Chemistry

Student Workbook

Chemistry and the Nature of Science

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. The study of matter and how it changes is called _____.

2. When science is applied to improve people's lives, it is called _____.

3. If something has mass and _____, it is matter.

4. In an experiment, the _____ responds to changes in the independent variable.

5. After you gather and study facts on a problem, you might state a(n) _____.

6. A measure of how much matter something contains is called _____.

7. Common characteristics are used to organize _____ into categories.

8. Chemists use the _____ to solve problems and explain matter.

9. After a hypothesis has been tested and accepted, it is called a _____.

10. In an experiment, the _____ is changed.

| **Word Bank** |
| chemistry |
| dependent variable |
| hypothesis |
| independent variable |
| mass |
| matter |
| scientific method |
| technology |
| theory |
| volume |

Directions Label each measurement as *qualitative* or *quantitative*.

_____ **11.** The water in the lake is cold.

_____ **12.** I am 2 inches taller than my sister.

_____ **13.** The earth is round.

_____ **14.** There are 5 ounces of water in the glass.

_____ **15.** The book weighs 4 pounds.

Scientific Notation

Directions Put the following numbers in order from smallest to largest. The answer to number 1 would be the smallest number. The answer to number 6 would be the largest. Write the answers on the lines.

2.1×10^{-34}

3.1×10^1

0.00007

4.5×10^{-3}

5.2×10^3

$2,400$

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Directions Label each number as *SC* for scientific notation or *ST* for standard notation.

_____ **7.** 35,000

_____ **8.** 3.4×10^4

_____ **9.** 2.4

_____ **10.** 1.2×10^{-3}

Directions Write the answer to each question.

11. Why would you use scientific notation for counting a very large or very small amount?

_____

_____

12. Is 2.3452×10^{-45} a large or small number?

_____

13. Write 0.000354 in scientific notation.

_____

14. Write 3.2×10^{-5} in standard notation.

_____

15. Write 34,000 in scientific notation.

_____

Chemistry

Accuracy, Precision, and Certainty

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** meaningful digits in a
measurement

_____ **2.** measurements that are close to
the correct value

_____ **3.** known by the number of
significant figures

_____ **4.** measurements that are close to
each other

_____ **5.** these digits are always significant

Column B

A accurate

B certainty

C nonzero digit

D precise

E significant

Directions Circle all insignificant digits in the following
measurements.

6. 3,040.50 pounds

7. 2.30×10^3 miles

8. 23,000 miles

9. 5,400.00 yards

10. 0.0000079 meter

Directions Write the answer to each question.

11. Would it be more important for your car speedometer to be accurate
or precise?

_____

12. You measure out 23.4 grams of water. Which digit is an estimate?

_____

13. Why do scientists need to know which digits are significant?

_____

14. How many significant figures are in 0.000304 inch?

_____

15. You record a mass of 20 grams. How would you write this
measurement to show 3 significant digits?

_____

Chemistry

Solving Problems with Significant Figures

Directions Write the answer to each question.

1. Defined numbers do not limit significant figures in an answer.
Explain why.

_____

_____

2. What is the rule for significant figures after multiplying
measurements?

_____

_____

3. What is the rule for significant figures after adding measurements?

_____

_____

4. Why do scientists use these rules?

_____

_____

Directions Write the number of significant figures each answer would
have. You do not need to find the answer.

_____ **5.** 2.3 grams × 5.7 grams   _____ **8.** 200 liters − 12.4 liters

_____ **6.** 34.567 inches + 0.2 inches   _____ **9.** 0.003 feet × 34.7 feet

_____ **7.** 3.0 minutes ÷ 2 seconds   _____ **10.** 12.03 minutes − 2.03 minutes

Directions Write the answer to each problem. Use the correct number
of significant figures.

_____ **11.** 34.2 inches × 0.03 inches

_____ **12.** 482 pounds − 2.45 pounds

_____ **13.** 0.067 yards × 2.04 yards

_____ **14.** 5,402.56 seconds − 2.53 seconds

_____ **15.** You have 42.0 liters of water. You want to divide it in half
with your friend. How many liters of water does she get?

Chemistry

Measurement Units and Unit Conversions

Directions Match each base unit in column B with the quantity it measures in column A. Write the letter on the line.

Column A   **Column B**

_____ **1.** length   **A** degree Celsius

_____ **2.** mass   **B** gram

_____ **3.** temperature   **C** liter

_____ **4.** time   **D** meter

_____ **5.** volume   **E** second

Directions Choose the words from the Word Bank that best complete the sentence.

6. Changing a measurement from one unit to another is called a(n) _____.

7. In most metric conversions, you just move the _____.

8. To make a base unit larger or smaller, you use a(n) _____.

9. To convert from meters to centimeters, you would use $\frac{1\ cm}{0.01\ m}$ as the _____.

10. When converting units, the _____ appears in the bottom of the conversion factor.

> **Word Bank**
> conversion factor
> decimal point
> given unit
> prefix
> unit conversion

Directions Write the answer to each question.

11. Convert 3.4 kg to grams. _____

12. Convert 0.0034 mm to meters. _____

13. How many kilometers are there in 120 m? _____

14. How many deciliters do you need to have 12.3 L? _____

15. Convert 0.02 kg to decigrams. _____

Chemistry

Derived Units

Directions Write the correct term on the line.

1. Density is found by dividing _____ by volume.

2. When you multiply or _____ measurements, you make
a derived unit.

3. Density, area, and _____ are all derived units.

4. The SI unit for area is _____.

Directions Write the letter of the answer to each question on the line.

_____ **5.** If you cut an object in half, what happens to its density?
   A It doubles.   **C** It stays the same.
   B It decreases by half.   **D** It triples.

_____ **6.** If a substance has a volume of 10 L and a mass of 5 kg,
   what is its density?
   A 2 kg/L   **B** 50 kg/L   **C** 0.5 kg/L   **D** 5 kg/L

_____ **7.** If density is mass divided by volume, what is mass?
   A $M=\dfrac{D}{V}$ **B** $M=D\times V$ **C** $M=D-V$ **D** $M=\dfrac{V}{D}$

_____ **8.** Which of the following measurements has a derived unit?
   A $7.0\ m^2$ **B** 7.0 kL   **C** 0.97 dm   **D** $0.97 g/cm^3$

_____ **9.** If you are given mass in grams and volume in milliters,
   what will the unit of density be?
   A $g\times mL$ **B** cm^3 **C** g/L   **D** g/mL

Directions Write the answer to each problem. Use the correct number
of significant figures.

10. If an object has a mass of 23.1 g and a volume of 150 mL, what is its density? _____

11. What is the density of an object with a mass of 230 kg and a volume of 3,004 L? _____

12. What is the mass of an object with a density of 3.4 g/mL and a volume
of 500.0 mL?   _____

13. If an object has a mass of 3.0 g and a density of 0.023 g/mL, what is its
volume?   _____

14. If a substance has a density of 0.23 g/mL, what is the mass of a 24-L sample? _____

15. A 10.0-g object with a density of 1.5 g/mL is cut in half. What is the volume
of half of the object?   _____

◆▶ **Chemistry**

Chapter 1 Vocabulary Review

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

Column B

_____ **1.** used by scientists to answer questions

_____ **2.** study of matter

_____ **3.** a possible explanation

_____ **4.** standard amount used for measuring

_____ **5.** description using numbers

_____ **6.** a scientist who studies matter

_____ **7.** variable changed by the experimenter

_____ **8.** written above the writing line

_____ **9.** hypothesis that has been tested many times

_____ **10.** variable that responds to the independent variable

_____ **11.** has mass and takes up space

_____ **12.** conditions measured or controlled in an experiment

_____ **13.** description without numbers

_____ **14.** meaningful digit

_____ **15.** shortcut for writing very large or very small numbers

A chemist

B chemistry

C dependent variable

D hypothesis

E independent variable

F matter

G qualitative

H quantitative

I scientific method

J scientific notation

K significant figure

L superscript

M theory

N unit

O variable

◀▶ **Chemistry**

Chapter 1 Vocabulary Review, continued

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

16. The amount of space used by an object is its _____. (oemvlu)

17. Use _____ to measure length. (treme)

18. How close a measurement is to the real value is called _____. (yruaccca)

19. The process of changing units is a(n) _____. (itnu oieovncsnr)

20. Use _____ to measure volume. (tilre)

21. The measurement of matter in an object is its _____. (smas)

22. A unit made when multiplying or dividing other units is a(n) _____. (revddie niut)

23. A ratio showing the relationship between two units is a(n) _____. (sirevnocno tacrof)

24. Mass divided by volume equals an object's _____. (dsineyt)

25. Use _____ to measure temperature. (regede lsescui)

26. Use _____ for measuring mass. (agmr)

27. The SI unit for temperature is _____. (lkinev)

28. How close several measurements of an object are to each other is _____. (noprseici)

29. _____ is the application of science to help people or improve their lives. (lohcTegyon)

Chemistry

Physical and Chemical Properties

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

Column B

_____ 1. has a definite shape and volume

_____ 2. describes how a substance chemically changes

_____ 3. tightly packed particles that can flow

_____ 4. can be observed without changing the substance

_____ 5. the set of changes that happen when two substances combine

A chemical property

B chemical reaction

C liquid

D physical property

E solid

Directions Label each number as *P* for physical change or *C* for chemical change.

_____ 6. an ice cube melting

_____ 7. iron rusting

_____ 8. cutting a piece of paper

Directions Write the answer to each question.

9. List three signs that a chemical reaction has occurred. _____

_____

_____

10. Why is a change in state a physical change? _____

_____

_____

Chemistry

Mixtures

Directions Choose the word or words from the Word Bank that best complete the sentence.

1. A(n) _____ has the same makeup in all parts.

2. If two different samples of matter are identical, the matter is a(n) _____ .

3. In an aqueous solution, the _____ is water.

4. Steel is an example of a(n) _____ .

5. A homogenous mixture can also be called a _____ .

6. The _____ is dissolved in a solvent.

7. In a(n) _____ , the different substances can be picked out.

Word Bank
alloy
heterogeneous mixture
homogeneous mixture
solute
solution
solvent
substance

Directions Write the solute on the line. Write *none* if the substance is not a solution.

_____ 8. salt dissolved in water

_____ 9. oil and water

_____ 10. sweetened tea

_____ 11. sand and water

_____ 12. coffee and cream

_____ 13. tomato sauce

Directions Write the answer to each question.

14. What kind of change has to occur in order to separate a mixture?

_____

15. Why do the properties of mixtures vary from sample to sample?

_____

_____

Atoms, Elements, and the Periodic Table

Directions Choose the word or words from the Word Bank
that best complete the chart.

Particle	Charge	Location
1.	3.	nucleus
2.	neutral	5.
electron	4.	6.

Directions Label each item as *M* for metal, *NM* for nonmetal,
or *S* for semimetal.

_____ **7.** magnesium

_____ **8.** silicon

_____ **9.** bromine

_____ **10.** nickel

Directions Write the answer to each question.

11. How many elements are in an atom?

_____

12. What particle in an atom makes each element unique?

_____

13. Explain the difference between an element that is monatomic,
diatomic, and polyatomic.

_____

_____

14. Find sulfur on the periodic table. What is its atomic number?
How many electrons does it have?

_____

15. What kind of properties might sulfur have?

_____

_____

Compounds and Chemical Formulas

Directions Write the correct term on the line.

1. A compound consists of more than one _____.

2. A group of symbols that show the number of atoms in a compound is called a _____.

3. Separating a compound requires a _____ change.

4. If there is no subscript to the right of a symbol it means _____ atom of that element.

Directions Write the answer to each question.

5. What do compounds and mixtures have in common? How are they different? _____

_____

6. What do elements and compounds have in common? How are they different? _____

_____

7. In the compound $Mg(NO_2)_2$, what is the difference between the number two inside the parenthesis and the number two outside? _____

_____

8. Why don't mixtures have chemical formulas? _____

_____

9. Why do the properties of an element change after it has become a compound? _____

_____

Directions Write the correct number of atoms for each element on the line.

10. CCl_4
C - _____   Cl - _____

11. H_2SO_4
H - _____   S - _____   O - _____

12. $HC_2H_3O_2$
H - _____   C - _____   O - _____

13. $Pb_3(PO_4)_2$
Pb - _____   P - _____   O - _____

14. $FeBr_3$
Fe - _____   Br - _____

15. H_2O
H - _____   O - _____

Chapter 2 Vocabulary Review

Directions Match the items in column A with those in column B. Write
the letter of each correct answer on the line.

Column A

_____ **1.** results in one or more new
substances being formed

_____ **2.** two or more substances mixed
together without changing
properties

_____ **3.** a characteristic that is observed
without changing the substance

_____ **4.** dissolves a solute

_____ **5.** mixture that is unevenly mixed

_____ **6.** has definite shape and volume

_____ **7.** definite volume but has the shape
of its container

_____ **8.** is dissolved in a solvent

_____ **9.** homogenous mixture with solutes
dissolved in a solvent

_____ **10.** two or more kinds of atoms
chemically combined

_____ **11.** changes physical properties but
not chemical properties

_____ **12.** made of only one kind of atom

_____ **13.** describes how substances change
into one or more different
substances

_____ **14.** no definite shape or volume

_____ **15.** mixture that is evenly mixed

Column B

A chemical change

B chemical property

C compound

D element

E gas

F heterogeneous mixture

G homogenous mixture

H physical change

I physical property

J liquid

K mixture

L solid

M solute

N solution

O solvent

◢▶ **Chemistry**

Chapter 2 Vocabulary Review, continued

Directions Choose the word or words from the Word Bank that best complete the sentence.

16. A(n) _____ is the smallest particle of an element that still has the properties of that element.

17. The names and symbols of elements are arranged on the _____ .

18. A certain amount of electricity is known as a(n) _____ .

19. Groups of three or more bonded atoms are called _____ .

20. Chemical changes that happen when one or more substances react to form different substances is called a(n) _____.

21. The number of protons in an atom is its _____.

22. A solution that uses water as the solvent is a(n) _____.

23. A group of symbols that shows the number and kinds of atoms in a compound is a(n) _____.

24. A(n) _____ exists as single atoms.

25. A one- or two-letter symbol that represents an element is a(n) _____.

> **Word Bank**
> aqueous solution
> atom
> atomic number
> charge
> chemical formula
> chemical reaction
> chemical symbol
> monatomic
>   substance
> periodic table
> polyatomic

Directions Unscramble the letters in the parentheses and write the word or words on the line.

26. The positively charged part of the atom is the _____. (notrop)

27. A(n) _____ is used in chemical formulas to show how many atoms of an element are used. (pictrssbu)

28. Atoms that exist as bonded pairs are called _____. (toimdcia)

29. The _____ is the center of the atom. (unescul)

30. The _____ is the physical form of a substance. (taste)

31. A(n) _____ is sometimes a shiny solid that conducts heat and electricity. (letam)

Chemistry

Chapter 2 Vocabulary Review, continued

32. The _____ is the negatively charged part of the atom. (letrnoec)

33. A(n) _____ has properties of both metals and nonmetals. (telamesim)

34. The ability to do work is called _____. (yngere)

35. The _____ is the part of the atom that has no charge. (eountrn)

36. A(n) _____ has a definite makeup and properties. (natcsuebs)

37. A(n) _____ is usually a dull solid or a gas. (naetlonm)

38. A(n) _____ is a solid solution containing metals. (oalyl)

39. Each element has a(n) _____. (cmtaio bmeurn)

Molecular Compounds and Formulas

Directions Write the letter of the answer to each question on the line.

_____ **1.** How many atoms does one molecule of N_2O_5 contain?

          A 10   **B** 7   **C** 5   **D** 1

_____ **2.** Which of the following prefixes means seven?

          A *penta-*   **B** *hexa-*   **C** *hepta-*   **D** *tetra-*

_____ **3.** What kind of compound do you usually have if the name ends in *-ide*?

          A covalent   **B** molecular   **C** diatomic   **D** binary

_____ **4.** What is the smallest unit of a molecular compound?

          A molecule   **B** atom   **C** carbon   **D** formula unit

Directions Write the answer to each question.

5. What is the difference between an element and a compound?

_____

_____

6. What happens to the electrons in a molecular compound?

_____

_____

7. Describe the two steps needed to find the formula of a binary molecular compound.

_____

_____

Directions Write the correct formula for each compound on the line.

_____ **8.** phosphorous pentabromide

_____ **9.** dicarbon hexoxide

_____ **10.** carbon monoxide

Chemistry

Ions and Ionic Compounds

Directions Choose the word or words from the Word Bank that best complete the sentence.

1. A(n) _____ is an atom that has gained electrons.

2. A(n) _____ compound consists of one cation and one anion.

3. When writing the name of an ionic compound the _____ is always written first.

4. An atom has a positive charge if it has _____ electrons.

5. A(n) _____ can have a positive or negative charge.

Word Bank
anion
cation
ion
ionic
lost

Directions Write the ion for each element on the line.

_____ 6. sodium   _____ 9. barium

_____ 7. copper(II)   _____ 10. phosphorus

_____ 8. oxygen

Directions Write the answer to each question.

11. What do Roman numerals after an ion name indicate? _____

_____

12. What are the two ionic charges common for iron? _____

_____

13. What holds an ionic compound together? _____

_____

14. What is true about the electrons in a sulfur ion? _____

_____

15. What kind of ions do metals tend to form? _____

_____

  Chemistry

Ionic Compounds and Formula Units

Directions Put the steps in order from first step to last step. The first step would be number 1. The last step would be number 4.

_____ Reduce the formula.

_____ Make the number in the positive charge the subscript for the anion. (Ignore charge)

_____ Write the cation and anion symbols with charges.

_____ Make the number in the negative charge into a subscript for the cation. (Ignore charge)

Directions Write the correct term on the line.

5. Ionic compounds are made of a cation and an anion, but are _____.

6. Ionic formulas are reduced, which is why they are called _____.

Directions Write the formula unit for each ionic compound on the line.

_____ **7.** sodium iodide

_____ **8.** potassium sulfide

_____ **9.** calcium iodide

_____ **10.** copper(II) chloride

_____ **11.** aluminum fluoride

_____ **12.** iron(III) oxide

_____ **13.** potassium chloride

_____ **14.** potassium nitride

_____ **15.** magnesium oxide

Chemistry

Polyatomic Ions and Formula Units

Directions Write the answer to each question.

1. What is a polyatomic ion?

_____

_____

2. How is a polyatomic ion written when being treated as one item?

_____

_____

3. What are the differences between a nitrate, nitrite, and nitrogen ion?

_____

_____

Directions Write the correct name on the line.

_____ **4.** NH^{1+}

_____ **5.** $SO_4{}^{2-}$

_____ **6.** $HCO_3{}^{1-}$

_____ **7.** ClO^{1-}

_____ **8.** $SO_3{}^{2-}$

Directions Write the correct formula unit on the line.

_____ **9.** aluminum hydroxide

_____ **10.** sodium perchlorate

_____ **11.** magnesium hydrogen carbonate

_____ **12.** iron(III) chlorate

_____ **13.** ammonium hydroxide

_____ **14.** sodium dichromate

_____ **15.** copper(II) acetate

Names of Compounds

Directions Put the steps in order from first step to last step. The first step would be number 1. The last step would be number 3.

