Key

Name ______________________ Date ____________ Class ____________

CHAPTER 15 **STUDY GUIDE FOR CONTENT MASTERY**

Section 15.2 Solution Concentration

In your textbook, read about expressing concentration and using percent to describe concentration.

Data related to aqueous solutions of sodium chloride (NaCl) and aqueous solutions of ethanol (C_2H_5OH) are provided in the table below. Use the table to answer the following questions. Circle the letter of the choice that best answers the question.

	Mass (g)			Volume (mL)	
Solution	NaCl	H_2O	Solution	C_2H_5OH	H_2O
1	3.0	100.0	5	2.0	100.0
2	3.0	200.0	6	5.0	100.0
3	3.0	300.0	7	9.0	100.0
4	3.0	400.0	8	15.0	100.0

1. What is the percent by mass of NaCl in solution 1?
   a. 0.030% **b. 2.9%** c. 3.0% d. 33%
2. Which of the following solutions is the most dilute?
   a. Solution 1 b. Solution 2 c. Solution 3 **d. Solution 4**
3. What is the percent by volume of C_2H_5OH in Solution 5?
   a. 0.2% b. 1.9% **c. 2.0%** d. 22%
4. Which of the following solutions is the most concentrated?
   a. Solution 5 b. Solution 6 c. Solution 7 **d. Solution 8**

In your textbook, read about molarity and preparing molar solutions.

Read the following problem and then answer the questions.

An 85.0-mL aqueous solution contains 7.54 g iron(II) chloride ($FeCl_2$). Calculate the molarity of the solution.

5. What is the mass of the solute? 7.54 g
6. What is the volume of the solution? 85 mL
7. Write the equation that is used to calculate molarity.
   M = mol of solute / Liters of Solution
8. In what unit must the amount of the solute be expressed to calculate molarity? mole
9. In what unit must the volume of the solution be expressed to calculate molarity? liter
10. Write the expression needed to convert the volume of the solution given in the problem to the volume needed to calculate molarity. 85.0 mL × 1 L / 1000 mL = .085 L

SOLUBILITY CURVE WORKSHEET

Use your solubility curve graph provided to answer the following questions.

1. What are the customary units of solubility on solubility curves? °C and g/sol of solute / 100 g H2O
2. Define solubility. a measure of how much solute can dissolve in a given amount of solvent.
3. According to the graph, the solubility of any substance changes as Temp. changes.
4. List the substances whose solubility decreases as temperature increases. NH3 and Ce2(SO4)2
5. Which substance is least affected by temperature changes? NaCl
6. How many grams of ammonium chloride (NH_4Cl) at 50°C? 50g
7. NaCl and KClO3 have the same solubility at approximately 78oC.
8. Which compound is least soluble in water at 10°C? KClO3
9. How many grams of KNO_3 can be dissolved at 50°C? 80g
10. Are the following solutions unsaturated, saturated, or supersaturated?
    a. 45g of $NaNO_3$ in 100 g of water at 30°C. Un
    b. 60g of $KClO_3$ in 100 g of water at 60°C. SS
11. How many grams of sodium chloride, NaCl are required to saturate 100 grams of water at 100° C? 40g
12. How many grams of $NaNO_3$ are required to saturate 100 grams of water at 90°C? > 150
13. How many grams of KI will saturate water at 20°C? 145g
14. At what temperature would 25g of potassium chlorate ($KClO_3$) dissolve? 60°C
15. At what temperature would 55g of NH_4Cl dissolve? 70°C
16. 89 g $NaNO_3$ is prepared at 30°C.
    a) Will all of the salt dissolve? No
    b) What mass of $NaNO_3$ will dissolve at this temperature? 95g
17. If 25 grams of NH_4Cl is dissolved at 50°C, how many additional grams NH_4Cl would be needed to make the solution saturated at 80°C? 15g
18. At 50°C, how many grams of KNO_3 will dissolve? 80g
19. At 70°C, how many grams of cerium (III) sulfate ($Ce_2(SO_4)_3$) dissolve? 5g
20. Determine if each of the following is unsaturated, saturated, or supersaturated.
    a. 55g of NH_3 at 20°C. SS
    b. 10g of $Ce_2(SO_4)_3$ at 10°C. US
    c. 125g of KNO_3 at 60°C. SS
    d. 65g of NH_4Cl at 80°C.
    e. 12g of NH_3 at 90°C. SS
    f. 80g of $NaNO_3$ at 10°C. S
    g. 145g of $NaNO_3$ at 80°C. S
    h. 35g of NaCl at 100°C. US

