurements and Calculations***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.

1. Match the description on the right to the most appropriate quantity on the left.

- | | |
|--------------------------|--|
| _____ 2 m^3 | (a) mass of a small paper clip |
| _____ 0.5 g | (b) length of a small paper clip |
| _____ 0.5 kg | (c) length of a stretch limousine |
| _____ 600 cm^2 | (d) volume of a refrigerator compartment |
| _____ 20 mm | (e) surface area of the cover of this workbook |
| | (f) mass of a jar of peanut butter |

2. _____ A measured quantity is said to have good accuracy if

- (a) it agrees closely with the accepted value.
(b) repeated measurements agree closely.
(c) it has a small number of significant figures.
(d) all digits in the value are significant.

3. A certain sample with a mass of 4.00 g is found to have a volume of 7.0 mL. To calculate the density of the sample, a student entered $4.00 \div 7.0$ on a calculator. The calculator display shows the answer as 0.571429.

- _____ a. Is the setup for calculating density correct?
_____ b. How many significant figures should the answer contain?

4. It was shown in the text that in a value such as 4000 g, the precision of the number is uncertain. The zeros may or may not be significant.

- _____ a. Suppose that the mass was determined to be 4000 g. How many significant figures are present in this measurement?
_____ b. Suppose you are told that the mass lies somewhere between 3950 and 4050 g. Use scientific notation to report the value, showing an appropriate number of significant figures.

5. If you divide a sample's mass by its density, what are the resulting units?

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6. Three students were asked to determine the volume of a liquid by a method of their choosing. Each performed three trials. The table below shows the results. The actual volume of the liquid is 24.8 mL.

	Trial 1 (mL)	Trial 2 (mL)	Trial 3 (mL)
Student A	24.8	24.8	24.4
Student B	24.2	24.3	24.3
Student C	24.6	24.8	25.0

- _____ a. Considering the average of all three trials, which student's measurements show the greatest accuracy?
- _____ b. Which student's measurements show the greatest precision?

PROBLEMS Write the answer on the line to the left. Show all your work in the space provided.

7. _____ A single atom of platinum has a mass of 3.25×10^{-22} g. What is the mass of 6.0×10^{23} platinum atoms?

8. A sample thought to be pure lead occupies a volume of 15.0 mL and has a mass of 160.0 g.

- _____ a. Determine its density.
- _____ b. Is the sample pure lead? (Refer to **Table 4** on page 38 of the text.)
- _____ c. Determine the percentage error, based on the accepted value for the density of lead.

CHAPTER 3 REVIEW*Atoms: The Building Blocks of Matter***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.

1. The element boron, B, has an atomic mass of 10.81 amu according to the periodic table. However, no single atom of boron has a mass of exactly 10.81 amu. How can you explain this difference?

2. How did the outcome of Rutherford's gold-foil experiment indicate the existence of a nucleus?

3. Ibuprofen, $C_{13}H_{18}O_2$, that is manufactured in Michigan contains 75.69% by mass carbon, 8.80% hydrogen, and 15.51% oxygen. If you buy some ibuprofen for a headache while you are on vacation in Germany, how do you know that it has the same percentage composition as the ibuprofen you buy at home?

4. Complete the following chart, using the atomic mass values from the periodic table:

Compound	Mass of Fe (g)	Mass of O (g)	Ratio of O:Fe
FeO			
Fe ₂ O ₃			
Fe ₃ O ₄			

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5. Complete the following table:

Element	Symbol	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons
Sodium			22			
	F	9	19			
			80		45	
			40	20		
		1			0	
			222			86

PROBLEMS Write the answer on the line to the left. Show all your work in the space provided.

6. _____ a. How many atoms are there in 2.50 mol of hydrogen?

_____ b. How many atoms are there in 2.50 mol of uranium?

_____ c. How many moles are present in 107 g of sodium?

7. A certain element exists as three natural isotopes, as shown in the table below.

Isotope	Mass (amu)	Percent natural abundance	Mass number
1	19.99244	90.51	20
2	20.99395	0.27	21
3	21.99138	9.22	22

_____ Calculate the average atomic mass of this element.

CHAPTER 4 REVIEW

Arrangement of Electrons in Atoms

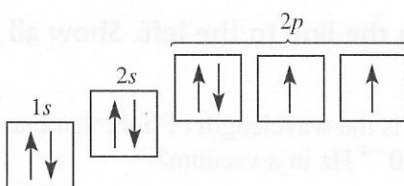
MIXED REVIEW

SHORT ANSWER Answer the following questions in the space provided.