Group A

_____ Write the name of the second element. Change the ending to *-ide*.

_____ Write the name of the first element in the formula.

_____ Add prefixes to indicate the number of atoms of each element.

Directions Put the steps in order from first step to last step. The first step would be number 1. The last step would be number 3.

Group B

_____ If the cation can have more than one charge, indicate the correct charge with Roman numerals.

_____ Write the name of the anion and change the ending to *-ide*.

_____ Write the name of the cation.

Directions Write the answer to each question.

  7. What kind of compounds are named using Group A steps? _____

  8. What kind of compounds are named using Group B steps? _____

  9. What are three differences between ionic and covalent compounds?

  _____

  _____

10. What are three similarities of ionic and covalent bonds?

  _____

  _____

Chapter 3 Vocabulary Review

Directions Match the items in column A with those in column B. Write
the letter of each correct answer on the line.

Column A

_____ **1.** group of two or more atoms
acting as one ion with one charge

_____ **2.** contains two elements

_____ **3.** chemical formula for an ionic
compound

_____ **4.** a negative ion

_____ **5.** smallest unit of a molecular
compound

_____ **6.** contains two or more elements
bonded by sharing electrons

_____ **7.** a charged atom

_____ **8.** produces hydrogen ions

_____ **9.** compound with one kind of
cation and one kind of anion

_____ **10.** a positive ion

Column B

A acid

B anion

C binary

D cation

E formula unit

F ion

G ionic compound

H molecule

I molecular compound

J polyatomic ion

Measuring Matter

Directions Write the answer to each question.

1. What is the mole? _____

_____

2. Why do we use the mole instead of counting particles? _____

_____

3. What are the three particles we use to measure matter? _____

_____

4. When converting from moles to particles, what conversion factor
would you use? _____

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A	Column B
_____ **5.** 4.52×10^{24} particles	**A** 3.00 mol
_____ **6.** 2.41×10^{23} particles	**B** 7.50 mol
_____ **7.** 1.81×10^{24} particles	**C** 0.400 mol

Directions Write the answer to each question. Use the correct
units, significant figures, and show your work.

8. How many atoms are in 2.4 mol of carbon?

_____

9. How many moles are in 5.4×10^{22} formula units of sodium chloride?

_____

10. How many molecules are in 0.03 mol of carbon dioxide?

_____

Chemistry

Molar Mass

Directions Explain how the items in each pair are related.

1. molar mass and atomic mass

_____

2. moles and molar mass

_____

3. $\dfrac{\text{molar mass (g)}}{1\ \text{mol}}$ and $\dfrac{1\ \text{mol}}{6.02 \times 10^{23}\ \text{molecules}}$

_____

Directions Write the answer to each question. Use the correct units and significant figures, and show your work.

4. What is the molar mass of copper?

_____

5. What is the molar mass of C_2H_4?

_____

6. How many moles are in 4.5 g of CO?

_____

7. If you wanted 1.2 mol of KCl, how many grams would you need?

_____

8. What is the mass of 3.20 mol of Cl_2?

_____

9. How many molecules do you have in 64 g of CO_2?

_____

10. What is the mass of 2.0×10^{23} atoms of sodium?

_____

Chemistry

Molar Volume

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line. The conversion
factors may be used more than one time.

Column A		**Column B**
_____	**1.** converting moles to volume	**A** $\dfrac{1 \text{ mol}}{22.4 \text{ L}}$
_____	**2.** converting mass to moles	
_____	**3.** converting volume to moles	**B** $\dfrac{22.4 \text{ L}}{1 \text{ mol}}$
_____	**4.** converting particles to volume	**C** $\dfrac{\text{molar mass g}}{1 \text{ mol}}$
_____	**5.** converting volume to mass	
_____	**6.** converting moles to particles	**D** $\dfrac{1 \text{ mol}}{\text{molar mass g}}$
_____	**7.** converting mass to particles.	**E** $\dfrac{6.02 \times 10^{23} \text{ particles}}{1 \text{ mol}}$
		F $\dfrac{1 \text{ mol}}{6.02 \times 10^{23} \text{ particles}}$

Directions Write the answer to each question. Use the correct
units, significant figures, and show your work.

8. How many moles are in 7.3 L of H_2 at STP?

_____

_____

9. What is the volume of 2.3 mol of CO_2 at STP?

_____

_____

10. How many moles are in 543 mL of O_2 at STP?

_____

_____

Chemistry

The Molarity of Solutions

Directions Label each solution *C* for concentrated or *D* for dilute.

_____ **1.** 0.002 *M*

_____ **2.** 14 *M*

_____ **3.** 2 *M*

_____ **4.** 9 *M*

Directions Write the answer to each question. Use the correct units, significant figures, and show your work.

5. How many moles of NaCl will it take to make 3.0 L of a 0.1 *M* solution?

_____

6. How many grams of CaF_2 are needed to make 1.5 L of a 0.5 *M* solution?

_____

7. 63.2 g of $BaCl_2$ are dissolved in enough water to make a 634 mL solution. What is the solution's molarity?

_____

8. A 1.9-*M* solution of KI has a volume of 0.90 L. How many moles of solute does it contain?

_____

9. What is the volume of a 0.30-*M* solution with 2.3 mol of NH_4OH?

_____

10. If 0.02 mol of LiOH are dissolved to make 4.5 L of solution, what is the molarity?

_____

     Chemistry

Percent Composition

Directions Put the steps for calculating percent composition in order from first step to last step. The answer to number 1 would be the first step. The answer to number 5 would be the last step.

_____   Divide the total molar mass of each element
              by the molar mass of the compound.

_____   Find the total molar mass of each element
              in the compound.

_____   Check that each element has a percentage
              and that the percentages add up 100.

_____   Multiply by 100%.

_____   Find the molar mass of the entire compound.

Directions Write the answer to each question.

6. What are the units of percent composition?

_____

7. Which compound has the highest percent of iron by mass,
   FeO or $FeCl_2$?

_____

8. What is the percent of hydrogen in H_2S?

_____

9. Which element has the highest percent by mass in NaOH?

_____

10. What is the percent composition of Na_3PO_4?

_____

Empirical and Molecular Formulas

Directions Label each as an *E* for empirical formula, *M* for
molecular formula, or *F* for formula unit. Some formulas may be
more than one.

_____   **1.** S_2Cl_2

_____   **2.** $HC_2H_3O_2$

_____   **3.** Na_2SO_3

_____   **4.** $C_6H_{10}O_4$

_____   **5.** $C_3H_5O_2$

Directions Write your answers on the lines.

   6. What is the difference between an empirical formula and a molecular
   formula?

   _____

   _____

   7. Explain how an empirical formula and a molecular formula could be
   the same thing.

   _____

   _____

   8. What is the empirical formula of $C_6H_{12}O_3$?

   _____

   9. A compound has a mole ratio of 2 moles of nitrogen and 1 mole of
   oxygen. What is its empirical formula?

   _____

   10. If a compound contains 17.6 g of sodium, 39.7 g of chromium, and
   42.7 g of oxygen, what is its empirical formula?

   _____

Name _____ Date _____ Period _____

Molecular Formulas and Hydrates

Directions Write the correct term on the line. Each sentence describes a step in determining a molecular formula.

1. Calculate the mass of the _____ formula.

2. Compare the mass of the empirical formula with the given _____ mass.

3. Find a _____ number n.

4. Multiply each _____ in the empirical formula by n.

Directions Write the letter of the answer to each question on the line.

_____ 5. A compound has an empirical formula of NaO and a molar mass of 78 g/mol. What is its molecular formula?
A Na_2O **B** Na_2O_2 **C** Na_4O_4 **D** Na_2O_4

_____ 6. A compound has an empirical formula of C_2HCl and a molar mass of 181.5 g/mol. What is its molecular formula?
A $C_2H_2Cl_2$ **B** $C_4H_2Cl_2$ **C** $C_6H_3Cl_3$ **D** C_2HCl

_____ 7. If a hydrate of Na_2CO_3 weighed 41.95 g before heating and 23.75 g of water were removed, how many grams of Na_2CO_3 are remaining?
A 66.4 g **B** 54.45 g **C** 24.1 g **D** 18.2 g

Directions Write the answer to each question.

8. What does the molecular formula $CuSO_4 \cdot 5H_2O$ mean?

_____

9. A compound has an empirical formula of HgCl and a molar mass of 472.2 g. What is its molecular formula?

_____

10. A compound has an empirical formula of CH_2O and a molar mass of 90 g. What is its molecular formula?

_____

Chemistry

Chapter 4 Vocabulary Review

Directions Unscramble the letters in the parentheses and write the word or words on the line.

1. The _____ compares the moles of two or more substances. (lemo aiotr)

2. An ionic compound chemically combined with water in a specific ratio is called a(n) _____. (artehdy)

3. The _____ is the amount of solute in a volume of solution. (nrtaitnontocce)

4. The _____ is the number of moles of solute per liter of solution. (ralmoity)

5. The average mass of an atom of an element is called _____. (ticmoa sams)

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A	Column B
_____ 6. large amount of solute compared to other solutions	**A** atmosphere
_____ 7. shows the percentage of mass of each element in a compound	**B** Avagadro's number
_____ 8. unit for measuring pressure	**C** concentrated
_____ 9. unit for measuring the amount of a substance	**D** dilute
_____ 10. small amount of solute compared to other solutions	**E** empirical formula
_____ 11. the volume of one mole of gas at STP	**F** molar mass
_____ 12. formula that shows the smallest whole-number ratio of atoms in a compound	**G** mole
_____ 13. the mass in grams of 1 mol of a substance	**H** molecular formula
_____ 14. temperature of zero degrees celsius and a pressure of one atmosphere	**I** percent composition
_____ 15. the number of particles in one mole	**J** standard molar volume
_____ 16. a formula that gives the actual number of each kind of atom in a molecule	**K** standard temperature and pressure (STP)

 Chemistry

Chemical Equations

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

	Column A		Column B
_____	**1.** substance is a solid	**A**	*(aq)*
_____	**2.** reacts to produce	**B**	*(g)*
_____	**3.** substance is a liquid	**C**	*(l)*
_____	**4.** substance is a gas	**D**	*(s)*
_____	**5.** used to separate two or more reactants	**E**	+
		F	→
_____	**6.** substance is dissolved in water		

Directions Write the answer to each question.

7. What is the difference between a chemical equation and a word equation?

_____

_____

8. What symbols are needed to show that an aqueous solution and a solid substance react to form two gases?

_____

9. Write the following chemical equation as a word equation.
$N_2O_3(g) + H_2O(l) \rightarrow HNO_2(aq)$

_____

_____
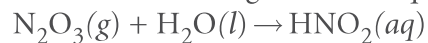
10. Write the following word equation as a chemical equation. Hydrogen gas and sodium hydroxide are formed when sodium is dropped into water.

_____

_____

     Chemistry

Balancing Chemical Equations

Directions Choose the word or words from the Word Bank that best complete the sentence.

_____ **1.** states that matter cannot be created or destroyed

_____ **2.** the energy of position or composition

_____ **3.** the energy of motion

_____ **4.** states that the total amount of energy does not change

_____ **5.** a whole number in front of an element symbol or formula

Word Bank
coefficient
kinetic energy
law of conservation of energy
law of conservation of matter
potential energy

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A   **Column B**

_____ **6.** $C_6H_{12}O_6 + O_2 \rightarrow CO_2 + H_2O$ **A** 3:1:2

_____ **7.** $H_2 + N_2 \rightarrow NH_3$ **B** 2:5:4:2

_____ **8.** $C_2H_2 + O_2 \rightarrow CO_2 + H_2O$ **C** 2:1:2

_____ **9.** $Sn + HF \rightarrow SnF_2 + H_2$ **D** 1:2:1:1

_____ **10.** $NO + O_2 \rightarrow NO_2$ **E** 1:6:6:6

Directions Write the correct coefficients on the lines.

11. ____CS_2 + _____$Cl_2 \rightarrow$ ____CCl_4 + ____S_2Cl_2

12. ____$AgNO_3$ + _____$H_2S \rightarrow$ ____Ag_2S + ____HNO_3

13. ____C + _____$Fe_2O_3 \rightarrow$ ____Fe + ____CO

14. ____$KClO_4 \rightarrow$ ____KCl + ____O_2

15. ____Na + _____$H_2O \rightarrow$ ____$NaOH$ + ____H_2

Chemistry

Combination, Decomposition, and Combustion

Directions Label each reaction as *CI* for combination, *D* for decomposition, or *CU* for combustion.

_____ **1.** $NH_4I \rightarrow NH_3 + HI$

_____ **2.** $CO + Cl_2 \rightarrow COCl_2$

_____ **3.** $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

_____ **4.** $PCl_5 \rightarrow PCl_3 + Cl_2$

_____ **5.** $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

_____ **6.** $2H_2 + O_2 \rightarrow 2H_2O$

Directions Write the answer to each question.

7. When a hydrocarbon burns with oxygen, what two products are always formed?

_____

_____

8. Write an example of a reaction that can be more than one type.

_____

_____

9. How are combination reactions related to decomposition reactions?

_____

_____

10. When metal reacts with oxygen in a combination reaction, what are the products?

_____

_____

Chemistry

Single Replacement

Directions Write the answer to each question.

1. How do you recognize a single-replacement reaction?

_____

_____

2. How is the activity series arranged?

_____

3. When the cation in the compound is replaced, does it stay charged?

_____

4. If element A replaces metal B in a compound, which would be higher on an activity series?

_____

5. How do you use an activity series to determine if a single-replacement reaction will occur?

_____

_____

6. Metal X reacts with $Mg(NO_3)_2$ and $Al(NO_3)_3$, but does not react with $CaSO_4$. Using the metal activity series, determine the metal's identity.

_____

7. What is special about the metals found between lithium and sodium on the activity series?

_____

_____

Directions Label each item as *R* for a reaction that will occur or *NR* for no reaction. You do not have to predict the products.

_____ **8.** $Al + Cu(NO_3)_2 \rightarrow$

_____ **9.** $K + Mg_3(PO_4)_2 \rightarrow$

_____ **10.** $Fe + AgNO_3 \rightarrow$

Double Replacement

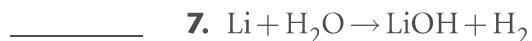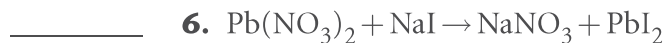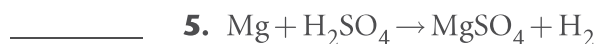***Directions*** Write the answer to each question.

1. Why is the metal activity series not used with double-replacement reactions?

_____

_____

2. How are double-replacement reactions and acid-base reactions similar?

_____

_____

3. How are double-replacement reactions and acid-base reactions different?

_____

_____

4. What are the products formed in a double-replacement reaction?

_____

_____

Directions Label each equation as *SR* for a single-replacement reaction or *DR* for a double-replacement reaction.

_____ **5.** $Mg + H_2SO_4 \rightarrow MgSO_4 + H_2$

_____ **6.** $Pb(NO_3)_2 + NaI \rightarrow NaNO_3 + PbI_2$

_____ **7.** $Li + H_2O \rightarrow LiOH + H_2$

_____ **8.** $Ca(OH)_2 + HCl \rightarrow CaCl_2 + H_2O$

_____ **9.** $Na_2S + Cd(NO_3)_2 \rightarrow CdS + NaNO_3$

_____ **10.** $Cl_2 + KI \rightarrow KCl + I_2$
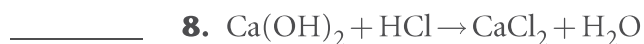
Predicting Products of Reactions

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A	Column B

_____ **1.** If a carbonate is the reactant, the products are carbon dioxide and a compound containing O^{2-}.

A acid-base

B combination

_____ **2.** Check the metal reactivity series to see if the reaction occurs.

C combustion

D decomposition

_____ **3.** If the reactants are a metal and a nonmetal, the product is often an ionic compound.

E double replacement

F single replacement

_____ **4.** If the reactants are a hydrocarbon and oxygen gas, the products are carbon dioxide and water.

_____ **5.** Two ionic compounds are the reactants.

_____ **6.** Hydrogen and hydroxide ions combine to form water as a product.

Directions Predict products for the following reactions. Then balance the equation. If no reaction occurs, write "no reaction."

7. $Na_2CO_3 \rightarrow$ _____

8. $Cu + LiOH \rightarrow$ _____

9. $NaOH + Fe(NO_3)_2 \rightarrow$ _____

10. $Be + O_2 \rightarrow$ _____

11. $OF_2 \rightarrow$ _____

12. $Al + CuSO_4 \rightarrow$ _____

13. $Sr + I_2 \rightarrow$ _____

14. $C_3H_6 + O_2 \rightarrow$ _____

15. $CdBr_2 + Na_2S \rightarrow$ _____

Chapter 5 Vocabulary Review

Directions Unscramble the letters in the parentheses and write the word or words on the line.

1. A(n) _____uses symbols to represent a chemical reaction. (hicemlac oinatequ)

2. The _____says energy cannot be created or destroyed. (awl fo seatnoicnovr fo neegyr)

3. In a(n) _____, one large reactant breaks down into two or more smaller products. (pomsdecatinoi atcnioer)

4. A compound that can decompose to make carbon dioxide is called a(n) _____. (aboncatre)

5. The _____states matter cannot be created or destroyed. (wla fo coverntasnio fo amtert)

6. The energy of position is called _____ . (aitoplnte neeryg)

7. The _____is used up in a chemical reaction. (rteatcna)

8. A list of most reactive elements to the least reactive elements is called a(n) _____. (vtyiiatc eeisrs)

9. A(n) _____ is a number in front of a symbol or formula in a chemical equation. (tieceofcfen)

Chemistry

Chapter 5 Vocabulary Review, continued

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

| Column A	Column B
_____ **10.** two or more small reactants form one larger product	**A** acid-base reaction
_____ **11.** ions of two compounds trade places and form new compounds	**B** base
_____ **12.** ionic compound made of a cation of a base and the anion of an acid	**C** combination reaction
_____ **13.** produces OH^{1-} ions in water	**D** combustion reaction
_____ **14.** contains only carbon and hydrogen atoms	**E** double-replacement reaction
_____ **15.** reaction between an acid and a base to produce water and a salt	**F** hydrocarbon
_____ **16.** energy of motion	**G** kinetic energy
_____ **17.** reaction in which a compound or element burns by reacting with water	**H** product
_____ **18.** an element and compound react to make a different element and different compound	**I** salt
_____ **19.** substance produced by a chemical reaction	**J** single-replacement reaction

Chemistry

Stoichiometry and Moles

Directions Circle the answer to each question.

1. Stoichiometry is the study of (substances, amounts, changes) in chemical reactions.

2. Amounts in chemical reactions always depend on (grams, atoms, moles).

3. Stoichiometry calculations always involve a(n) (mole ratio, gas at STP, amount in grams).

4. In mole-mole calculations, the (desired unit, smallest unit, given unit) is on the bottom of the conversion factor.

Directions Write the answer to each question. Use the balanced equation.

$$Fe_2O_3 + 3C \rightarrow 3CO + 2Fe$$
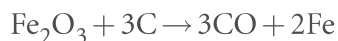
5. How would you convert from moles of iron(III) oxide to moles of carbon monoxide?

