Name: _____

Honors Chemistry Unit 6 Study Guide

***Chapter 16:**

**Know all vocabulary from the chapter! STUDY YOUR NOMENCLATURE!!

1. What are the 3 factors that can speed the rate of dissolving?
2. What are the 3 colligative properties?
3. How do you dilute a solution?
4. How can you increase the solubility of a solid? (1 way)
5. How can you increase the solubility of a gas? (2 ways)
6. What is the molarity of a solution that contains 4 mol of hydrochloric acid in 3.5L of solution?
7. What is the molarity of a solution that contains 182g of lead(II)nitrate in 772mL of solution?
8. How many grams of sodium nitride are in 1766mL of a 1.3M solution?
9. If 15mL of a 5M sodium chloride solution is diluted to 600mL, what is the molarity of the diluted solution?
10. If a solution is 23% (m/m) and the mass of the solution is 500mL, then what is the mass of the solute?
11. If 50mL of sucrose is present in 1.2L of solution, then what is the percent by volume of the solution?
12. How many particles form when the following compounds dissolve in water?
    a. sulfuric acid
    b. iron (III) carbonate
    c. calcium chloride
    d. sodium phosphate

13. You have two solutions. Solution A contains 1 mole of calcium phosphite. Solution B contains 2 moles of nitrous acid. Fill in the following chart.

Property	Lower	Higher
Freezing Point		
Boiling Point		

Vapor Pressure		

14. **Explain** how stirring, crushing, and increasing temperature speed up the rate of dissolving.
15. **Explain** why the addition of a solute affects the boiling and freezing points of a solution.

***Chapter 17:**

16. Fill in the following chart.

Process	Heat Flow	Sign	Temperature
Exothermic			
			Feels cold

17. Would the following processes be exothermic or endothermic?
    a. solid □ liquid
    b. gas □ liquid
    c. liquid □ solid
    d. $NaOH_{(s)}$ □ $NaOH_{(aq)}$ $-\Delta H$
    e. liquid □ gas

18. Make the following conversions.
    a. 1977J □ cal
    b. 744.6 cal □ J

19. If 769J of heat is absorbed when 50g of iodine is heated from 70°C to 95°C, then what is the specific heat of iodine?
20. How much heat is released when 78g of iron is cooled from 98°C to 50°C?
21. How much heat is absorbed when 60g of mercury (II) oxide reacts?

$$2HgO \square 2Hg + O_2 \qquad \Delta H = 181.4 \text{ kJ}$$

22. How much heat is released when 266g of carbon dioxide are formed?

$$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O \qquad \Delta H = -3120 \text{ kJ}$$

23. How much heat is absorbed when 188g of ammonia is changed from a liquid to a gas?
24. How much heat is released when 263g of ethanol is changed from a liquid to a solid?
25. How much heat is released when 60g of steam at 120°C is converted to liquid water at 55°C?
26. How much heat is absorbed when 90g of ice at -70°C is converted to steam at 200°C?
27. Use the following equations to calculate the change in enthalpy for the following reaction:

$$2CO_2 + 2H_2O \rightarrow C_2H_4O + 5/2O_2 \qquad \Delta H = ?$$

$2C_2H_6O + O_2 \rightarrow 2C_2H_4O + 2H_2O$ $\Delta H = -610.5kJ$

$C_2H_6O + 3O_2 \rightarrow 2CO_2 + 3H_2O$ $\Delta H = -2056.5kJ$

28. Use the following equations to calculate the change in enthalpy for the following reaction:

$$Fe_3O_4 + CO \rightarrow 3FeO + CO_2 \qquad \Delta H = ?$$

$2Fe + 3CO_2 \rightarrow Fe_2O_3 + 3CO$ $\Delta H = 40.2kJ$

$3Fe_2O_3 + CO \rightarrow 2Fe_3O_4 + CO_2$ $\Delta H = -68.2kJ$

$FeO + CO \rightarrow Fe + CO_2$ $\Delta H = 1.8kJ$

29. Calculate the change in enthalpy for the following reaction:

$$CH_{4(g)} + 2O_{2(g)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$$

30. Calculate the change in enthalpy for the following reaction:

$$8Al_{(s)} + 3Fe_3O_{4(s)} \rightarrow 4Al_2O_{3(s)} + 9Fe_{(s)}$$

**Hint: ΔH_f° = -1120.9 kJ/mol for $Fe_3O_{4(s)}$.

***Chapter 19:**

31. Which scientist's definition of acids and bases involved the following?
    a. electron pair donors and acceptors
    b. H^+ and OH^- ions

c. proton (H^+) donors and acceptors

32. In the following reactions, label the acid, conjugate acid, base, and conjugate base.

a. $H_2SO_4 + H_2O \rightleftharpoons HSO_4^- + H_3O^+$ b. $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$

33. Which of the following are conjugate acid-base pairs?

a. OH^-, H_2O
b. H_2SO_4, HSO_4^-
c. H_3PO_4, PO_4^{-3}
d. H_2O_2, H_2O
e. PO_3^{-3}, HPO_3^{-2}

34. Which is higher in a basic solution, $[H^+]$ or $[OH^-]$?

35. Label the portions of the pH and pOH scales that are acidic, basic, and neutral.

36. Acidic, Basic, or Neutral?

a. pH = 8.3
b. $[OH^-] = 7.6 \times 10^{-9}M$
c. $[H^+] = 3.6 \times 10^{-4}M$
d. pOH = 2.9
e. $[H^+] = 1 \times 10^{-7}M$

37. Write the chemical equation for the self-ionization of water.

38. What are three properties of acids and bases.

39. Calculate the following:

a. pH = 9.6, $[H^+]$ = ?
b. $[H^+] = 3.9 \times 10^{-8}M$, $[OH^-]$ = ?
c. pOH = 13.7, pH = ?
d. $[OH^-] = 6.2 \times 10^{-4}M$, pOH = ?
e. $[H^+] = 7.6 \times 10^{-11}M$, pOH = ?

40. What are monoprotic, diprotic, and triprotic acids? (Give an example of each using the formula and name.)

41. List the three strong acids and strong bases. (Use the names and the formulas)

42. What is a buffer?

43. A 0.3M solution of benzoic acid is determined to have a $[H^+]$ ion concentration of 9.86×10^{-4}M. What is the k_a?

$$C_6H_5COOH + H_2O \square\square H_3O^+ + C_6H_5COO^-$$

44. What is the molarity of phosphoric acid if 15.0mL is completely neutralized by 38.5mL of 0.150M sodium hydroxide?

45. What volume of 0.2M magnesium hydroxide must be added to completely neutralize 55mL of 0.4M hydrofluoric acid?