1. Under what conditions is a photon emitted from an atom?

2. What do quantum numbers describe?

3. What is the relationship between the principal quantum number and the electron configuration?



4. In what way does the figure above illustrate Hund's rule?

5. In what way does the figure above illustrate the Pauli exclusion principle?

MIXED REVIEW continued

6. Elements of the fourth and higher main-energy levels do not seem to follow the normal sequence for filling orbitals. Why is this so?

7. How do electrons create the colors in a line-emission spectrum?

8. Write the ground-state electron configuration of the following atoms:

a. Carbon

b. Potassium

c. Gallium

d. Copper

PROBLEMS Write the answer on the line to the left. Show all your work in the space provided.

9. _____ What is the wavelength of light that has a frequency of 3×10^{-4} Hz in a vacuum?

10. _____ What is the energy of a photon that has a frequency of 5.0×10^{14} Hz?

CHAPTER 5 REVIEW*The Periodic Law***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.

- Consider the neutral atom with 53 protons and 74 neutrons to answer the following questions.
 - _____ a. What is its atomic number?
 - _____ b. What is its mass number?
 - _____ c. Is the element's position in a modern periodic table determined by its atomic number or by its atomic mass?
- Consider an element whose outermost electron configuration is $3d^{10}4s^24p^x$.
 - _____ a. To which period does the element belong?
 - _____ b. If it is a halogen, what is the value of x ?
 - _____ c. The group number will equal $(10 + 2 + x)$. True or False?
- _____ a. In which block are metalloids found, s , p , d , or f ?
 - _____ b. In which block are the hardest, densest metals found, s , p , or d ?
- _____ a. Name the most chemically active halogen.
 - _____ b. Write its electron configuration.
 - _____ c. Write the configuration of the most stable ion this element makes.
- Refer only to the periodic table at the top of the review of Section 2 to answer the following questions on periodic trends.
 - _____ a. Which has the larger radius, Al or In?
 - _____ b. Which has the larger radius, Se or Ca?
 - _____ c. Which has a larger radius, Ca or Ca^{2+} ?
 - _____ d. Which class has greater ionization energies, metals or nonmetals?
 - _____ e. Which has the greater ionization energy, As or Cl?
 - _____ f. An element with a large negative electron affinity is most likely to form a (positive ion, negative ion, or neutral atom)?

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- _____ g. In general, which has a stronger electron attraction, a large atom or a small atom?
- _____ h. Which has greater electronegativity, O or Se?
- _____ i. In the covalent bond between Se and O, to which atom is the electron pair more closely drawn?
- _____ j. How many valence electrons are there in a neutral atom of Se?
6. _____ Identify all of the following ions that do not have noble-gas stability.
 K^+ S^{2-} Ca^+ I^- Al^{3+} Zn^{2+}
7. Use only the periodic table in the review of Section 2 to give the noble-gas notation of the following:
- _____ a. Br
- _____ b. Br^-
- _____ c. the element in Group 13, Period 5
- _____ d. the lanthanide with the smallest atomic number
8. Use electron configuration and position in the periodic table to describe the chemical properties of calcium and oxygen.
- _____
- _____
- _____
- _____
- _____
- _____
9. Copper's electron configuration might be predicted to be $3d^94s^2$. But in fact, its configuration is $3d^{10}4s^1$. The two elements below copper in Group 11 behave similarly. (Confirm this in the periodic table in **Figure 6** on pages 140–141 of the text.)
- _____ a. Which configuration for copper is apparently more stable?
- _____ b. Is the *d* sublevel completed in the atoms of these three elements?
- _____ c. Every element in Period 4 has four levels of electrons established. True or False?

CHAPTER 6 REVIEW*Chemical Bonding***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.

1. Name the type of energy that is a measure of strength for each of the following types of bonds:

_____ a. ionic bond
_____ b. covalent bond
_____ c. metallic bond

2. Use the electronegativity values shown in **Figure 20**, on page 161 of the text, to determine whether each of the following bonds is nonpolar covalent, polar covalent, or ionic.