_____

6. What mole ratio would calculate the moles of carbon produced from 10 mol of iron?

_____

7. How many moles of carbon will react with 4.3 mol of iron(III) oxide?

_____

Directions Write the answer to each question. Use the balanced equation.

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$
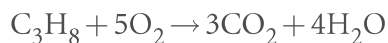
8. Name the type of reaction.

_____

9. List four different mole ratios that can be formed from this equation. _____

_____

10. What mole ratio would you use to find moles of water from moles of oxygen?

_____

    Chemistry

Stoichiometry with Moles and Mass

Directions Write the answer to each question. Use the balanced equation.

$$N_2O_5 + H_2O \rightarrow 2HNO_3$$

1. What conversion map shows how to convert from mass of N_2O_5 to moles of HNO_3?

_____

2. What conversion factors would be needed for the conversion map you wrote in question 1?

_____

3. 32.1 g of dinitrogen pentoxide reacts with an excess of water. How many moles of nitric acid are produced?

_____

Directions Complete the correct conversion factor. Use the balanced chemical equation.

$$2S + 3O_2 \rightarrow 2SO_3$$
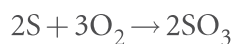
| Conversion	1st Conversion Factor	2nd Conversion Factor	3rd Conversion Factor
mol S → g SO_3	$\dfrac{2 \text{ mol } SO_3}{2 \text{ mol S}}$	$\dfrac{\text{Molar mass } SO_3}{1 \text{ mol } SO_3}$	
g S → mol O_2	**4.** $\dfrac{}{\text{Molar mass S}}$	$\dfrac{3 \text{ mol } O_2}{\textbf{5.}}$	
g O_2 → g SO_3	$\dfrac{1 \text{ mol} O_2}{\textbf{6.}}$	**7.** $\dfrac{}{3 \text{ mol } O_2}$	$\dfrac{\text{Molar mass } SO_3}{\textbf{8.}}$
g SO_3 → g S	$\dfrac{1 \text{mol } SO_3}{\text{Molar mass } SO_3}$	$\dfrac{2 \text{ mol S}}{\textbf{9.}}$	$\dfrac{\text{Molar mass S}}{\textbf{10.}}$

Stoichiometry with Particles and Volume

Directions Choose the word or words from the Word Bank that best complete the sentence.

1. Converting between moles and particles requires _____.

2. Converting between mass and moles requires _____.

3. Converting between moles of different substances requires a balanced equation and a _____.

4. Converting between the volume of a gas at STP and moles requires _____.

5. In stoichiometry calculations, the first step is converting the given units to _____.

6. The last step in stoichiometry calculations is converting to _____.

Word Bank
Avogadro's number
desired units
molar mass
molar volume
mole ratio
moles

Directions Write the answer to each question. Use the balanced equation.

$$4K(s) + O_2(g) \rightarrow 2K_2O(s)$$
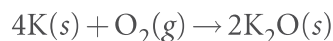
7. What conversion map would be used to convert from volume of O_2 to grams of K_2O?
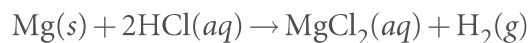
   _____

8. If 45.2 L of O_2 at STP reacts with excess K, how many moles of K_2O are produced?

   _____

9. What volume of O_2 at STP is needed to react with 45.2 g of K?

   _____

10. An excess of oxygen gas reacts with 2.4×10^{24} atoms of K. How many formula units of K_2O are made?

    _____

Stoichiometry with Solutions

Directions Write the correct conversion maps. Use the balanced equation.

$$Mg(s) + 2HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$$

Calculation	Conversion Map
moles $Mg \rightarrow$ volume H_2	**1.**
mass $HCl \rightarrow$ particles $MgCl_2$	**2.**
mass $Mg \rightarrow$ mass HCl	**3.**
particles $HCl \rightarrow$ volume H_2 at STP	**4.**
volume and molarity $HCl \rightarrow$ mass $MgCl_2$	**5.**
given volume of $MgCl_2$ and moles $Mg \rightarrow$ molarity $MgCl_2$	**6.**

Directions Write the answer to each question. Use the balanced equation.

$$2Al(s) + 6HCl(aq) \rightarrow 2AlCl_3(aq)3H_2(g)$$
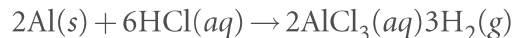
7. How many moles are in 3.2 L of a 6.0 M solution of HCl?

_____

8. If 1.3 mol of aluminum reacts with excess HCl, how many moles of $AlCl_3$ are produced?

_____

**9.** The volume and molarity of HCl are given. List the conversion factors needed to convert to volume of H_2 at STP.

_____

_____

10. What is the molarity of $AlCl_3$ if 1.3 mol of aluminum reacts with excess HCl, producing 4.3 L of $AlCl_3$?

_____

Chemistry

Percent Yield

Directions For each error, write *M* if more product could be produced or
N if no more product could be produced.

_____ **1.** All of the limiting reactant has not been used.

_____ **2.** The reaction did not go to completion.

_____ **3.** The product is contaminated.

_____ **4.** Product stuck to equipment and was not measured.

_____ **5.** The reactants were not properly measured.

Directions Write the answer to each question. Use the balanced equation.

$$2Cu(s) + S(s) \rightarrow Cu_2S(s)$$
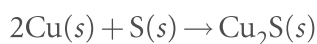
6. Excess sulfur reacts with 4.3 g of Cu. What mass of Cu_2S will
be produced?

_____

7. What is the value calculated in question 10 called?

_____

8. Excess sulfur reacts with 4.3 g of Cu in a lab. What is the
percent yield if 4.7 g of Cu_2S are produced?

_____

9. Excess copper reacts with 9.5 g of S and 0.20 mol of Cu_2S is
produced. What is the percent yield?

_____

10. Excess sulfur reacts with 2.3 mol of Cu. The percent yield is
73.2%. What is the actual yield?

_____

Limiting and Excess Reactants

Directions Write the letter of the answer that best completes
each sentence.

_____ **1.** A reaction usually has _____ limiting reactant(s).
     A one   **B** two   **C** three   **D** four

_____ **2.** Making a ham sandwich requires two slices of bread
and one slice of ham. You have six slices of bread and
four of ham. The limiting reactant is _____.
     A ham   **B** cheese   **C** bread   **D** not listed

_____ **3.** In a chemical reaction, the _____ is used up first.
     A limiting reactant   **B** limiting product   **C** excess reactant   **D** excess product

_____ **4.** The limiting reactant limits the amount of _____.
     A time needed   **B** product made   **C** reactant used   **D** gas produced

_____ **5.** A substance that is not used up in a reaction is called
the _____.
     A limiting reactant   **B** limiting product   **C** excess reactant   **D** excess product

_____ **6.** The reactant that theoretically produces less product
is the _____.
     A limiting reactant   **B** limiting product   **C** excess reactant   **D** excess product

Directions Write the answer to each question. Use the balanced equation.

$$2Na(s) + Cl_2(g) \rightarrow 2NaCl$$
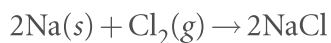
7. What is the mole ratio for Na and Cl_2 in this reaction?

_____

8. What is the limiting reactant when 0.23 mol of Na reacts with
0.13 mol of Cl_2?

_____

9. How many moles of NaCl are produced by the reaction in
question 8?

_____

10. What is the limiting reactant when 72.4 g of Cl_2 reacts with
90.7 g of Na?

_____

      Chemistry

Chapter 6 Vocabulary Review

Directions Unscramble the letters in the parentheses and write the word or words on the line.

1. The reactant that is not used up in a reaction is called _____. (sceexs tcanreat)

2. The _____ is a comparison of the actual product yield and the theoretical product yield. (recpret idlye)

3. The study of the amounts in chemical reactions is called _____. (tihoerysocimt)

4. The amount of product measured in a lab is the _____. (ultaca dyeli)

5. The _____ is used up first in a chemical reaction. (mgiitlni tanrecat)

6. The _____ is the ideal amount of product predicted by stoichiometry. (ctletreohia lyedi)

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ 7. is a percentage of the actual yield divided by the theoretical yield

_____ 8. the amount of product that is measured

_____ 9. study of amounts in chemical reactions

_____ 10. limits the amount of product

_____ 11. ideal amount of product

_____ 12. reactant that is more than needed for the reaction

Column B

A actual yield

B excess reactant

C limiting reactant

D percent yield

E stoichiometry

F theoretical yield

Chemistry

Properties of Gases and the Kinetic Model

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** The force acting on a certain area.

_____ **2.** A set of assumptions about how gases act.

_____ **3.** The pressure exerted by the weight of the atmosphere.

_____ **4.** A property such as pressure, temperature, and volume.

_____ **5.** A gas described by the kinetic model.

_____ **6.** A type of substance that will expand to fill any
container.

Column B

A atmospheric pressure

B gas

C ideal gas

D kinetic model

E physical property

F pressure

Directions Answer each question on the lines. Use complete sentences.

7. Why is there less atmospheric pressure on a mountain than at
sea level?

_____

_____

8. What happens to particle speed and kinetic energy when a gas
is heated?

_____

_____

9. Why is it possible to compress a gas but not a solid?

_____

_____

10. In an ideal gas, what happens to energy when particles collide?

_____

_____

Chemistry

Measuring Pressure and Temperature

Directions Match the items in column A with their value at STP in column B. Write the letter of each correct answer on the line.

Column A	Column B
_____ **1.** mm Hg	**A** 0
_____ **2.** kPa	**B** 1
_____ **3.** atm	**C** 32
_____ **4.** K	**D** 101.3
_____ **5.** °C	**E** 273
_____ **6.** °F	**F** 760

Directions Write the answer to each question.

7. What is absolute temperature?

_____

8. What is the pressure in mm Hg of a gas at 2 atm?

_____

9. What is the temperature in kelvins of a gas at 45°C?

_____

10. What is the pressure in kPa of 0.75 atm?

_____

Chemistry

Dalton's Law of Partial Pressure

Directions Read each statement. Circle the answer that correctly completes each sentence.

1. Partial pressure is the pressure of (all gases, one gas, two gases) in a mixture of gases.

2. Water vapor is water that is in the (solid, liquid, gas) state.

3. Dalton's law says that the total pressure is the (sum, average, difference) of partial pressures.

4. To use Dalton's law, all pressures have to be in (units of atm, the same unit, units of Kelvin).

5. Bubbling gas through water mixes (water vapor, air, oxygen) with the gas.

6. The pressure of water vapor depends on the (size of the container, temperature of the water, pressure of the gas).

Directions Write the answer to each question.

7. What is the equation for Dalton's law of partial pressure?

   _____

8. What does each variable in the above equation mean?

   _____

   _____

9. What equation finds the pressure of a gas mixed with water vapor?

   _____

10. For water at 303 K, what is the water vapor pressure in mm Hg?

    _____

Chemistry

More Gas Laws

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ **1.** Relates pressure and volume of a gas.

_____ **2.** Relates pressure, volume, and temperature of a gas. This law can be used in place of all others.

_____ **3.** Relates volume and temperature of a gas.

_____ **4.** Relates pressure and temperature of a gas.

Column B

A Boyle's law

B Charles's law

C combined gas law

D Gay-Lussac's law

Directions Write the answer to each question.

5. A gas sample at 45°C has a pressure of 123 kPa. If the gas is cooled to 30°C, what is the new pressure?

_____

6. A 3.4-L sample of a gas has a pressure of 1.9 atm. What is the new volume if the pressure is increased to 3.5 atm?

_____

7. A gas sample at 20°C has a volume of 1.0 L. What would the new volume be if the gas is cooled to –15°C?

_____

8. A 732-mL gas sample has a pressure of 540.0 mm Hg. What is the new pressure if the volume is increased to 1.0 L?

_____

9. What gas law explains why the tires on a car lose pressure in winter?

_____

10. A reaction occurs in a closed container that produces a gas. Adding more gas increases the pressure inside the container. Explain why. What else increases and why?

_____

_____

Chemistry

The Ideal Gas Law

Directions Write the letter of the answer that best completes each sentence.

_____ **1.** The ideal gas law contains _____ constant(s).
     A 1   **B** 2   **C** 3   **D** 4

_____ **2.** When using the ideal gas law, volume must be in units of _____.
     A cm^3 **B** milliliters   **C** liters   **D** cups

_____ **3.** Adding more of a gas causes the number of moles to _____.
     A decrease   **B** stay the same   **C** increase   **D** do nothing

_____ **4.** The variable _____ is the number of moles of gas.
     A P **B** R **C** m **D** n

_____ **5.** The equation for the ideal gas law is _____.
     A $PV = nRT$ **B** $PVn = RT$ **C** $n = \dfrac{RT}{PV}$ **D** $\dfrac{PV}{T2} = Rn$

Directions Write the answer to each question.

6. Which value for R is used if pressure is in atmospheres?

_____

7. What is the volume of 2.4 mol of CO_2 at $-10°C$ and 0.5 atm?

_____

8. How many moles are in a 4.3-L sample of H_2 at 34°C and 245 kPa?

_____

9. What is the temperature of 2.4 mol of O_2 in a volume of 35.2 L and a pressure of 1 atm?

_____

10. What is the pressure in kilopascals of 35.6 g of NH_3 in 0.75 L at $-15°C$?

_____

Graham's Law

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. In a sample of gas, _____ varies.

2. When particles move from high concentration to low concentration it is called _____.

3. Another word for speed is _____.

4. Graham's law relates particle speed to _____.

5. In a gas mixture, the gas with highest molar mass will move more slowly. This is a(n) _____ relationship.

Word Bank
diffusion
inversely proportional
molar mass
particle speed
velocity

Directions Answer each question on the lines. Use complete sentences.

6. Carbon monoxide and carbon dioxide are at the same temperature. Which moves faster?

_____

7. How does particle speed affect how fast a gas diffuses?

_____

_____

8. Why should $\frac{V_A}{V_B}$ not be less than 1?

_____

_____

9. If the temperature is the same, would N_2 or Ne be faster? How much faster?

_____

10. To make a balloon stay inflated a long time should you fill it with He or Ne? Why?

_____

_____

_____

Chemistry

Chapter 7 Vocabulary Review

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ **1.** the temperature at which particles stop moving

_____ **2.** a relationship between quantities where one increases as the other increases

_____ **3.** instrument used to measure atmospheric pressure

_____ **4.** a gas described by the kinetic model

_____ **5.** temperature measured on the Kelvin scale

_____ **6.** movement of particles from areas of high concentration to areas of low concentration

_____ **7.** pressure that is exerted by the weight of the atmosphere

_____ **8.** a relationship between quantities where one increases as the other decreases

_____ **9.** the energy of motion

Column B

A absolute temperature

B absolute zero

C atmospheric pressure

D barometer

E diffusion

F direct proportion

G ideal gas

H inverse proportion

I kinetic energy

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

10. Water in the form of a gas is called _____.

11. The _____ is used to explain the physical properties of gases.

12. The speed of an object is its _____.

13. The _____ is the SI unit for measuring pressure.

14. The pressure of one gas in a mixture of gases is called _____.

15. The force of acting on a certain area is called _____.

Word Bank

kinetic model

partial pressure

pascal

pressure

velocity

water vapor

Chemistry

Chapter 7 Vocabulary Review, continued

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **16.** Gas pressure and gas temperature are directly proportional.

_____ **17.** Gas pressure and gas volume are inversely proportional.

_____ **18.** Total pressure of a gas mixture is the sum of the pressures of each gas.

_____ **19.** The greater the molar mass, the slower its particles move.

_____ **20.** Gas volume and gas temperature are directly proportional.

_____ **21.** The law that shows how gas pressure, volume, and temperature are related.

_____ **22.** A fixed number in an equation.

_____ **23.** The fixed value of *R* in the ideal gas law.

Column B

A Boyle's law

B combined gas law

C Charles's law

D constant

E Dalton's law

F gas constant

G Gay-Lussac's law

H Graham's law

Early Atomic Theories

Directions Use the terms in the Word Bank to complete the paragraph.
Write the terms on the lines.

Electrons were discovered by **1.** _____. He used a cathode-ray
tube to prove that they existed. The tube contained a(n) **2.** _____
at each end. One was positively charged and called the **3.** _____.
The other was negatively charged and called the **4.** _____. When
electricity passed through the electrodes, a glowing beam called a cathode ray
appeared. This ray could be deflected by a(n) **5.** _____. This meant
that the beam must contain **6.** _____. It was proposed that this ray
contained negatively charged particles that are in all elements. Later,
7. _____ determined the charge and mass of an electron.

Word Bank
anode
cathode
electrode
J. J. Thomson
magnet
matter
Robert Millikan

Directions Label each statement by the scientist who suggested it.
Use *D* for Dalton or *T* for J. J. Thomson.

_____   **8.** Atoms cannot be divided into smaller parts.

_____   **9.** Chemical reactions occur when atoms separate, join, or rearrange.

_____   **10.** All elements contain negatively charged particles.

_____   **11.** All atoms of an element have identical properties.

_____   **12.** A cathode ray contains matter, not energy.

Directions Answer each question on the lines. Use complete sentences.

13. Explain the difference between the atomic models of Dalton
and Thomson.

_____

_____

14. What was being studied when electrons were discovered?

_____

15. Why did the discovery of electrons mean that an atom must contain
some positive charge?

_____

_____

_____

◆ **Chemistry**

Later Atomic Theories

Directions Use the terms in the Word Bank to complete the paragraph. Write the terms on the lines.

Ernest Rutherford sent a beam of **1.** _____, or helium nuclei, at a piece of gold foil. He expected the particles to **2.** _____. A few of them appeared to **3.** _____ at odd angles. Rutherford decided atoms must contain **4.** _____, small dense centers containing **5.** _____. (Neutrons were discovered later.) Rutherford proposed that the rest of the atom is empty space and **6.** _____.

Word Bank
alpha particles
bounce back
electrons
nuclei
pass through
protons

Directions The table compares the subatomic particles of an atom. Complete the table.

Particle	Symbol	Charge	Mass (g)	Location
Electron	e^-	**7.**	9.110×10^{-28}	**8.**
9.	p^+	1+	**10.**	Inside nucleus
Neutron	**11.**	0	1.675×10^{-24}	**12.**

Directions Answer each question on the lines. Use complete sentences.

13. What was the problem before the neutron was discovered?

_____

_____

14. Which atom contains no neutrons in the nucleus?

_____

15. How is Bohr's model different from Rutherford's?

_____

_____

_____

Chemistry

Atomic Number and Mass Number

Directions Answer each question on the lines. Use complete sentences.

1. An isotope is an atom with a different _____.
  A number of electrons   **C** number of neutrons
  B number of protons   **D** charge

2. Changing the number of protons makes an atom _____.
  A an isotope   **C** an ion
  B a new element   **D** stay the same

3. Changing the number of electrons makes an atom _____.
  A an isotope   **B** a new element   **C** an ion   **D** stay the same

4. A chlorine atom has a 1– charge. This atom has _____ electrons.
  A 16   **B** 17   **C** 18   **D** 19

5. The ion $_{11}Na^{1+}$ has _____ protons and _____ electrons.
  A 10, 11   **B** 10, 10   **C** 11, 10   **D** 11, 11

6. Mass number is the number of _____ and _____ in an atom.
  A protons, neutrons   **C** neutrons, electrons
  B protons, electrons   **D** isotopes, ions

Directions The table shows information about isotopes. Complete the table.