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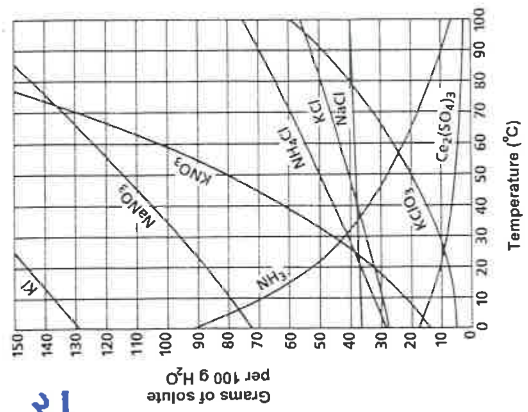

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Name _____ Date _____ Class _____

CHAPTER 16 STUDY GUIDE FOR CONTENT MASTERY

Energy and Chemical Change

Section 16.1 Energy

In your textbook, read about the nature of energy.

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word or phrase to make it true.

T 1. *Energy* is the ability to do work or produce heat.

(F) cannot be 2. The law of conservation of energy states that energy ~~can be~~ created and destroyed.

T 3. Chemical potential energy is energy stored in a substance because of its *composition*.

T 4. *Heat* is the flow of a warmer object to a cooler object.

T 5. A calorie is the amount of energy required to raise the temperature of *one gram* of pure water by one degree Celsius.

(F) Joule 6. A *calorie* is the SI unit of heat and energy.

T 7. The *specific heat* of a substance is the amount of heat required to raise the temperature of one gram of that substance by one degree Celsius.

T 8. *Kinetic energy* is energy of motion.

(F) Both PE + KE 9. Chemicals participating in a chemical reaction contain *only potential energy*.

(F) 1000 cal 10. One nutritional Calorie is equal to *100 calories*.

T 11. One calorie equals *4.184 joules*.

T 12. When a fuel is burned, some of its *chemical potential energy* is lost as heat.

multiply 13. To convert kilojoules to joules, *divide* the number of kilojoules by 1000 joules/1 kilojoule.

Answer the following question. Show all your work.

14. If the temperature of a 500.0-g sample of liquid water is raised 2.00°C, how much heat is absorbed by the water? The specific heat of liquid water is 4.184 J/(g·°C).

$q = m \cdot c \cdot \Delta T$

$(500\ g)(4.184\ J/g \cdot °C)(2.00\ °C) = 4.184 \times 10^3\ J$

Name _____ Date _____ Class _____

CHAPTER 17 STUDY GUIDE FOR CONTENT MASTERY

Section 17.2 Factors Affecting Reaction Rates

In your textbook, read about the factors that affect reaction rates (reactivity, concentration, surface, area, temperature, and catalysts).

In the space at the left, write *true* if the statement is true; if the statement is false, change the italicized word to make it true.

(F) increasing 1. *Decreasing* the concentration of reactants increases the collision frequency between reacting particles.

(T) 2. A *heterogeneous* catalyst exists in a different physical state than the reaction it catalyzes. NOT ON Test

(F) Temperature 3. Increasing the *concentration* of a substance increases the kinetic energy of the particles that make up the substance.

(F) lowering 4. Catalysts increase the rates of chemical reactions by *raising* the activation energy of the reactions.

T 5. *Increasing* the surface area of a reactant increases the rate of the reaction.

T 6. Raising the temperature of a reaction increases the rate of the reaction by increasing the *energy* of the collisions between reacting particles.

Answer the following questions.

7. A chemist heated a sample of steel wool in a burner flame exposed to oxygen in the air. He also heated a sample of steel wool in a container of nearly 100% oxygen. The steel-wool sample in the container reacted faster than the other sample. Explain why.

Greater concentration of O_2 in container. ↑ Concentration, ↑ rate of reaction.

8. Would the chemist have observed the same results if he used a block of steel instead of steel wool? Explain your answer.

No, A block of steel would react more slowly (less surface area)

9. How would the reaction have differed if the steel wool was not heated?

Not heating steel wool would decrease rate of reaction.