_____ a. H—F	_____ d. H—H
_____ b. Na—Cl	_____ e. H—C
_____ c. H—O	_____ f. H—N

3. How is a hydrogen bond different from an ionic or covalent bond?

4. H_2S and H_2O have similar structures and their central atoms belong to the same group. Yet H_2S is a gas at room temperature and H_2O is a liquid. Use bonding principles to explain why this is.

MIXED REVIEW continued

5. In what way is a polar-covalent bond similar to an ionic bond?

6. Draw a Lewis structure for each of the following formulas. Determine whether the molecule is polar or nonpolar.

_____ a. H_2S

_____ b. COCl_2

_____ c. PCl_3

_____ d. CH_2O

CHAPTER 7 REVIEW*Chemical Formulas and Chemical Compounds***MIXED REVIEW****SHORT ANSWER** Answer the following questions in the space provided.**1.** Write formulas for the following compounds:

_____ a. copper(II) carbonate

_____ b. sodium sulfite

_____ c. ammonium phosphate

_____ d. tin(IV) sulfide

_____ e. nitrous acid

2. Write the Stock system names for the following compounds:_____ a. $\text{Mg}(\text{ClO}_4)_2$ _____ b. $\text{Fe}(\text{NO}_3)_2$ _____ c. $\text{Fe}(\text{NO}_2)_3$ _____ d. CoO

_____ e. dinitrogen pentoxide

3. _____ a. How many atoms are represented by the formula $\text{Ca}(\text{HSO}_4)_2$?

_____ b. How many moles of oxygen atoms are in a 0.50 mol sample of this compound?

_____ c. Assign the oxidation number to sulfur in the HSO_4^- anion.**4.** Assign the oxidation number to the element specified in each of the following:_____ a. hydrogen in H_2O_2 _____ b. hydrogen in MgH_2 _____ c. sulfur in S_8 _____ d. carbon in $(\text{CO}_3)^{2-}$ _____ e. chromium in $\text{Na}_2\text{Cr}_2\text{O}_7$ _____ f. nitrogen in NO_2

MIXED REVIEW continued

PROBLEMS Write the answer on the line to the left. Show all your work in the space provided.

5. _____ Following are samples of four different compounds. Arrange them in order of increasing mass, from smallest to largest.
- | | |
|-----------------------|--|
| a. 25 g of oxygen gas | c. 3×10^{23} molecules of C_2H_6 |
| b. 1.00 mol of H_2O | d. 2×10^{23} molecules of $C_2H_6O_2$ |
6. _____ a. What is the formula for sodium hydroxide?
_____ b. What is the formula mass of sodium hydroxide?
_____ c. What is the mass in grams of 0.25 mol of sodium hydroxide?
7. _____ What is the percentage composition of ethane gas, C_2H_6 , to the nearest whole number?
8. _____ Ribose is an important sugar (part of RNA), with a molar mass of 150.15 g/mol. If its empirical formula is CH_2O , what is its molecular formula?

MIXED REVIEW continued

9. Butane gas, C_4H_{10} , is often used as a fuel.

_____ a. What is the mass in grams of 3.00 mol of butane?

_____ b. How many molecules are present in that 3.00 mol sample?

_____ c. What is the empirical formula of the gas?

10. _____ Naphthalene is a soft covalent solid that is often used in mothballs. Its molar mass is 128.18 g/mol and it contains 93.75% carbon and 6.25% hydrogen. Determine the molecular formula of naphthalene from this information.

11. Nicotine has the formula $C_xH_yN_z$. To determine its composition, a sample is burned in excess oxygen, producing the following results:

1.0 mol of CO_2

0.70 mol of H_2O

0.20 mol of NO_2

Assume that all the atoms in nicotine are present as products.

_____ a. Determine the number of moles of carbon present in the products of this combustion.

MIXED REVIEW continued

_____ b. Determine the number of moles of hydrogen present in the combustion products.

_____ c. Determine the number of moles of nitrogen present in the combustion products.

_____ d. Determine the empirical formula of nicotine based on your calculations.

_____ e. In a separate experiment, the molar mass of nicotine is found to be somewhere between 150 and 180 g/mol. Calculate the molar mass of nicotine to the nearest gram.

12. When $\text{MgCO}_3(s)$ is strongly heated, it produces solid MgO as gaseous CO_2 is driven off.

_____ a. What is the percentage loss in mass as this reaction occurs?

_____ b. Assign the oxidation number to each atom in MgCO_3 .

_____ c. Does the oxidation number of carbon change upon the formation of CO_2 ?