Isotope Name	Isotope Symbol	Atomic Number	Mass Number	Number of Protons	Number of Neutrons	Number of Electrons
Carbon-14	$_{6}^{14}C$	**7.**	**8.**	6	**9.**	6
10.	$_{3}^{4}Li^{1+}$	3	**11.**	3	1	**12.**
13.	**14.**	5	9	5	**15.**	5

Chemistry

Atomic Mass

Directions Answer each question on the lines. Use complete sentences.

1. What is an atomic mass unit?

_____

_____

2. What accounts for most of an atom's mass?

_____

3. What is the approximate mass of a neon-11 atom?

_____

4. What equation is used to calculate atomic mass?

_____

5. Why are atomic numbers never whole numbers?

_____

_____

6. What is percent abundance?

_____

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

7. Molar mass is the same number as _____. (tmoiac ssma)

8. To calculate atomic mass you have to know the mass and _____ of each isotope. (bunacaden)

9. When calculating atomic mass, _____ can be ignored. (clrestneo)

10. Mass numbers are always _____. (helow burmsen)

Chemistry

Chapter 8 Vocabulary Review

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

1. One _____ is approximately the mass of a proton. (cimtao asms nuti)

2. Electrons move from the _____. (chtadoe)

3. A(n) _____ is a metal piece that conducts electricity. (cledeoter)

4. A(n) _____ is a glass tube with an electrode at each end. (tcdeaho-yra btue)

5. The nucleus of helium is called a(n) _____. (aahpl citeparl)

6. A(n) _____ has the same number of protons but a different number of neutrons. (peostoi)

7. The positively charged electrode is called a(n)_____. (nadoe)

8. The _____ is the number of particles in the nucleus. (ssam bmunre)

9. The percentage of abundance and mass of each isotope of an element is called _____. (vegarae maoitc asms)

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A	Column B
_____ **10.** The electrode that electrons move toward.	**A** anode
_____ **11.** The electrode that electrons move away from.	**B** atomic mass unit
_____ **12.** A unit of mass.	**C** cathode
_____ **13.** The total number of particles in the nucleus of an atom.	**D** electrode
_____ **14.** An atom with a different number of neutrons.	**E** isotope
_____ **15.** Conducts electricity.	**F** mass number

Chemistry

Radiation and the Electromagnetic Spectrum

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A	Column B
_____ **1.** Also called radiant energy.	**A** cancer
_____ **2.** The distance from one wave peak to the next.	**B** electromagnetic radiation
_____ **3.** High-energy radiation that can remove an electron from a substance.	**C** electromagnetic spectrum
_____ **4.** A disease in which cells grow without control.	**D** frequency
_____ **5.** A unit used to measure radiation that affects organisms.	**E** ionizing radiation
_____ **6.** Energy or particles that can travel through space.	**F** radiation
_____ **7.** The number of wave peaks that pass a given point in a set time.	**G** rem
_____ **8.** Ionizing radiation that can pass through soft body tissue, but not bone.	**H** wavelength
_____ **9.** A range that shows the forms of radiant energy.	**I** X-rays

Directions Read each statement. Circle the answer that correctly
completes each sentence.

10. The higher the wave (frequency, wavelength, temperature), the
more ionizing the radiation.

11. Nonionizing radiation includes (X-rays, infrared rays, gamma
rays).

12. Frequency is measured in (hertz, kilometers, rem).

13. (Gamma rays, Radio waves, UV rays) have the highest energy.

14. The waves with the largest wavelength are (gamma rays, radio
waves, UV rays).

15. A nuclear reaction means a change in the (nucleus, protons,
electrons) of an atom.

Radioactive Decay

Directions   Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

Word Bank
alpha particle
beta particle
gamma ray
radioactive
radioactive decay
transmutation

1. When a neutron breaks down, one proton and one _____ are produced.

2. Isotopes can change from one element to another. This is called _____.

3. Isotopes are considered _____ if their nucleus is unstable.

4. A helium nucleus can also be called a(n) _____.

5. The breakdown of unstable nuclei is called _____ and occurs all the time.

6. Some radioisotopes emit high-energy electromagnetic waves such as a _____.

Directions   Answer each question on the lines. Use complete sentences.

7. Why do radioisotopes release radiation?

_____

_____

8. What is true for all nuclear equations?

_____

_____

9. How are beta particles different from alpha particles?

_____

_____

10. Why can gamma rays be left out of a nuclear equation?

_____

_____

_____

Chemistry

Nuclear Bombardment

Directions Write the letter of the answer that best completes each sentence.

1. Bombarding a nucleus with a high-speed particle can force _____.
   A natural decay   **C** chemical bonding
   B transmutation   **D** atoms to explode

2. If an element is created in a laboratory it is a(n) _____ .
   A transuranium element   **C** metalloid
   B inner transition metal   **D** lanthinide

3. The _____ isotope was the first man-made element.
   A plutonium-239   **C** neptunium-329
   B plutonium-329   **D** neptunium-239

4. A device called a _____ speeds up the particles for nuclear bombardment.
   A particle generator   **C** radiation generator
   B photon emitter   **D** particle accelerator

5. If a heavier element is formed by bombardment, it usually _____.
   A undergoes radioactive decay **C** has similar properties
   B becomes more stable   **D** creates a new element

Directions Write the answer to each question.

6. A titanium-48 atom is bombarded by an alpha particle. If two protons are emitted, what new element is formed? _____

7. A berkelium-247 atom is bombarded with a lithium-7 atom. When the two nuclei combine, 3 neutrons are emitted. What isotope is formed? _____

8. A barium-137 atom is bombarded with a neutron. What isotope is formed? _____

9. An alpha particle bombards a $^{23}_{11}$Na. What is produced?

   _____

10. A cerium-144 isotope is bombarded by two protons. One product is $^{143}_{60}$Nd. What subatomic particle is emitted?

    _____

Chemistry

Half-Life and Uses of Radioisotopes

Directions Write the word or words that complete each sentence correctly.

1. The isotope _____ is usually used for radioactive dating.

2. The time it takes for half of a radioactive sample to decay is its _____.

3. A(n) _____ is helpful for identifying injuries or diseases in the head or brain.

4. A radioactive substance is considered _____ after 10 half-lives.

5. Treating cancer by directing a beam of radiation at the body is _____.

6. Foods are irradiated to kill _____.

7. A(n) _____ can be used to trace a path through the body.

Word Bank
carbon-14
CAT scan
half-life
mold and bacteria
nonradioactive
radiotherapy
radiotracer

Directions Write the answer to each question.

8. Why does radioactive material never reach a mass of zero?

   _____

   _____

9. How do you calculate the amount left after n half-lives?

   _____

   _____

10. Why is carbon-14 used for radioactive dating?

   _____

   _____

Fission, Fusion, and Nuclear Power

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** The device in which fission chain reactions occur.

_____ **2.** The difference between the mass of a nucleus and
the mass of its particles.

_____ **3.** The joining of two small atoms.

_____ **4.** The splitting of a large nucleus.

_____ **5.** An uncontrolled chain reaction in a nuclear
reactor.

_____ **6.** This is what the mass defect is converted into in
a nuclear reaction.

Column B

A energy

B fission reaction

C fusion reaction

D mass defect

E meltdown

F nuclear reactor

Directions Answer each question on the lines. Use complete sentences.

7. What equation do you use to calculate the energy released when
a nucleus is formed?

_____

8. Why does splitting a nucleus cause a chain reaction?

_____

_____

9. What are the major drawbacks of using fission reactions to
produce energy?

_____

_____

10. How is the speed of reaction in a nuclear reactor controlled?

_____

_____

Chapter 9 Vocabulary Review

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** join two small atoms to make one large one

_____ **2.** can be called radiant energy or radiation

_____ **3.** time it takes for half of a radioactive sample
to decay

_____ **4.** radiation that cannot remove electrons

_____ **5.** splitting a large nucleus into two smaller pieces

_____ **6.** radiation that can remove an electron

_____ **7.** can be called radiation or electromagnetic
radiation

_____ **8.** difference between the mass of a nucleus and the
sum of the masses of its particles

_____ **9.** ionizing radiation with very high energy

_____ **10.** high-energy electron emitted when a neutron
breaks down

_____ **11.** a change in the nucleus of an atom

_____ **12.** nonionizing radiation with wavelengths longer
than visible light

_____ **13.** device used to make fission chain reactions

_____ **14.** the range of every form of radiant energy

Column B

A beta particle

B electromagnetic radiation

C electromagnetic spectrum

D fission reaction

E fusion reaction

F gamma rays

G half-life

H infrared rays

I ionizing radiation

J mass defect

K nonionizing radiation

L nuclear reaction

M nuclear reactor

N radiant energy

Directions Unscramble the word or words in parentheses to complete
each sentence. Write the answer on the line.

15. A radioactive isotope is called a(n) _____.
(drasopteioio)

16. A(n) _____ occurs when an isotope
of one atom is changed into an isotope of another element.
(ratutamtonisn)

Chemistry

Chapter 9 Vocabulary Review, continued

17. A(n) _____ is used to identify health problems. (creatdroiar)

18. When cells grow and divide too much it is called _____. (neracc)

19. The _____ is a unit for measuring wave frequency. (ezhrt)

20. The number of wave peaks that pass a point in a given time is called _____. (enycferuq)

21. A(n) _____ is any element with an atomic number above 92. (anuaimartsur leeentm)

22. Energy or particles that can travel through space are called _____. (tniaroadi)

23. Ionizing radiation with wavelengths shorter than visible light is called _____. (alrtvuetloi asry)

24. When an unstable nucleus breaks down it is called _____ _____. (aracvetoidi acedy)

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

25. The _____ is the distance between wave peaks.

26. The release of radiation caused by radioactive decay is called _____.

27. A(n) _____ occurs when there is an uncontrolled chain reaction.

28. The unit to measure radiation that affects an organism is called _____.

29. A treatment, called _____, can be used to treat cancers.

30. Radiation that can pass through soft tissue but not bone is called _____.

31. A substance is called _____ when radiation is given off.

Word Bank
radioactive
radioactivity
radiotherapy
rem
wavelength
X-rays
meltdown

Chemistry

Energy Levels and Orbitals

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. The arrangement of the separate colors emitted by energized atoms is its _____.

2. Electrons in the lowest _____ are closer to the nucleus.

3. A bundle of energy can be called a(n) _____.

4. A(n) _____ can be described by a shape.

5. The _____ occurs when electrons are emitted from a metal struck by light.

6. The probable location of an electron can be shown as a(n) _____.

7. An electron can move in a(n) _____, such as *s*, *p*, *d*, or *f*.

Word Bank
electron cloud
emission spectrum
energy level
orbital
photoelectric effect
photon
sublevel

Directions Write the letter of the answer that best completes each sentence.

8. A *p* sublevel contains _____ orbitals.
   A 1   **B** 3   **C** 5   **D** 7

9. Light must have a certain _____ to cause the photoelectric effect.
   A wavelength   **B** photon   **C** frequency   **D** volume

10. A *p* sublevel has a _____ shape.
    A sphere   **B** peanut   **C** pyramid   **D** complex

11. Energy levels farther from the nucleus contain _____ sublevels.
    A more   **B** fewer   **C** no   **D** the same

12. Sublevels within a level are _____ energy.
    A far apart in   **B** equal   **C** empty of   **D** close in

Directions Answer each question on the lines. Use complete sentences.

13. What are the three orbitals in the *p* sublevel?

_____

14. How does an emission spectrum show that electrons have certain values of energy? _____

_____

15. What orbitals exist in the fourth energy level?

_____

Chemistry

Electron Configurations

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

1. The electrons in the highest *s* or *p* orbital are called _____ electrons. (calneve)

2. The elements in the same _____ have the same number of valence electrons. (lcuonm)

3. The third energy level contains nine _____. (rabilost)

4. Elements with the same number of valence electrons have similar _____. (ecimahcl ptpresoire).

5. The _____ of an atom explains how it reacts. (corleten gonaftuciniro)

Directions Answer each question on the lines. Use complete sentences.

6. What is the Aufbau principle?

   _____

   _____

7. What information does $3s^1$ give you?

   _____

   _____

8. What is the link between rows of the periodic table and electron configuration?

   _____

   _____

9. How many electrons can the third energy level hold?

   _____

10. How do you find the number of electrons an atom contains?

    _____

    _____

Chemistry

Electron Configurations Beyond Row 3

Directions Match the electron configurations in column A with the
elements in column B. Write the letter of each correct answer on the line.

Column A		Column B
_____	**1.** $1s^22s^22p^63s^23p^64s^1$	**A** arsenic
_____	**2.** $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^2$	**B** barium
_____	**3.** $1s^22s^22p^63s^23p^64s^23d^8$	**C** nickel
_____	**4.** $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^2$	**D** potassium
_____	**5.** $1s^22s^22p^63s^23p^64s^23d^{10}4p^3$	**E** tin
_____	**6.** $1s^22s^22p^63s^23p^64s^23d^2$	**F** titanium
_____	**7.** $1s^22s^22p^63s^23p^64s^23d^{10}4p^65s^24d^{10}5p^66s^2$	**G** zirconium

Directions Write the answer to each question.

8. What is the third rule for electron configurations?

_____

9. Which orbitals do not contain valence electrons?

_____

10. What is the electron configuration for chromium?

_____

11. How many valence electrons does chromium have?

_____

12. What is the electron configuration for magnesium?

_____

13. How many valence electrons does magnesium have?

_____

14. What is the electron configuration for silver?

_____

15. How many valence electrons does silver have?

_____

Chemistry

Shortcuts for Writing Electron Configurations

Directions Label each element as *N* for noble gas, *T* for transition metal, or *R* for representative element.

_____ **1.** krypton

_____ **2.** iron

_____ **3.** rubidium

_____ **4.** tin

Directions Write the answer to each question.

5. With which element is the Al^{3+} ion isoelectronic?

_____

6. What are three examples of elements with unpredictable electron configurations?

_____

7. What is special about noble gases?

_____

_____

8. Why can we abbreviate electron configurations?

_____

_____

9. What is the noble gas configuration for phosphorus?

_____

10. Which element's noble gas configuration is $[Ar]4s^2 3d^{10} 4p^4$?

_____

Chemistry

Dot Diagrams

Directions Label each group of elements as *S* for having the same or *D* for having different dot diagrams.

_____ **1.** Be, Ca, Sr

_____ **2.** potassium, calcium, gallium

_____ **3.** F, O, N

_____ **4.** sulfur, polonium, oxygen

Directions Read each statement. Circle the answer that correctly completes each sentence.

5. The four sides of the symbol represent the four (sublevels, electrons, valence orbitals).

6. A dot diagram can also be called a(n) (electron dot diagram, dot formula, dot structure).

7. To determine a dot diagram for an element, first determine its (molar mass, electron configuration, location on the periodic table).

8. When doing a dot diagram for an ion, the charge goes outside of the (brackets, parentheses, symbol).

9. A dot diagram of (aluminum, beryllium, germanium) shows four dots.

10. All elements in a (row, column, section) have the same dot diagram.

Directions Write the answer to each question.

11. What is the maximum number of valence electrons?

_____

12. What is the dot diagram for bromine?

_____

13. What is the dot diagram for Al?

_____

14. What is the dot diagram for Rb^{1+}?

_____

15. What is the dot diagram for N^{3-}?

_____

Chapter 10 Vocabulary Review

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. A(n) _____ is an element in columns 3 through 12 of the periodic table.

2. A(n) _____ is found in column 18 of the periodic table.

3. The arrangement of electrons in an atom's orbitals is called _____.

4. The _____ is an area of space where electrons move.

5. The arrangement of separate colors in light emitted when atoms are energized and viewed through a prism is called _____.

6. A(n) _____ is found in columns 1 and 2 and 13 through 18.

7. The _____ states that electrons fill orbitals at the lowest energy levels first.

8. The _____ occurs when electrons are emitted from metal surfaces when light strikes it.

9. The electrons in the *s* or *p* orbital in the highest energy level are called _____.

10. A(n) _____ uses dots to represent the valence electrons.

Word Bank
Aufbau principle
dot diagram
electron configuration
emission spectrum
energy level
noble gas
photoelectric effect
representative element
transition metal
valence electron

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

11. When an ion has the same number of electrons it is called _____. (loectetinrsoi)

12. The _____ is a region of space described by a shape. (aoibltr)

13. The indistinct region around the nucleus is called the _____ _____. (ncoetler ocdul)

14. The _____ is a small level within an energy level. (blslevue)

15. A(n) _____ is a bundle of energy. (nothpo)

Chemistry

Development of the Periodic Table

Directions Match the elements in column A with the family name in column B. Write the letter of each correct answer on the line.

Column A

_____ **1.** elements in column 2

_____ **2.** elements with atomic numbers 90–103

_____ **3.** elements in column 18

_____ **4.** elements in column 1

_____ **5.** elements with atomic numbers 58–71

_____ **6.** elements in column 17

_____ **7.** elements that are considered
              lanthanides or actinides

Column B

A actinides

B alkali metals

C alkaline earth metals

D halogens

E inner transition metals

F lanthanides

G noble gases

Directions Use the terms in the Word Bank to complete the paragraph. Write the terms on the lines.

The first periodic table was created to make sense of the patterns in element
8. _____. Johann Dobereiner put elements with similar properties
together in groups called **9.** _____. This only made sense with some
of the elements. John Newlands arranged elements in groups called
10. _____. Each element in these groups had different properties.
Dmitri Mendeleev arranged the elements by **11.** _____. He placed
elements with similar properties in the same **12.** _____. He also
left blanks for **13.** _____ that seemed to be missing.

Word Bank
atomic mass
column
elements
octaves
properties
triads

Directions Answer each question on the lines. Use complete sentences.

14. Why was it important that Dmitri Mendeleev left blank spots in his
periodic table?

_____

_____

15. How did the periodic table get its name?

_____

_____

◆ Chemistry

Patterns in Valence Electrons

Directions Write the letter of the answer that best completes each sentence.

1. A set of _____ valence electrons is a stable set.
  A 4   **B** 6   **C** 8   **D** 10

2. The elements in columns 14 and 15 usually _____ electrons.
  A share   **B** lose   **C** gain   **D** double

3. Metal atoms usually _____ electrons.
  A double   **B** lose   **C** gain   **D** share

4. The elements in column 16 and 17 usually _____ electrons.
  A share   **B** lose   **C** gain   **D** double

5. The ionic charges of metals usually _____ across a row.
  A have no pattern   **B** stay the same   **C** decrease   **D** increase

6. The ionic charges of nonmetals generally _____ across a row.
  A have no pattern   **B** stay the same   **C** decrease   **D** increase

Directions Write the number of valence electrons each element would have on the line.

_____ **7.** magnesium   _____ **9.** cesium

_____ **8.** iron   _____ **10.** selenium

Directions Write the answer to each question.

11. Why do atoms form bonds?

_____

_____

12. Why do atoms not always form ions in order to bond?

_____

13. What would the charge likely be on a strontium ion?

_____

14. What would the charge likely be on a nitrogen ion?

_____

15. What would the charge likely be on an iodine ion?

_____

    ▶ **Chemistry**

Patterns in Atomic Size

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. The distance from the nucleus of an atom to its outermost orbitals is _____.

2. Atomic radius _____ from the top of the periodic table to the bottom.

3. Cations are _____ than their neutral atom.

4. Atomic radius _____ across a period.

5. Anions are _____ than their neutral atom.

Word Bank
atomic radius
decreases
increases
larger
smaller

Directions Circle the atom or ion in each pair with the largest radius.

6. lithium and potassium

7. fluorine and nitrogen

8. chlorine and argon

9. Ba and Ba^{2+}

10. Fe^{2+} and Fe^{3+}

11. O^{2-} and Li^{1+}

Directions Answer each question on the lines. Use complete sentences.

12. Explain why valence electrons affect the atomic radius of an element.

   _____

   _____

13. Why is the radius of a cation smaller than the neutral atom?

   _____

   _____

14. Why is the radius of an anion larger than the neutral atom?

   _____

   _____

15. Why does atomic radius decrease across a period?

   _____

   _____

■▶ **Chemistry**

Patterns in Ionization Energy and Electron Affinity

Directions Read each statement. Circle the answer that correctly completes each sentence.

1. The SI unit for energy is (joules, kelvins, watts).

2. The amount of energy required to remove an electron is called (electron affinity, shielding effect, ionization energy).

3. The (halogen, alkali, noble gas) family does not release energy when an electron is added.

4. The energy released when an electron is added is called (electron affinity, shielding effect, ionization energy).

5. Lower levels of electrons block valence electrons from the attractive force of the nucleus. This is called (electron affinity, shielding effect, ionization energy).

Directions Circle the element in each pair with the strongest electron affinity.

6. magnesium and barium

7. calcium and gallium

8. oxygen and potassium

9. fluorine and neon

10. boron and thallium

Directions Circle the element in each pair with the highest ionization energy.

11. magnesium and barium

12. calcium and gallium

13. oxygen and potassium

14. fluorine and neon

15. boron and thallium

Properties of Families

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A	Column B

Column A

_____ **1.** These elements have low densities, are good conductors, and are extremely reactive.

_____ **2.** A form of an element that has a different bonding arrangement than another form.

_____ **3.** This group has the properties of metals. It contains the only metal that is liquid at 20°C.

_____ **4.** These metals are good conductors, reactive, and form ions with a 2+ charge.

_____ **5.** These elements are diatomic, but are too reactive to be found that way in nature.

Column B

A alkali metals

B alkaline earth metals

C allotrope

D halogens

E transition metals

Directions Write the letter of the answer that best completes each sentence.

_____ **6.** Alkali metals react easily with _____. This is why they are not found in their elemental form in nature.
   A each other   **B** oxygen and water   **C** carbon   **D** nitrogen and oxygen

_____ **7.** The aluminum family contains one semimetal, _____.
   A thallium   **B** boron   **C** aluminum   **D** carbon

_____ **8.** The oxide coating aluminum forms protects it from _____.
   A rusting   **B** melting   **C** radiation   **D** corrosion

_____ **9.** Graphite and diamonds are allotropes of _____.
   A phosphorus   **B** carbon   **C** nitrogen   **D** aluminum

_____ **10.** The most reactive nonmetal is _____.
   A fluorine   **B** lithium   **C** oxygen   **D** hydrogen

Chemistry

Chapter 11 Vocabulary Review

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

1. If a metal can be rolled into sheets it is said to be _____. (aelalbelm)

2. A(n) _____ is found in column 17 of the periodic table. (nagehlo)

3. The _____ are elements that have an atomic number between 90 and 103. (ndicsetai)

4. The _____ are elements that have an atomic number between 58 and 71. (ndiselnahta)

5. If a metal can be pulled into a wire it is _____. (icdleut)

6. A row on the periodic table is called a(n) _____. (oedrpi)

7. A(n) _____ is a form of an element that has a different bonding arrangement. (eaplolotr)

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ 8. the lanthanide or actinide series elements

_____ 9. any element in column 1, except hydrogen

_____ 10. also called groups

_____ 11. the blocking of valence electrons

_____ 12. a measure of the size of an atom

_____ 13. the amount of energy needed to remove a valence electron

_____ 14. elements in column 2

_____ 15. a measure of the size of an ion

_____ 16. amount of energy released when an electron is added

_____ 17. the SI unit for energy

Column B

A alkali metals

B alkaline earth metals

C atomic radius

D electron affinity

E family

F inner transition metal

G ionic radius

H ionization energy

I joule

J shielding effect

Chemistry

Electronegativity and Bond Type

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. When the atoms share electrons it is called a(n) _____.

2. If the atoms in a chemical bond share the electrons evenly it is a(n) _____.

3. When two atoms share or transfer electrons a(n) _____ is formed.

4. If a chemical bond is formed by electrons being transferred between atoms it is called a(n) _____.

5. When electrons are not shared evenly in a chemical bond it is called a(n) _____.

6. The _____ of an atom describes how strongly it attracts the shared electrons in a bond.

Word Bank
chemical bond
covalent bond
electronegativity
ionic bond
nonpolar covalent bond
polar covalent bond

Directions Label each pair as *I* for ionic bond, *P* for polar covalent bond, or *N* for nonpolar covalent bond.

_____ 7. sodium and oxygen

_____ 8. nitrogen and bromine

_____ 9. carbon and iodine

_____ 10. phosphorus and oxygen

_____ 11. iron and nitrogen

_____ 12. sulfur and fluorine

_____ 13. nickel and chlorine

Directions Answer each question on the lines. Use complete sentences.

14. What holds the atoms in a covalent bond together?

_____

_____

15. What holds the atoms in an ionic bond together?

_____

_____

Chemistry

Dot Diagrams of Molecules

Directions   Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

1. when two atoms share two pairs of electrons

2. when atoms tend to transfer or share electrons to get eight valence electrons

3. the bond that holds a polyatomic ion together

4. when two atoms share one pair of electrons

5. when two atoms share three pairs of electrons

6. valence electrons not involved in a bond

Column B

A covalent bond

B double bond

C lone pair

D octet rule

E single bond

F triple bond

Directions   Answer each question on the lines. Use complete sentences.

7. How do you know how many dots to draw in a dot diagram?

_____

_____

8. Why wouldn't you use a line to show shared electrons for an ionic compound?

_____

_____

9. Why are two shared electrons not a double bond?

_____

_____

10. How does the compound NaOH contain ionic and covalent bonds?

_____

_____

_____

Molecular Geometry

Directions The table shows the shapes molecules form.
Complete the table.

	Number of Lone Pairs	Degree of Bond Angle	Example
1.	0	180	CO_2
trigonal planar	**2.**	**3.**	CO_3^{2-}
tetrahedral	**4.**	109.5	CH_4
5.	1	**6.**	NH_3
bent	**7.**	**8.**	H_2O

Directions Answer each question on the lines. Use complete sentences.

9. Why is molecular geometry important?

_____

_____

10. What does the VSEPR theory say about molecular geometry?

_____

_____

11. What is the difference between the shape of NH_3 and NH_4^{1+}?

_____

_____

Directions Read each statement. Circle the answer that correctly
completes each sentence.

12. A molecule of CCl_4 will have a (bent, trigonal pyramidal,
tetrahedral) shape.

13. A molecule of NO_3 will have a (bent, trigonal planar,
tetrahedral) shape.

14. A molecule of CS_2 will have a (bent, linear, trigonal planar) shape.

15. A molecule of PF_3 will have a (bent, trigonal pyramidal,
tetrahedral) shape.

Chemistry

Polar and Nonpolar Molecules

Directions Write the letter of the answer that best completes
each sentence.

1. An asymmetric molecule is _____.
   A unbalanced   **C** made of nonpolar covalent bonds
   B even   **D** balanced

2. A _____ molecule has a positive end and a negative end.
   A nonpolar   **B** covalent   **C** polar   **D** ionic

3. When positive and negative charges are balanced
the molecule is _____.
   A nonpolar   **B** covalent   **C** polar   **D** ionic

4. All polar molecules must have at least one _____.
   A ionic bond   **C** polar covalent bond
   B nonpolar covalent bond   **D** lone pair

5. If the center of the positive and negative charges
are separated the molecule is _____.
   A nonpolar   **B** ionic   **C** covalent   **D** asymmetric

6. Linear molecules are always _____.
   A nonpolar   **B** covalent   **C** polar   **D** ionic

7. Bent and _____ shapes are always polar.
   A tetrahedral   **B** linear   **C** trigonal planar   **D** trigonal pyramidal

8. In an asymmetrical molecule all of the atoms
bonded to the center atom are not _____.
   A different   **B** identical   **C** hydrogen   **D** balanced

9. Lone pairs cause a molecule to be _____.
   A nonpolar   **B** covalent   **C** polar   **D** ionic

Directions Label each molecule as *P* for polar or *N* for nonpolar.

_____ **10.** NCl_3 _____ **13.** H_2S

_____ **11.** CCl_4 _____ **14.** CH_3Cl

_____ **12.** N_2 _____ **15.** HCl

Chemistry

Interparticle Forces

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** a permanent force between two polar molecules

_____ **2.** the cause of all five attractive forces

_____ **3.** occurs between a cation and an anion

_____ **4.** caused by a temporary closeness of electrons within a particle

_____ **5.** between a hydrogen in one polar molecule and the negative end of another polar molecule

_____ **6.** occurs when a sea of freely moving electrons holds metal atoms together

Column B

A dipole-dipole force

B dispersion force

C hydrogen bonding

D ionic bonding

E metallic bonding

F polarity

Directions Answer each question on the lines. Use complete sentences.

7. Why is ionic bonding considered a bond type and an attractive force?

_____

_____

8. Why do metals and ionic compounds share some properties?

_____

_____

9. Why are dispersion forces so weak?

_____

_____

10. A substance is a brittle solid at room temperature. The substance can conduct electricity and has a high boiling point. What kind of attractive forces are occurring in the substance?

_____

_____

Chapter 12 Vocabulary Review

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** a weak force of attraction that results when electrons become close

_____ **2.** an unbalanced arrangement

_____ **3.** a pyramid-shaped geometry

_____ **4.** flat, straight geometry

_____ **5.** permanent attraction between oppositely charged ends of polar molecules

_____ **6.** a molecule with positive and negative ends

_____ **7.** having a flat, triangle-shaped geometry

_____ **8.** a chemical bond with electrons equally shared

_____ **9.** idea that molecular geometry is determined by minimizing repulsion of valence electrons

_____ **10.** a covalent bond where two pairs of electrons are shared

_____ **11.** a strong attraction between hydrogen atoms and oxygen, nitrogen, or fluorine atoms

_____ **12.** a chemical bond in which electrons are shared between two atoms

Column B

A asymmetric

B covalent bond

C dipole-dipole force

D dispersion force

E double bond

F hydrogen bonding

G linear

H nonpolar covalent bond

I polar molecule

J tetrahedral

K trigonal planar

L valence-shell electron-pair repulsion theory

Chapter 12 Vocabulary Review, continued

Directions Choose the term from the Word Bank that complete each sentence correctly. Write the answer on the line.

13. The _____ states that atoms tend to transfer or share electrons to obtain 8 electrons in their outer energy level.

14. Water molecules are _____ because the tetrahedral geometry is affected by two lone pairs.

15. A flat, triangle-shaped geometry is called _____.

16. A(n) _____ forms when electrons are transferred.

17. The ability of an atom to attract electrons is called _____.

18. In a(n) _____, electrons are not equally shared.

19. When there is an attractive force between metals it is called _____.

20. The presence of areas of positive and negative charges on an atom or molecule is called _____.

21. A(n) _____ occurs when atoms share three pairs of electrons.

22. The shape of a molecule is its _____.

23. A solid that shatters when hit with force is called _____.

24. A(n) _____ forms between atoms that share one pair of electrons.

Word Bank
bent
brittle
electronegativity
ionic bond
metallic bonding
molecular geometry
octet rule
polar covalent bond
polarity
single bond
trigonal planar
triple bond

Measuring Heat

Directions Choose the term from the Word Bank that completes each
sentence correctly. Write the answer on the line.

1. Heat transfer is measured with _____.
2. The energy transferred between two objects of different temperatures
   is _____.
3. An object's _____ is a measure of its average kinetic energy.
4. In a(n) _____ change, such as ice melting, heat is absorbed.
5. The study of energy and how it changes is called _____.
6. A(n) _____ includes all of the substances involved in a change.
7. The _____ states that the energy of the universe is constant.
8. A change is considered _____ if it releases heat.
9. The _____ of a substance is the heat needed to raise the
   temperature of 1 g of the substance by 1°C .

Word Bank
calorimetry
endothermic
exothermic
first law of thermodynamics
heat
specific heat
system
temperature
thermodynamics

Directions Write the answer to each question. Use the correct units and
significant figures, and show your work.

10. The specific heat of water is 4.18 J/g•°C. How much energy is released
    when a 4.30-g sample of water cools from 45.0°C to 10.0°C?

    _____

11. Is the change in question 10 endothermic or exothermic?

    _____

12. The specific heat of glass is 0.50 J/g•°C. A 61.3-g piece of glass absorbs
    1,200 J of heat. What is the change in temperature?

    _____

13. Is the change in question 12 endothermic or exothermic?

    _____

14. The specific heat of water is 4.18 J/g•°C. A 76.3-g piece of metal at
    103°C is dropped into 89 g of water at 40°C. The final temperature of
    the mixture is 65°C. What is the specific heat of the metal?

    _____

15. The specific heat of water is 4.18 J/g•°C. The specific heat of mercury
    is 0.14 J/g•°C. A piece of mercury at 46°C is added to 1.13 g of water at
    10°C. The final temperature is 25°C. What is the mass of the mercury?

    _____

Chemistry

Enthalpy and the Heat of Reaction

Directions Write the letter of the answer that best completes
each sentence.

1. The amount of heat a sample has is called _____.
   A entropy   **C** enthalpy
   B heat of combustion   **D** temperature

2. Heat of reaction is the change in heat in a reaction. It is
calculated for every _____ of a reactant or product.
   A 1 g   **B** 1 molecule   **C** 10^{23} particles   **D** 1 mol

3. The heat of combustion is always _____, so the change
in enthalpy is _____.
   A exothermic; negative   **C** exothermic; positive
   B endothermic; negative   **D** endothermic; positive

4. The symbol for enthalpy is _____.
   A q   **B** E   **C** H   **D** T

5. When energy is released, the change in enthalpy is _____.
   A zero   **B** negative   **C** positive   **D** ignored

Directions Write the answer to each question. Use the balanced equation.

$$2Mg + O_2 \rightarrow 2MgO + 1{,}204 \text{ kJ}$$

6. Is the combustion of magnesium endothermic or exothermic?

_____

7. How many kJ are released when 4.30 mol Mg reacts with an
excess of oxygen?

_____

8. If 6.40 mol magnesium oxide are produced, how much energy
is released?

_____

9. If 68.9 g Mg react with an excess of oxygen, how much energy
is released?

_____

10. The reaction produces 5,356 kJ of energy. How many grams
of MgO are formed?

_____

Chemistry

Enthalpy and the Heat of Formation

Directions Read each statement. Circle the answer that correctly
completes each sentence.

1. The standard heat of formation is the enthalpy change when
1 mol of a compound is (formed, burned, decomposed).

2. Standard state is the state of an element at 1 atm and (30°C,
25°C, 0°C).

3. For an element in its standard state the heat of formation is (zero,
negative, positive).

4. A compound has a coefficient in the balanced equation. The heat of
formation for that compound should be (divided by, multiplied by,
subtracted from) the coefficient.

5. The ΔH_{rxn} for a combination reaction is the (sum, average, product)
of the ΔH_f of the products minus the ΔH_f of the reactants.

Directions Write the answer to each question.

6. What is the ΔH_{rxn} for the reaction $CO(g) + O_2(g) \rightarrow CO(g)$?

_____

7. Is the reaction in number 6 endothermic or exothermic?

_____

8. What is the ΔH_{rxn} for the reaction $H_2(g) + Cl_2(g) \rightarrow 2HCl(aq)$?
The standard state for chlorine and hydrogen is a gas.

_____

9. Is the reaction in number 8 endothermic or exothermic?

_____

10. What is the ΔH_{rxn} for the reaction $NO(g) + O_2(g) \rightarrow NO_2(g)$?

_____

Chemistry

Entropy

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

<div style="float:right">

Word Bank
decreases
endothermic
energy
entropy
exothermic
increases
second
third

</div>

1. The _____ law of thermodynamics says the entropy of the universe is always increasing.

2. Changes tend to occur so the lowest possible _____ of a system is reached.

3. When a liquid freezes into a solid, entropy _____.

4. The randomness of a system is measured by _____.

5. A(n) _____ change results in a state of higher energy.

6. The _____ law of thermodynamics says the entropy of a solid at 0 K is zero.

7. Entropy usually _____ when solid reactants produce gases.

8. A(n) _____ change results in a drop in energy.

Directions Label each as *I* for increasing entropy or *D* for decreasing entropy.

_____ 9. raking leaves into a pile

_____ 10. $2H_2(g) + O_2(g) \rightarrow 2H_2O(l)$

_____ 11. heating water to make hot chocolate

_____ 12. burning paper

_____ 13. $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l)$

_____ 14. an ice cube melting

_____ 15. $Pb(NO_3)_2(aq) \rightarrow PbO(s) + NO_2(g) + O_2(g)$

Chemistry

Spontaneity

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ **1.** This can often determine whether a change is spontaneous or not.

_____ **2.** A change that is exothermic and results in an increase in entropy will be spontaneous.

_____ **3.** Occurring naturally as predicted.

_____ **4.** A change that is endothermic and results in a decrease in entropy will be spontaneous.

_____ **5.** Not occurring without the addition of energy.

_____ **6.** A change that is endothermic and results in an increase in entropy will be spontaneous.

Column B

A always

B never

C nonspontaneous

D sometimes

E spontaneous

F temperature

Directions Label each as *A* for always spontaneous, *N* for never spontaneous, or *S* for sometimes spontaneous.

_____ **7.** decrease in entropy and enthalpy

_____ **8.** decrease in entropy, increase in enthalpy

_____ **9.** increase in entropy, decrease in enthalpy

_____ **10.** $2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l) + \text{heat}$

Chapter 13 Vocabulary Review

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ 1. amount of heat released in a combustion reaction

_____ 2. amount of heat a sample has at a certain pressure and temperature

_____ 3. amount of heat needed to raise the temperature of 1 g of a substance 1°C

_____ 4. change in enthalpy when 1 mol of a compound is formed from elements in their standard state

_____ 5. measurement of heat transfer

_____ 6. absorb heat

_____ 7. all substances involved in a change

_____ 8. produce heat

_____ 9. normal state of elements at 1 atm and 25°C

_____ 10. amount of heat released or absorbed in a chemical reaction

_____ 11. energy transferred between objects of different temperatures

_____ 12. measure of randomness in a system

_____ 13. occurs naturally as predicted

Column B

A calorimetry

B endothermic

C enthalpy

D entropy

E exothermic

F heat

G heat of combustion

H heat of reaction

I specific heat

J spontaneous

K standard heat of formation

L standard state

M system

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

14. The _____ says entropy is increasing.

15. The study of energy and how it changes is called _____.

16. The _____ says energy is constant.

17. A(n) _____ change needs additional energy.

18. The _____ says entropy of an ideal solid at 0 K is zero.

Word Bank

first law of thermodynamics

second law of thermodynamics

third law of thermodynamics

nonspontaneous

thermodynamics

Chemistry

Condensed States of Matter

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** changing from a liquid to a solid

_____ **2.** changing from a gas to a liquid

_____ **3.** a solid with particles in orderly,
repeating patterns

_____ **4.** changing from a gas to a solid

_____ **5.** a solid in which the particles are not in orderly,
repeating patterns

_____ **6.** changing from a solid to a liquid

_____ **7.** when liquid changes to a gas, at a temperature below
the boiling point

_____ **8.** changing from a solid to a gas

Column B

A amorphous solid

B condense

C crystal

D deposition

E evaporation

F freeze

G melt

H sublimation

Directions Answer each question on the lines. Use complete sentences.

9. What happens to make a gas condense into a liquid?

_____

_____

10. What is the difference in the motion of particles in a solid,
liquid, and gas?

_____

_____

Chemistry

Vapor Pressure and Boiling Point

Directions Use the terms in the Word Bank to complete the paragraph.
Write the terms on the lines.

A liquid substance with a high **1.**_____ evaporates easily.
When **2.**_____ is increased, vapor pressure increases. The
3._____ of a liquid is the temperature at which its vapor
pressure equals the pressure of the **4.**_____. Vapor pressure
is also affected by the **5.**_____ between the particles. A liquid
that has weak interparticle forces has a low **6.**_____.

Directions Answer each question on the lines. Use complete sentences.

7. When does a substance's normal boiling point equal its actual boiling
point?

_____

8. How do the attractive forces between particles affect vapor pressure?

_____

_____

9. Why does a nonpolar compound like propane (C_3H_8) have a low
normal boiling point?

_____

_____

10. Would you expect an ionic compound to have a higher normal
boiling point than water? Explain.

_____

_____

_____

Word Bank

atmosphere

attractive forces

boiling point

normal boiling
  point

temperature

vapor pressure

Heating and Cooling Processes

Directions Write the letter of the answer that best completes each sentence.

_____ 1. During a change of state, heat absorbed is used to _____.
   A increase temperature   **C** change particle arrangements
   B form new bonds   **D** decrease temperature

_____ 2. The heat transferred when 1 g of a substance melts
   or freezes is called _____.
   A heat of fusion   **C** heat of vaporization
   B heat of formation   **D** heat of combustion

_____ 3. Calculating the heat absorbed when water is heated from
   −5°C to 40°C uses ____ calculation(s).
   A 4   **B** 3   **C** 2   **D** 1

_____ 4. Heat of vaporization is the heat transferred when 1 g of
   a substance boils or _____.
   A melts   **B** condenses   **C** freezes   **D** sublimes

_____ 5. Calculating the heat absorbed when water is heated from
   −15°C to 120°C uses ____ calculations.
   A 5   **B** 4   **C** 3   **D** 2

Directions Read the sentences. Put the steps of the heating process in order. Write 1, 2, 3, 4, or 5 on the line in front of each sentence.

_____ 6. The energy absorbed is enough to cause the molecules to evaporate. The temperature remains at the boiling point.

_____ 7. Absorbed heat increases the kinetic energy of the particles of the solid. The temperature rises.

_____ 8. Additional energy increases the kinetic energy of the particles of the gas. The temperature rises.

_____ 9. Absorbed energy overcomes the interparticle forces holding the molecules in a fixed position. The temperature remains at the melting point.

_____ 10. Absorbed heat increases the kinetic energy of the particles of the liquid. The temperature rises.

Water: A Unique Substance

Directions Write the word or words that complete each sentence correctly.

1. The inward pull that keeps a liquid from spreading is _____.

2. The temperature where all three states of a substance exist together is the _____.

3. Above the _____ a gas cannot be condensed, no matter what the pressure.

4. The pressure required to condense a gas at the critical temperature is the _____.

5. The temperature at 1 atm when a substance melts is the _____.

Word Bank
critical pressure
critical temperature
normal melting point
surface tension
triple point

Directions Read each statement. Circle the answer that correctly completes each sentence.

6. The density of solid water is (more than, the same as, less than) the density of liquid water.

7. Water has a high (melting point, boiling point, freezing point) for its molecular mass.

8. Strong (dispersion forces, ionic bonds, hydrogen bonds) increase water's surface tension.

Directions Write the answer to each question.

9. What is the attractive force that influences all of water's unique properties?

_____

_____

10. What is special about a substance's triple point? What is water's triple point?

_____

_____

_____

Chapter 14 Vocabulary Review

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

1. To _____, a substance changes from a gas to a liquid. (sendnoce)

2. A three-dimensional pattern of particles in a crystal is called a(n) _____. (yaclrts taltcie)

3. The inward pull of hydrogen bonding that prevents a liquid from spreading out creates _____. (acfsrue soientn)

4. A(n) _____ solid has no orderly pattern of particles. (mahpourso)

5. An object will _____ when it changes from a solid to a liquid. (elmt)

6. A(n) _____ is a solid with orderly, repeating particles. (atslycr)

7. The _____ is the temperature and pressure at which all three states of a substance exists together. (riptel niotp)

8. The process of _____ occurs when a solid changes directly to a gas. (ambusinotil)

9. The process of _____ occurs when particles on the surface of a liquid become a gas. (paeovnitora)

10. For a substance to _____, it must change from a liquid to a solid. (zefeer)

Chemistry

Chapter 14 Vocabulary Review, continued

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **11.** change from liquid to a gas

_____ **12.** change from a gas directly to a solid

_____ **13.** temperature when a solid changes to a liquid at 1 atm

_____ **14.** a liquid or solid state

_____ **15.** temperature where a gas cannot be condensed to a liquid

_____ **16.** amount of heat transferred when 1 g of a substance melts or freezes

_____ **17.** temperature when the vapor pressure of a liquid equals atmospheric pressure

_____ **18.** temperature when the vapor pressure of a liquid equals 1 atm

_____ **19.** pressure created by an evaporated liquid

_____ **20.** amount of heat transferred when 1 g of a substance boils or condenses

_____ **21.** pressure required to condense a gas at the critical temperature

_____ **22.** critical pressure and critical temperature of a substance

Column B

A boil

B boiling point

C condensed state

D critical point

E critical pressure

F critical temperature

G deposition

H heat of fusion

I heat of vaporization

J normal boiling point

K normal melting point

L vapor pressure

     Chemistry

Solvation

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** a description of a solid that dissolves in a liquid

_____ **2.** a mixture of particles spread evenly through a substance;
particles are not visible and will not settle

_____ **3.** a substance that conducts electricity when in water,
like most ionic compounds

_____ **4.** a solid that does not dissolve in a liquid

_____ **5.** when an ionic compound breaks apart and separates
into ions in water

_____ **6.** a mixture of particles evenly spread through a substance
when shaken; particles will settle

_____ **7.** when solvent particles attract and surround solute
particles, making them dissolve

_____ **8.** the scattering of light in all directions; a car's headlights
in fog

Column B

A colloid

B dissociation

C electrolyte

D insoluble

E soluble

F solvation

G suspension

H Tyndall effect

Directions Answer each question on the lines. Use complete sentences.

9. What are examples of two miscible liquids? What are examples of two
immiscible liquids?

_____

_____

10. Explain the difference in increasing temperature when the solute is a
solid or a gas.

_____

_____

Chemistry

Saturated Solutions and Solubility

Directions Read each statement. Circle the answer that correctly completes each sentence.

1. A solution that has more than the maximum amount of solute dissolved is (unsaturated, saturated, supersaturated).

2. If a substance's solubility decreases as temperature increases it is likely a (gas, liquid, solid).

3. A solution that could dissolve more solute is (unsaturated, saturated, supersaturated).

4. The amount of solute needed to saturate a solution depends on (pressure, temperature, surface area).

5. A solution that has the maximum amount of solute dissolved is (unsaturated, saturated, supersaturated).

Directions Label each solution as *S* for saturated, *U* for unsaturated, or *SS* for supersaturated. Refer to Figure 15.2.2 in Chapter 15, Lesson 2 of the textbook.

_____ **6.** 20 g SO_2 at 20°C in 100 g of water

_____ **7.** 110 g of KNO_3 at 60°C in 100 g of water

_____ **8.** 60 g of $NaNO_3$ at 30°C in 50 g of water

_____ **9.** 140 g KI at 10°C in 200 g of water

_____ **10.** 50 g KCl at 80°C in 100 g of water

Chemistry

Solubility Rules and Net Ionic Equations

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. A solid that forms out of solution is called a(n) _____.
2. If a _____ is formed the reaction will occur.
3. An ion that remains aqueous and is not part of the reaction is a(n) _____.
4. A(n) _____ shows only the ions that are part of the reaction.
5. If both products are _____ the reaction will not occur.

Word Bank
molecular compound
net ionic equation
precipitate
soluble
spectator ion

Directions Label each compound as *S* for soluble in water or *I* for insoluble in water.

_____ 6. Na_3PO_4

_____ 7. $Fe(OH)_2$

_____ 8. $Ca(NO_3)_2$

_____ 9. K_2SO_4

_____ 10. AgCl

Directions Write the answer to each question.

11. Will the following reactants produce a double-replacement reaction? If so, write the balanced equation and include the state of each product.
$$NaOH + Fe(NO_3)_3 \rightarrow$$

12. Will the following reactants produce a double-replacement reaction? If so, write the balanced equation and include the state of each product.
$$HC_2H_3O_2 + KOH \rightarrow$$
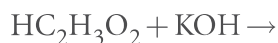
13. Will the following reactants produce a double-replacement reaction? If so, write the balanced equation and include the state of each product.
$$NaC_2H_3O_2 + AgNO_3 \rightarrow$$
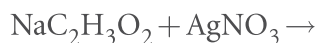
14. Will the following reactants produce a double-replacement reaction? If so, write the net ionic equation.
$$CdBr_2 + Na_2S \rightarrow$$

15. Will the following reactants produce a double-replacement reaction? If so, write the net ionic equation.
$$Ba(NO_3)_2 + H_3PO_4 \rightarrow$$

Chemistry
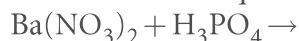
Dilutions

Directions Write the letter of the answer that best completes
each sentence.

1. Concentration is a _____ description of a solution.
   A quantitative   B qualitative   C vague   D quantized

2. Dilute solutions can be made by diluting _____ solutions.
   A pure   C more concentrated
   B less concentrated   D aqueous

3. When doing a dilution calculation the two volumes must be _____.
   A in liters   B in milliliters   C equal   D in the same unit

4. When diluting an acid, always add _____.
   A water to acid   C less than calculated
   B more than calculated   D acid to water

5. The dilution of some strong acids is highly _____.
   A difficult   B endothermic   C exothermic   D dangerous

Directions Write the answer to each question. Use the correct units,
significant figures, and show your work.

6. What is the molarity of solution with a volume of 250 mL that
   contains 0.70 mol NaCl?

7. The solution in question 6 needs to be diluted. To do this, 20.0 mL
   of the solution are diluted to 500 mL. What is the molarity of
   the new solution?

8. 45.3 g of KCl dissolves in enough water to make 3.4 L of solution.
   What is the molarity of the solution?

9. How much of the KCl solution above is needed to make 2.9 L of
   a 0.010 M solution?

10. How much 17.0 M acetic acid is needed to prepare 750.0 mL of
    6.00 M solution?

◢▶ **Chemistry**

Other Units of Concentration

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** Calculated with the equation: $M = \dfrac{\text{moles of solute}}{\text{liters of solution}}$

_____ **2.** Calculated with the equation:
$\dfrac{\text{grams of solute}}{\text{grams of solution}} \times 100\%$

_____ **3.** Calculated with the equation:
$m = \dfrac{\text{moles of solute}}{\text{kilograms of solvent}}$

_____ **4.** Calculated with the equation:
$X = \dfrac{\text{moles of one substance}}{\text{total moles in mixture}}$

Column B

A mass percent

B molality

C molarity

D mole fraction

Directions Write the answer to each question. Use the correct units and
significant figures, and show your work.

5. If 3.2 mol of HCl is dissolved in 345 g of water, what is the molality
of the solution?

6. If 3.2 mol of HCl is dissolved in 345 g of water, what is the mass
percent of the solution?

7. If 3.2 mol of HCl is dissolved in 345 g of water, what is the
mole fraction of the solution?

8. If 0.50 mol of $Ba(OH)_2$ is dissolved in 2.50 mol of water,
what is the molality of the solution?

9. If 0.50 mol of $Ba(OH)_2$ is dissolved in 2.50 mol of water,
what is the mass percent of the solution?

10. If 0.50 mol of $Ba(OH)_2$ is dissolved in 2.50 mol of water,
what is the mole fraction of the solution?

Chemistry

Colligative Properties

Directions Read each statement. Circle the answer that correctly completes each sentence.

1. Properties that depend on the number of dissolved solute particles are called (colligative, physical, chemical) properties.

2. Solute particles make the boiling point of a solution (lower than, higher than, the same as) the pure solvent.

3. Solute particles make the freezing point of a solution (lower than, higher than, the same as) the pure solvent.

4. When a solution freezes, the solute particles usually (freeze with the solvent, get pushed out, become trapped in the solid).

5. Solute particles make the vapor pressure of a solution (lower than, higher than, the same as) the pure solvent.

Directions Write the answer to each question. Use the correct units, significant figures, and show your work.

6. What is the value of i for $AlCl_3$?

7. What is the value of i for NH_3?

8. A solution is prepared by dissolving 53.1 g of KOH in 9.10 kg of water. The K_b for water is 0.512°C/m. What is the boiling point for this solution?

9. The K_f for water is 1.86°C/m. What is the freezing point of the solution in question 8?

10. A solution is prepared with 0.910 mol of C_6H_6O (a molecular compound) dissolved in 645 g of phenol. The K_b for phenol is 1.19°C/m. The boiling point of pure phenol is 182°C. What is the boiling point for this solution?

Chapter 15 Vocabulary Review

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ **1.** describes two liquids that do not dissolve in each other

_____ **2.** ratio comparing two mole amounts

_____ **3.** the percentage of a solution's mass that is due to the solute

_____ **4.** difference between the freezing points of a solution and the pure solvent

_____ **5.** conducts electricity when melted or in aqueous solutions

_____ **6.** remains aqueous and does not take part in a reaction

_____ **7.** amount of moles per kilogram of solvent

_____ **8.** chemical equation without the spectator ions

_____ **9.** physical property of a solution that depends on the number of dissolved solute particles

_____ **10.** more than the maximum solutes dissolved in a solution

_____ **11.** when the solvent surrounds and dissolves solutes

_____ **12.** describes two liquids that dissolve in each other

_____ **13.** less than the maximum solutes in a solution

_____ **14.** difference between the boiling points of a solution and the pure solvent

_____ **15.** has the maximum amount of solute dissolved in a solution

Column B

A boiling-point elevation

B colligative property

C electrolyte

D freezing-point depression

E immiscible

F mass percent

G miscible

H molality

I mole fraction

J net ionic equations

K saturated

L solvation

M spectator ions

N supersaturated

O unsaturated

Chapter 15 Vocabulary Review, continued

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

16. A solid that does not dissolve in a liquid is called _____.

17. The amount of solute that dissolves in a certain amount of solvent to create a saturated solution is called _____.

18. A(n) _____ is a mixture of particles that are evenly spread out when shaken.

19. The process of _____ occurs when an ionic compound breaks apart.

20. A _____ is a mixture that is evenly spread out but isn't dissolved and won't settle out.

21. A solid that dissolves in a liquid is called _____.

22. A(n) _____ will not conduct electricity.

23. The _____ is the scattering of light in all directions.

24. A(n) _____ is a solid that forms out of a solution.

Word Bank
colloid
dissociation
insoluble
nonelectrolyte
precipitate
solubility
soluble
suspension
Tyndall effect

Chemistry

Reaction Rates and Collision Theory

Directions Match the items in column A with those in column B. Write
the letter of each correct answer on the line.

	Column A		**Column B**
_____	**1.** A biological catalyst.	**A**	activation energy
_____	**2.** The speed of a reaction.	**B**	catalyst
_____	**3.** The minimum amount of energy needed for a reaction to take place.	**C**	collision theory
		D	enzyme
_____	**4.** A substance that increases the rate of a reaction.	**E**	reaction rate
_____	**5.** A reaction occurs when particles collide, break new bonds, and form a new one.		

Directions Read each statement. Circle the answer that correctly
completes each sentence.

6. When existing bonds break, it must be (easier, harder, no different) for new bonds to form.

7. Catalysts work by (lowering, raising, providing) the activation energy for a reaction.

8. In a chemical equation, a catalyst is written (on the reactant side, on the product side, over the arrow).

9. Activation energy depends on the (temperature, reaction, particle size of reactants).

Directions Label each statement as *I* for increasing reaction rate or
D for decreasing reaction rate.

_____ **10.** lowering the activation energy

_____ **11.** crushing a reactant into a powder

_____ **12.** increasing the speed of the reactant particles

_____ **13.** cooling a reactant

_____ **14.** diluting the reactants

_____ **15.** increasing the number of reactant particles available

Activation Energy and Potential Energy Diagrams

Directions Write the number of the correct arrow on the line.
Use the diagram below.
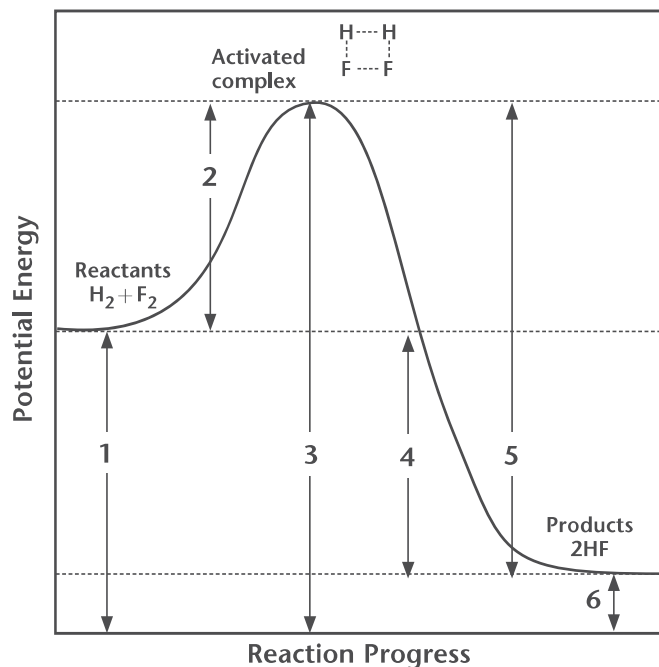
_____ **1.** The potential energy of the reactants.

_____ **2.** The potential energy of the products.

_____ **3.** The activation energy for the reaction.

_____ **4.** The energy difference that represents the heat of reaction.

_____ **5.** The difference in energy between the activated complex
and the products.

_____ **6.** The potential energy of the activated complex.

_____ **7.** This arrow will be changed by the addition of a catalyst.

_____ **8.** The total amount of energy particles must have
for the reaction to occur.

Directions Answer each question on the lines. Use complete sentences.

9. What is an activated complex? _____

_____

10. Does the diagram above show an endothermic or exothermic
reaction? Explain. _____

_____

Chemistry

Reaction Mechanisms and Rate Laws

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the term on the line.

1. The slowest step in a reaction mechanism is the _____.

2. A particle in a reaction mechanism that is not a reactant or a product is a(n) _____.

3. A(n) _____ shows how reaction rate depends on reactant concentration.

4. Small reaction steps that show how a balanced chemical reaction occurs is a(n) _____.

5. A(n) _____ is determined by experimentation.

> **Word Bank**
> intermediate
> rate constant
> rate law
> rate-determining
>   step
> reaction
>   mechanism

Directions Write the letter of the answer that best completes each sentence on the line.

6. The reaction rate is determined by the _____ step.
   A first   **B** last   **C** fastest   **D** slowest

7. An intermediate will have a power of _____ in a rate law.
   A 0   **B** 1   **C** 2   **D** 3

8. Rate laws are only written for the _____ step.
   A intermediate   **B** first   **C** rate-determining **D** last

9. In a second-order reaction the power is _____ for a given reactant.
   A 0   **B** 1   **C** 2   **D** 3

10. Rate mechanisms are used to explain reactions with more than _____ reactant particle(s).
   A 1   **B** 2   **C** 3   **D** 4

Equilibrium Systems

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ **1.** a mathematical equation relating product and reactant concentrations at equilibrium

_____ **2.** a reaction that is in a state of chemical equilibrium

_____ **3.** when the rate of the forward reaction equals the rate of the reverse reaction

_____ **4.** a reaction in which the products can react to form the reactants

Column B

A chemical equilibrium

B equilibrium expression

C equilibrium system

D reversible reaction

Directions Read each statement. Circle the answer that correctly completes each sentence.

5. Concentrations of reactants and products at equilibrium vary with each reaction and with (temperature, pressure, time).

6. When setting up an equilibrium expression, you can eliminate (gases, coefficients, state symbols).

7. Only gases and (liquids, aqueous solutions, solids) are considered in the equilibrium of a reaction.

8. A reaction that is reversible consists of (no, one, two) reaction(s) taking place at once.

9. In a reversible reaction, products must achieve enough energy to form the (products, activated complex, reactants).

10. At equilibrium the amount of each reactant and product (is equal, changes rapidly, remains constant).

Equilibrium Constants

Directions Write the letter of the answer that best completes each sentence on the line.

1. If K is greater than 1, _____ are favored.
    A gases   **B** products   **C** intermediates   **D** reactants

2. If K is less than 1, _____ are favored.
    A gases   **B** products   **C** intermediates   **D** reactants

3. A unique number that describes the equilibrium of a specific reaction is the _____.
    A equilibrium expression   **C** equilibrium constant
    B equilibrium system   **D** balance number

4. In an equilibrium expression, the concentrations of _____ are on top.
    A products   **B** solids   **C** reactants   **D** liquids

5. Equilibrium constants are sensitive to _____.
    A time   **C** changes in volume
    B temperature changes   **D** nothing

Directions Write the answer to each question. Use the correct units and significant figures, and show your work. Use the balanced equation,

$$I_2(g) + Cl_2(g) \rightleftharpoons 2ICl(g)$$
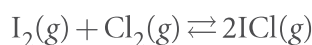
6. At equilibrium, $[I_2] = 0.32\ M$, $[Cl_2] = 1.03\ M$, and $[ICl] = 0.785\ M$. What is the value of K?

7. At equilibrium, $K = 54$, $[I_2] = 1.15\ M$, and $[ICl] = 2.34\ M$. What is the concentration of Cl_2?

8. At equilibrium, $[I_2] = 6.23\ M$, $[Cl_2] = 3.02\ M$, and $[ICl] = 5.74\ M$. What is the value of K?

Le Chatelier's Principle

Directions Use the terms in the Word Bank to complete the paragraph.
Write the terms on the lines.

An equilibrium system is a system in **1.** _____. If a(n)
2. _____ is applied, the equilibrium shifts to relieve
this change in conditions. One type of stress is a change in the
3. _____ of a reactant or product. Another is a
change in **4.** _____. Changing the **5.** _____
in a system of gases will also cause a shift in equilibrium.

| **Word Bank** |
| balance |
| concentration |
| pressure |
| stress |
| temperature |

Directions Label each stress as *L* for causing a shift to the left or *R* for
causing a shift to the right. Use the balanced equation,

$$2SO_3(g) + energy \rightleftharpoons 2SO_2(g) + O_2(g)$$

_____ **6.** increase in temperature

_____ **7.** increase in pressure caused by decrease of volume

_____ **8.** increase in concentration of SO_2

_____ **9.** decrease in temperature

Directions Write the answer to the question. Use the balanced equation,

$$4H_2(g) + CS_2(g) \rightleftharpoons CH_4(g) + 2H_2S(g) + energy$$
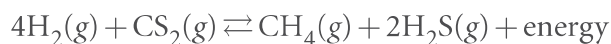
10. In which direction will the equilibrium shift if the
concentration of hydrogen gas is increased? Explain why.

_____

_____

_____

Chemistry

Chapter 16 Vocabulary Review

Directions   Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ 1. constant that describes the equilibrium of a reaction at a certain temperature

_____ 2. equation showing how the rate of a reaction depends on concentration of reactants

_____ 3. group of atoms that temporarily form when reactant particles collide

_____ 4. speed of a reaction

_____ 5. equation relating product concentrations to reactant concentrations at equilibrium

_____ 6. step that determines reaction rate

_____ 7. state of a reversible reaction when the rate of the forward reaction equals the reverse reaction

_____ 8. reaction where the products can react to form the reactants

_____ 9. series of small reaction steps that describes how a balanced reaction occurs

_____ 10. energy needed to start a reaction

_____ 11. a biological catalyst

_____ 12. a constant that is part of the rate law for a specific reaction

_____ 13. states that a reversible reaction at equilibrium will shift to relieve a stress

Column B

A activated complex

B activation energy

C chemical equilibrium

D enzyme

E equilibrium constant

F equilibrium expression

G Le Chatelier's principle

H rate constant

I rate-determining step

J rate law

K reaction mechanism

L reaction rate

M reversible reaction

Chemistry

Chapter 16 Vocabulary Review, continued

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

14. A(n) _____ increases the rate of a reaction. (casytatl)

15. A change in the conditions of a system at equilibrium is called _____. (rstses)

16. A(n) _____ is a particle in a reaction mechanism. (dmatieneriet)

17. The _____ is the idea that a reaction occurs when particles come in contact with each other. (sliconloi ohtrey)

18. A reaction that is in chemical equilibrium is called _____. (biqmleuiriu mesyts)

Chemistry

Acids and Bases

Directions Choose the term from the Word Bank that completes each sentence. Write the answer on the line.

1. The molecule or ion formed when a base accepts a proton is called the _____.

2. A(n) _____ is a compound that is a proton donor.

3. A(n) _____ is the molecule or ion formed when an acid donates a proton.

4. A compound that is a proton acceptor is called a(n) _____.

Word Bank
acid
base
conjugate acid
conjugate base

Directions Write the letter of the response that best completes each sentence. Use the balanced equation $KOH + HBr \rightleftarrows KBr + H_2O$

_____ 5. The conjugate acid is _____.
   A KOH   **B** HBr   **C** KBr   **D** H_2O

_____ 6. KOH is the _____.
   A acid   **B** base   **C** conjugate acid   **D** conjugate base

_____ 7. The conjugate base is _____.
   A KOH   **B** HBr   **C** KBr   **D** H_2O

_____ 8. HBr is the _____.
   A acid   **B** base   **C** conjugate acid   **D** conjugate base

Directions Write the answer to each question. Use the balanced equation

$$HCl + H_2O \rightleftarrows Cl^{1-} + H_3O^{1+}$$
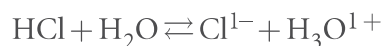
9. Which molecule or ion is the base?

   _____

10. Which molecule or ion is the conjugate acid?

   _____

Neutralization Reactions

Directions Use the terms in the Word Bank to complete the paragraph.
Write the terms on the lines.

Acid-base reactions are called **1.** _____ reactions. They

produce water and a(n) **2.** _____. When all of the acid

has reacted with all of the base, the **3.** _____ has been

reached. Chemists may use a(n) **4.** _____ to determine

the molarity of an acid by using a neutralization reaction. They

would neutralize the acid with a(n) **5.** _____ of a base.

A(n) **6.** _____ is added because it is one color in an

acid and another in a base. The **7.** _____ occurs when

the indicator shows that neutralization has been reached.

Word Bank
end point
equivalence point
indicator
neutralization
salt
standard solution
titration

Directions Read the sentences. Put the steps of a titration in order by 1, 2,
3, 4, or 5 on the line in front of each sentence.

_____ **8.** Add a small amount of indicator.

_____ **9.** Record the volume of acid used. Calculate the concentration of the base.

_____ **10.** Measure a specific volume of the base of unknown concentration.

_____ **11.** Add small, measured amounts of a standard solution of acid.

_____ **12.** Continue adding the standard solution until the end point is reached.

Directions Write the answer to each question. Use the correct units,
significant figures, and show your work.

13. A 150-mL sample of an NaOH solution is neutralized by
45 mL of 0.50 M HCl. What is the molarity of the NaOH?

_____

14. What volume of 1.5 M HNO_3 is needed to neutralize 100.0 mL
of 0.50 M KOH?

_____

15. If 14.5 mL of 1.0 M NH_4OH is needed to neutralize 50.0 mL
of $HC_2H_3O_2$, what is the molarity of the acetic acid?

_____

Chemistry

pH Scale

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

Column B

_____   **1.** an aqueous solution with a pH above 7

_____   **2.** a way of describing the H^{1+} concentration of a solution

_____   **3.** the units $[H^{1+}]$ must be in to calculate pH

_____   **4.** an aqueous solution with a pH below 7

_____   **5.** the equilibrium constant for the ionization of water

A acidic

B basic

C $K_w = [H^{1+}][OH^{1-}]$

D molarity

E pH

Directions The table shows information on some aqueous solutions. Complete the table.

Solution pH	$[H^{1+}]$ (*M*)	$[OH^{1-}]$ (*M*)	Acidic or Basic?
2	**6.**	**7.**	acidic
8.	4.3×10^{-5}		**9.**
10.	**11.**	1.3×10^{-12}	**12.**

Directions Answer each question on the lines. Use complete sentences.

13. Why was the pH scale developed?

_____

_____

14. What is the difference in $[H^{1+}]$ between a pH of 3 and a pH of 5?

_____

15. Why does an acidic solution have a pH less than 7?

_____

_____

_____

Chemistry

Acid and Base Strength

Directions Write the letter of the answer that best completes each sentence.

1. A molecule that completely ionized, creating H^{1+} ions, is a _____.
    A strong base   **B** strong acid   **C** weak base   **D** weak acid

2. An acid that does not ionize completely is called a _____.
    A strong base   **B** strong acid   **C** weak base   **D** weak acid

3. Weak acids and bases are _____.
    A unimportant   **C** important in biological systems
    B insoluble   **D** important only to chemists

4. A molecule that completely ionized, creating OH^{1-} ions, is a _____.
    A strong base   **B** strong acid   **C** weak base   **D** weak acid

5. A base that does not ionize completely is called a _____.
    A strong base   **B** strong acid   **C** weak base   **D** weak acid

Directions Label each compound as *SA* for strong acid, *SB* for strong base, *WA* for weak acid, or *WB* for weak base.

6. $HC_2H_3O_2$ **10.** LiOH

7. HCl   **11.** H_3PO_4

8. NH_3 **12.** $Mg(OH)_2$

9. $HClO_4$

Directions Answer each question on the lines. Use complete sentences.

13. Why is there a strong attraction between acid molecules and water molecules?

_____

14. Why is it important to recognize strong acids and bases?

_____

_____

15. Some strong bases, such as $Ba(OH)_2$, do not produce a large amount of OH^{1-} ions. Why are they still considered strong bases?

_____

_____

Chemistry

Salts and Buffers

Directions Read each statement. Circle the answer that correctly completes each sentence.

1. A(n) (neutral salt, acidic salt, basic salt) is formed when a strong acid reacts with a strong base.

2. A (neutral salt, balanced salt, buffer solution) can resist changes in pH.

3. The reaction between a strong base and a weak acid produces a(n) (neutral salt, acidic salt, basic salt).

4. When a weak acid and a weak base are mixed (a neutral salt is formed, very little reaction occurs, a buffer solution is created).

5. Reacting a strong acid and a weak base will form a(n) (neutral salt, acidic salt, basic salt).

Directions Write the answer to each question.

6. What salt is formed when $Ca(OH)_2$ and HI react?

   _____

7. Is the salt formed in question 6 acidic, basic, or neutral?

   _____

8. What salt is formed when HNO_3 and NH_3 react?

   _____

9. Is the salt formed in question 8 acidic, basic, or neutral?

   _____

10. What salt is formed when $Sr(OH)_2$ and H_3PO_4 react?

    _____

◀▶ **Chemistry**

Chapter 17 Vocabulary Review

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. A(n) _____ substance has a pH below 7.

2. An acid-base reaction is called a(n) _____.

3. A(n) _____ resists changes in pH when a small amount of acid or base is added.

4. A(n) _____ has a pH below 7 and completely ionizes in water.

5. A substance that has a pH above 7 is called a(n) _____.

6. The process of _____ determines the molarity of an acid or base solution using a neutralization reaction.

7. A(n) _____ has a pH above 7 and does not completely dissociate in water.

8. A(n) _____ changes color in acids and bases.

9. A strong acid mixed with a weak base will make a(n) _____.

10. The _____ is when the indicator shows that the equivalence point has been reached.

Word Bank
acidic
acidic salt
basic
buffer
end point
indicator
neutralization reaction
strong acid
titration
weak base

Chemistry

Chapter 17 Vocabulary Review, continued

Directions Match the items in column A with those in column B. Write the letter of each correct answer on the line.

Column A

_____ **11.** proton donor

_____ **12.** molecule or ion formed when an acid donates a proton

_____ **13.** has a known concentration in a titration

_____ **14.** produced from a strong acid and a strong base

_____ **15.** completely dissociates in water

_____ **16.** produced from a weak acid and a strong base

_____ **17.** point when all of the acid reacts with all of the base

_____ **18.** does not completely dissociate in water

_____ **19.** proton acceptor

_____ **20.** uses a scale of 0 to 14

_____ **21.** molecule or ion formed when a base accepts a proton

Column B

A acid

B base

C basic salt

D conjugate acid

E conjugate base

F equivalence point

G neutral salt

H pH

I standard solution

J strong base

K weak acid

Chemistry

Reduction, Oxidation, and Oxidation Numbers

Directions Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

1. An oxidation-reduction reaction can be called a(n) _____ reaction. (xedor)

2. The _____ for an unbonded atom equals zero. (axtoodiin unbrme)

3. If an atom or ion gains electrons in a chemical reaction it is called a(n) _____. (ecornudit)

4. A chemical reaction in which an atom or ion loses electrons is a(n) _____. (iiaxotodn)

5. An oxygen atom is very _____, so it attracts electrons easily. (cirevleettaenog)

Directions Match the items in column A with those in column B. Write the answer on the line.

Column A	Column B
6. In most compounds, oxygen has an oxidation number of _____.	0
7. All monatomic, diatomic, or polyatomic elements have an oxidation number of _____.	1^+
	2^-
8. Alkali metals have an oxidation number of _____.	

Directions Write the answer to each question.

9. What is the oxidation number for each of the following ions: Fe^{3+}, N^{3-}, and Li^{1+}?

_____

10. What is the oxidation number for each atom in the following: I_2, CF_4, and CO?

_____

_____

Redox Reactions

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. Loss of electrons indicates that _____ has occurred.

2. The reactant that causes another reactant to be reduced is the _____.

3. A gain of electrons means that _____ has occurred.

4. The reactant that causes another reactant to be oxidized is the _____.

5. If the oxidation numbers do not change, the equation is not a(n) _____.

Directions Write the answer to each question. Use the balanced equation,

$$C(s) + O_2(g) \rightarrow CO_2(g)$$
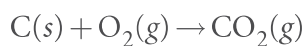
6. Which reactant is the reducing agent?

   _____

7. Which reactant is the oxidizing agent?

   _____

8. Which reactant is being reduced?

   _____

Directions Write the answer to each question. Use the balanced equation,

$$Cl_2(g) + 2HBr(aq) \rightarrow 2HCl(aq) + Br_2(l)$$
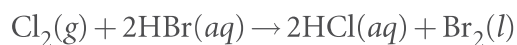
9. Which reactant is the reducing agent?

   _____

10. Which reactant is the oxidizing agent?

    _____

Balancing Redox Equations

Directions Read the sentences. Put the steps of balancing a redox equation in order by writing 1, 2, 3, 4, 5, 6, 7, or 8 on the line in front of each sentence.

_____   **1.** Balance O atoms by adding H_2O.

_____   **2.** Split in half-reactions.

_____   **3.** Add half-reactions. Cancel substances that appear on both sides.

_____   **4.** Balance H atoms by adding H^{1+}.

_____   **5.** Balance atoms except O and H.

_____   **6.** Make electrons lost = electrons gained.

_____   **7.** Check that atoms and charge are balanced.

_____   **8.** Balance charge by adding e^{1-}.

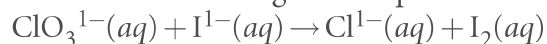**Directions** Write the answer to each question.

9. What is a half-reaction?

_____

_____

10. What two things must be balanced in a redox equation?

_____

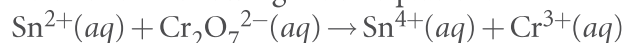**11.** Why are H^{1+} and H_2O sometimes added while balancing redox equations?

_____

_____

12. Balance the following redox equation.
$S(s) + NO_3^{1-}(aq) \rightarrow SO_2(g) + NO(g)$
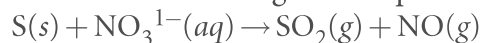
_____

13. Balance the following redox equation.
$ClO_3^{1-}(aq) + I^{1-}(aq) \rightarrow Cl^{1-}(aq) + I_2(aq)$

_____

14. Balance the following redox equation.
$Sn^{2+}(aq) + Cr_2O_7^{2-}(aq) \rightarrow Sn^{4+}(aq) + Cr^{3+}(aq)$

_____

15. Balance the following redox equation.
$MnO_2(s) + NO_2^{1-}(aq) \rightarrow NO_3^{1-}(aq) + Mn^{2+}(aq)$

_____

Chemistry
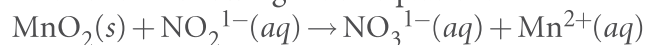
Applications of Redox Reactions

Directions Use the terms in the Word Bank to complete the paragraph.
Write the terms on the lines.

Redox reactions are used in many ways. Bleach **1.** _____
to produce sodium chloride and an oxygen atom. The oxygen atom
is an extremely strong **2.** _____. It oxidizes stains to
form **3.** _____ molecules. Bleach can be used to
disinfect because **4.** _____ are killed when they are
oxidized. Cleaners that release **5.** _____ are safer for the
environment.

Word Bank
bacteria
colorless
decomposes
hydrogen peroxide
oxidizing agent

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

Column B

_____ **6.** The weakening of metal by oxidation.

_____ **7.** An extremely reactive particle containing
an atom with an unpaired electron.

_____ **8.** A stable molecule that reacts with a free
radical, reducing its effect.

_____ **9.** An antioxidant works by giving one of
these to the free radical.

_____ **10.** These are powered by redox reactions.

A antioxidant

B corrosion

C electron

D free radical

E rocket engines

◁▷ **Chemistry**

Voltaic Cells and Batteries

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A   **Column B**

_____ 1. a voltaic cell in which the half-cells contain   **A** anode
paste instead of a solution

_____ 2. a metal object that conducts electric current   **B** cathode
in an electrochemical cell   **C** dry cell

_____ 3. a single electrode immersed in a solution   **D** electric current
of its ions

_____ 4. the flow of electrons   **E** electrical potential difference

_____ 5. the difference in electron pressure between   **F** electrochemistry
the anode and cathode   **G** electrode

_____ 6. the electrode toward which electrons move   **H** half-cell

_____ 7. the study of the relationship between electric
energy and chemical reactions

_____ 8. the half-cell in which oxidation takes place

Directions Answer each question on the lines. Use complete sentences.

  9. What is the difference between a 9-volt battery and
a 12-volt battery?

_____

_____

10. Why do car batteries eventually need to be replaced?

_____

_____

Chemistry

Electrolysis

Directions Read each statement. Circle the answer that correctly completes each sentence.

1. A process that converts electrical energy to chemical energy is (an electrochemical process, called electroplating, impossible).

2. In electrolytic cells, oxidation takes place in the (salt bridge, cathode, anode).

3. Depositing a thin layer of metal on an object in an electrolytic cell is called (electrical veneer, electroplating, electronic film).

4. In electrolytic cells, (oxidation, reduction, electrolysis) takes place in the cathode.

5. (Electrons, Protons, Ions) travel from the anode to the cathode in an electrolytic cell.

6. (Electrolysis, Electroplating, Corrosion) uses electrical energy to cause a chemical change.

Directions Write the letter of the answer that best completes each sentence.

_____ 7. Electrolysis can be used to _____.
   A purify metals   **C** plate one metal onto another
   B produce substances   **D** all of these

_____ 8. An electrolytic cell can isolate _____ from their compounds.
   A ions   **C** gases
   B reactive metals   **D** ores

_____ 9. Electroplating with electrolytic cells produces plating that is _____.
   A thinner   **C** less permanent
   B thicker   **D** more permanent

_____ 10. One step of refining copper ore _____.
   A is electroplating   **C** requires neutralization of the ore
   B uses an electrolytic cell **D** is all that is needed

Chemistry

Chapter 18 Vocabulary Review

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A   **Column B**

_____ **1.** single electrode immersed in a solution of its ions   **A** electrolysis

_____ **2.** an oxidation-reduction reaction   **B** electrolytic cell

_____ **3.** using electrical energy to cause a chemical change   **C** electroplating

_____ **4.** maintains the charge balance between two   **D** free radical
                  half-cells
                                                                          E half-cell
_____ **5.** when an ion or atom loses electrons
                                                                          F half-reaction
_____ **6.** a cell in which electrons are forced to move by an
                  external source of electricity   **G** oxidation

                                                                          H oxidation number
_____ **7.** reactant that causes another reactant to be
                  oxidized   **I** oxidizing agent

_____ **8.** converts chemical energy into electrical energy   **J** redox reaction

_____ **9.** when an atom or ion gains electrons   **K** reducing agent

_____ **10.** one of the two reactions in a redox equation   **L** reduction

_____ **11.** extremely reactive particle   **M** salt bridge

_____ **12.** unit of electrical potential difference   **N** volt

_____ **13.** charge an atom in a compound would have if its   **O** voltaic cell
                  bonds were ionic

_____ **14.** reactant that causes another reactant to be reduced

_____ **15.** depositing a thin layer of metal on an object in an
                  electrolytic cell

Chapter 18 Vocabulary Review, continued

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

16. A(n) _____ is a voltaic cell that uses a paste instead of a solution.

17. The flow of electrons is called a(n) _____.

18. The _____ is the electrode from which electrons move.

19. The _____ is the electrode toward which electrons move.

20. A(n) _____ is a metal object that conducts electricity in or out of an electrochemical cell.

21. A process that converts electrical energy into chemical energy is called _____.

22. A(n) _____ reduces the effect of free radicals.

23. The _____ is the difference in electron pressure between the anode and cathode.

24. When a metal is weakened by oxidation it is called _____.

25. The study of the relationship between chemical reactions and electrical energy is called _____.

Word Bank

anode

antioxidant

cathode

corrosion

dry cell

electrical potential
  difference

electric current

electrochemical
  process

electrochemistry

electrode

Chemistry

Hydrocarbons

Directions Match the items in column A with those in column B.
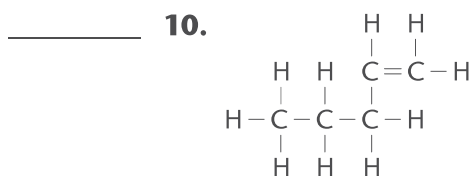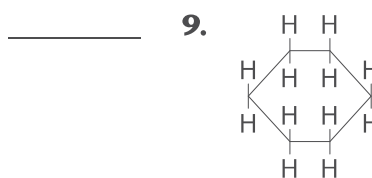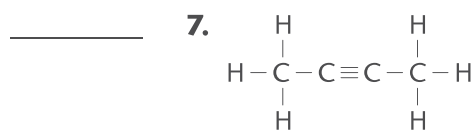Write the letter of each correct answer on the line.

Column A

_____ **1.** types of compounds that are saturated hydrocarbons

_____ **2.** compound with the same chemical formula as another compound, but a different structure

_____ **3.** compound containing at least one benzene ring

_____ **4.** having one or more multiple bonds between carbon atoms

_____ **5.** any compound that contains carbon, except for carbon oxides, carbides, cyanides, and carbonates

_____ **6.** triple bonds in these hydrocarbons are very reactive

Column B

A alkane

B alkyne

C aromatic compound

D isomer

E organic compound

F unsaturated

Directions Label each structural formula as *KA* for an alkane, *KE* for an alkene, or *KY* for an alkyne.

_____ **7.**
$$H-\overset{H}{\underset{H}{C}}-C\equiv C-\overset{H}{\underset{H}{C}}-H$$

_____ **8.**
$$\overset{H}{\underset{H}{}}C=C\overset{H}{\underset{H}{}}$$

_____ **9.** (benzene ring structure)

_____ **10.** (branched structure)

Functional Groups

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

1. A substance that evaporates easily is called _____.

2. Alcohols can be recognized by their _____.

3. An organic compound with hydrogen atoms replaced by a functional group is a(n) _____.

4. A(n) _____ is a carbon atom double-bonded to an oxygen atom and single-bonded to a hydroxyl group.

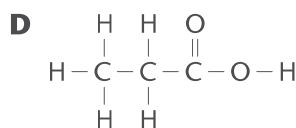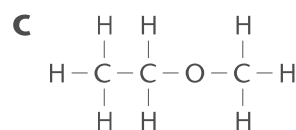5. Atoms that replace a hydrogen atom in a hydrocarbon are called a _____.
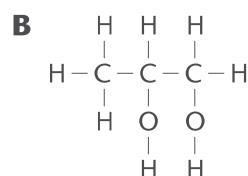
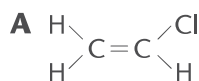| **Word Bank** |
| --- |
| carboxyl group |
| functional group |
| hydroxyl group |
| substituted hydrocarbon |
| volatile |

Directions Match the hydrocarbons in column A with the structural formulas in column B. Write the letter of the answer on the line.

Column A

_____ 6. alcohol

_____ 7. carboxylic acid

_____ 8. ester

_____ 9. ether

_____ 10. halogenated hydrocarbon

Column B

A
$$H{\diagdown}\atop{H{\diagup}}C=C{\diagup}^{Cl}_{\diagdown H}$$

B
$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-H$$

C
$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-O-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-H$$

D
$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\overset{\overset{O}{\|}}{C}-O-H$$

E
$$H-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\overset{\overset{O}{\|}}{C}-O-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-\underset{\underset{H}{|}}{\overset{\overset{H}{|}}{C}}-H$$
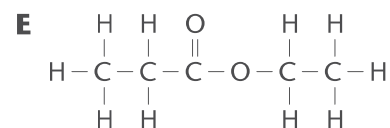
More Functional Groups

***Directions*** Unscramble the word or words in parentheses to complete each sentence. Write the answer on the line.

1. A(n) _____ contains a carbonyl group at the end of a hydrocarbon chain. (lhaeyded)

2. A functional group with a carbon double-bonded to an oxygen atom is a(n) _____. (ayrnlcbo urpog)

3. When an organic compound contains only an amino group it is called a(n) _____. (meani)

4. A carbonyl group within a hydrocarbon chain is called a(n) _____. (teneok)

5. An organic compound that contains an amino group and a carbonyl group is a(n) _____. (mdaei)

6. A(n) _____ consists of a nitrogen atom bonded to two hydrogen atoms. (nomia uropg)

Directions Match the hydrocarbons in column A with the structural formulas in column B. Write the letter of each correct answer on the line.

Column A

_____ **7.** aldehyde

_____ **8.** amide

_____ **9.** amine

_____ **10.** ketone

Column B

■ **Chemistry**
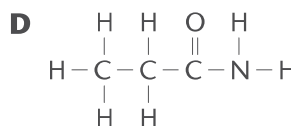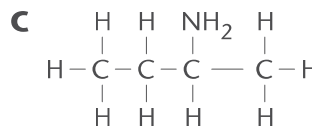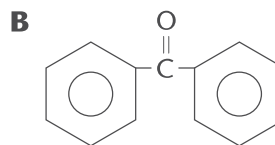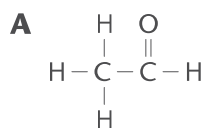
Polymers

Directions Use the terms in the Word Bank to complete the paragraph.
Write the terms on the lines.

Polymers are important to your life. Many polymers are **1.** _____,
which makes them good to use for storage containers. One important
type of polymer for industry is **2.** _____. Some polymers
have unique **3.** _____ that make them useful for certain
products. Raincoats are made of a polymer that **4.** _____.
Synthetic fleece is a polymer that **5.** _____. It is made
from recycled plastic **6.** _____. Disposable diapers
contain **7.** _____, which is very absorbent. One type of
biological polymers are **8.** _____.

Word Bank
bottles
plastic
polyacrylic acid
polysaccharides
properties
repels water
traps heat
unreactive

Directions Read each statement. Circle the answer that correctly
completes each sentence.

9. Many fabrics are made of natural polymers, such as (wool,
   rayon, polyester).

10. Monomers are often substituted for (saturated, unsaturated,
   synthetic) hydrocarbons.

11. (Plastic, Protein, Rubber) is a polymer that can be natural
   or synthetic.

12. The monomer that makes up polyethylene is (methane,
   ethane, ethene).

13. Polymers are (inorganic, organic, synthetic) molecules.

Directions Answer each question on the lines. Use complete sentences.

14. Why are polymers important?

_____

_____

15. List the special properties of several polymers.

_____

_____

Chemistry

Carbohydrates and Lipids

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **1.** a long-chained carboxylic acid

_____ **2.** a simple carbohydrate consisting of two sugar units bonded together.

_____ **3.** an alcohol with 3 carbon atoms and 3 hydroxyl groups

_____ **4.** a lipid with 3 fatty acids bonded to 3 hydroxyl groups in a glycerol molecule

_____ **5.** a sugar molecule or a large molecule of bonded sugars

_____ **6.** a complex carbohydrate with many sugar units bonded together in a polymer chain

_____ **7.** a simple carbohydrate with only one sugar unit

_____ **8.** an organic molecule that contains fatty acids

Column B

A carbohydrate

B disaccharide

C fatty acid

D glycerol

E lipid

F monosaccharide

G polysaccharide

H triglyceride

Directions Write the letter of the answer that best completes each sentence.

9. Cellulose is made of several thousand _____ monomers.
  A sucrose   **B** lactose   **C** glucose   **D** fructose

10. Carbohydrates are digested and _____ release energy.
  A neutralized to   **B** oxidized to   **C** reduced to   **D** do not

11. One important source of fiber is _____.
  A lipids   **B** amino acids   **C** triglycerides   **D** carbohydrates

12. Lipids are usually insoluble in water, but will dissolve in _____.
  A polar solvents   **B** nonpolar solvents **C** no other solvents **D** anything else

13. Animal fats usually have _____ fatty acids than plant oil.
  A less saturated   **B** less unsaturated **C** more saturated   **D** more unsaturated

14. Lipids that come from animals are usually called _____.
  A acids   **B** oils   **C** fats   **D** glycerol

15. Leaves and stems are protected from water loss by _____.
  A carbohydrates   **B** fats   **C** oils   **D** waxes

Chemistry

Proteins and Nucleic Acids

Directions Choose the term from the Word Bank that completes each
sentence correctly. Write the answer on the line.

1. Thymine, guanine, cytosine, adenine, and uracil are the five
   _____.

2. A(n) _____ is an organic molecule with an amino
   group and a carboxyl group.

3. Deoxyribonucleic acid, or _____, contains a cell's
   genetic code.

4. Ribonucleic acid is also called _____.

5. A(n) _____ consists of a phosphate, a sugar, and a
   nitrogen base.

6. A(n) _____ is a polymer made of amino acids.

7. A large polymer of nucleotides is called _____.

Word Bank
amino acid
DNA
nitrogen bases
nucleic acid
nucleotide
protein
RNA

Directions Read each statement. Circle the answer that correctly
completes each sentence.

8. When two amino acids bond, one (water molecule, carbon
   dioxide molecule, monomer) is formed.

9. All of the proteins in the human body are made from (10, 20,
   100) different amino acids.

10. (Essential, Nonessential, No) amino acids are made by the body.

11. The nucleotides of DNA and RNA share the same (nitrogen
    bases, sugar, phosphate).

12. Enzymes are proteins that are (transporters, structural parts,
    catalysts) for the human body.

Directions Answer each question on the lines. Use complete sentences.

13. What is the structure of DNA molecules? _____
    _____

14. Why is the shape of a protein important? _____
    _____

15. What are some of the vital functions of proteins in the human
    body?_____
    _____

Chapter 19 Vocabulary Review

Directions Choose the term from the Word Bank that completes each sentence correctly. Write the answer on the line.

	Word Bank

1. A(n) _____ is a hydrocarbon with single bond between the carbon atoms.

2. An organic compound that has an amino group bonded to a carbonyl group is called a(n) _____.

3. A carbohydrate with sugar units is called a(n) _____.

4. A(n) _____ has an amino group and a carboxyl group.

5. A hydrocarbon, called a(n) _____, has at least 1 triple bond between carbon atoms.

6. A sugar molecule is also called a(n) _____.

7. A(n) _____ has a carbon atom double-bonded to an oxygen atom and a single bond to a hydroxyl group.

8. A hydrocarbon chain with a hydroxyl group is called a(n) _____.

9. A(n) _____ has a carbon atom double-bonded to an oxygen atom.

10. A hydrocarbon, called a(n) _____, has at least one double bond between carbon atoms.

11. A(n) _____ has a carboxyl group at the end of a hydrocarbon chain.

12. A functional group with a nitrogen atom bonded to 2 hydrogen atoms is called a(n) _____.

13. An organic compound with a carbonyl group at the end of a hydrocarbon chain is called a(n) _____.

14. A compound with at least 1 benzene ring is called a(n) _____.

15. An organic compound with an amino group is called a(n) _____.

Word Bank
alcohol
aldehyde
alkane
alkene
alkyne
amide
amine
amino acid
amino group
aromatic
  compound
carbohydrate
carbonyl group
carboxyl group
carboxylic acid
disaccharide

Chapter 19 Vocabulary Review, continued

Directions Unscramble the word or words in parentheses to
complete each sentence. Write the answer on the line.

16. When an alcohol chain is bonded to a carboxylic acid chain,
a(n) _____ is formed. (rtese)

17. A substance that burns easily is _____.
(malemlfab)

18. A substance that has the same chemical formula but a different
structural formula, it is called a(n) _____.
(riemso)

19. A(n) _____ is an organic compound with a
carbonyl group within a hydrocarbon chain. (nekote)

20. Any compound that is not organic is a(n) _____.
(anciorgni nopcmuod)

21. A(n) _____ is a component of a lipid.
(tafty cadi)

22. A polymer is made of many _____. (noomrmse)

23. An organic molecule made of fatty acids is called
a(n) _____. (dipli)

24. A carbohydrate with only one sugar unit is called
a(n) _____. (arsnodhcmcieoar)

25. A(n) _____ is formed when 2 hydrocarbon
chains bond to the same oxygen atom. (herte)

26. An oxygen atom bonded to a hydrogen atom forms
a functional group called a(n) _____.
(doxylyhr rupog)

27. A(n) _____ replaces a hydrogen atom in a
hydrocarbon. (ncatinoful ugpor)

28. An organic compound called a(n) _____
contains 1 or more halogen atoms. (gahdetoalne racybnohdor)

29. Deoxyribonucleic acid is also called _____. (AND)

Chemistry

Chapter 19 Vocabulary Review, continued

Directions Match the items in column A with those in column B.
Write the letter of each correct answer on the line.

Column A

_____ **30.** thymine, adenine, guanine, cytosine

_____ **31.** having 1 or more double or triple bonds between carbon atoms

_____ **32.** ribonucleic acid

_____ **33.** made of a phosphate, a sugar, and a base

_____ **34.** carbohydrate made of many sugar units

_____ **35.** organic compounds with hydrogen atoms replaced by a functional group

_____ **36.** evaporates easily

_____ **37.** polymer made of amino acids

_____ **38.** study of structures, properties, and reactions of organic compounds

_____ **39.** lipid with 3 fatty acids

_____ **40.** made of many repeating structural units

_____ **41.** polymer of nucleotides that contains genetic information

_____ **42.** has only single bonds between carbon atoms

_____ **43.** compound that contains carbon except for carbon oxides, carbides, cyanides, and carbonates.

_____ **44.** uses symbols and bond lines

Column B

A nitrogen base

B nucleic acid

C nucleotides

D organic chemistry

E organic compound

F polymer

G polysaccharide

H protein

I RNA

J saturated

K structural formula

L substituted hydrocarbon

M triglyceride

N unsaturated

O volatile

Chemistry