Chemistry B Final Study Guide

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-What is a precipitation reaction? Provide an example.
-Summarize the simple solubility rules for ionic compounds.
-What is a combustion reaction? Write an equation that illustrates a combustion reaction.
-Give an example of a synthesis reaction and of a decomposition reaction.
-Classify the reaction represented by each of the following chemical equations in as many ways as possible based sections 8.6 and 8.7. Balance each equation.

a. $NaOH(s) + CuSO_4(aq) \rightarrow Cu(OH)_2(s) + Na_2SO_4(aq)$
b. $HI(aq) + KOH(aq) \rightarrow KI(aq) + H_2O(l)$
c. $FeO(s) + HNO_3(aq) \rightarrow Fe(NO_3)_2(aq) + H_2O(l)$
d. $C_{12}H_{22}O_{11}(s) \rightarrow C(s) + H_2O(g)$
e. $B(s) + O_2(g) \rightarrow B_2O_3(s)$

-Know the type of reactions listed in sections 8.6 and 8.7.

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-Considering the reaction represented by the (unbalanced) equation
$N_2(g) + H_2(g) \rightarrow NH_3(g)$
Determine the number of moles of $NH_3(g)$ that can be produced from the following:

a. 0.20 mol $N_2(g)$ reacts completely with $H_2(g)$.
b. 0.30 mol $H_2(g)$ reacts completely with $N_2(g)$.

-Considering the reaction represented by the (unbalanced) equation
$Mg(s) + HCl(aq) \rightarrow MgCl_2(aq) + H_2(g)$
Determine the mass of $H_2(g)$ that can be produced from the following:

a. 10.0 g Mg(s) reacts completely with HCl(aq).
b. 20.0 g HCl (aq) reacts completely with Mg(s).

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-How is the concept of energy defined?
-What does temperature measure?
-Convert the temperatures to Kelvin:
a. 25°C b. -56°C c. 96°C
-Explain what is meant by the terms exothermic and endothermic.
-What is meant by the specific heat capacity of a material
-Calculate the mass (in grams) of each of the following substances that could be warmed over the indicated temperature range by application of exactly 1.0 kJ of energy.

a. water, from 15°C to 42°C s = 4.184 J/g °C
b. iron, from 25°C to 125°C s = 0.45 J/g °C
c. carbon, from -10°C to 47°C s = 0.71 J/g °C

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-Convert 1.20 atm to units of mm Hg, torr, and pascals.
-What does “STP” stand for? What conditions correspond to STP?
- A sample of gas in a 10.0-L container exerts a pressure of 565 mm Hg. Calculate the pressure exerted by the gas if the volume is changed to 15.0 L at constant temperature.
-A sample of gas in a 5.00-L container at 35.0°C is heated at constant pressure to a temperature of70.0°C at constant pressure. Determine the volume of the gas.
-A 4.50 mol sample of a gas occupies a volume of 34.6 L at a particular temperature and pressure. What volume does 2.50 mol of the gas occupy at these same conditions of pressure and temperature?
-A sample of gas at 24°C occupies a volume of 3.45 L and exerts a pressure of 2.10 atm. The gas is cooled to –12°C and the pressure is increased to 5.20 atm. Determine the new volume occupied by the gas.

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-Define molar heat of fusion and molar heat of vaporization.
-What is a dipole-dipole attraction? What is hydrogen bonding?
-Define London dispersion forces.
-What is vaporization? What is condensation?
-How are kinetic energy and temperature related?

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-Define homogeneous and heterogeneous mixtures.
-What factors affect rate of dilution?
-How does concentration affect conductivity of a solution?
-What is an electrolyte?
-What is a saturated, unsaturated, and supersaturated solution?
-What is molarity?
-A chemist prepares some standard solutions for use in the lab using 500.0-mL volumetric flasks to contain the solutions. If the following masses of solutes are used, calculate the resulting molarity of each solution.
a. 4.865 g NaCl
b. 78.91 g $AgNO_3$
-What causes molecules to be polar?

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-What are the properties of acids and bases?
-What are the Arrhenius and Bronsted-Lowry definitions of acids and bases?
-Know what a conjugate acid-base pair is.
-What is a buffered solution?
-Calculate the pH and pOH values a 0.00515 M HCl solution.

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-What do we mean by an equilibrium position?
-What is a reversible reaction?
-Write the equilibrium constant expressions for each of the following reactions.

a. $2NO(g) + O_2(g) \leftrightarrow 2NO_2(g)$

b. $N_2H_4(l) + O_2(g) \leftrightarrow N_2(g) + 2H_2O(g)$

c. $CO(g) + NO_2(g) \leftrightarrow CO_2(g) + NO(g)$

-For the reaction: **$2SO_2(g) + O_2(g) \leftrightarrow 2SO_3(g)$**

at a particular temperature the equilibrium system contains $[SO_3(g)] = 0.42$ M, $[SO_2(g)] = 1.4 \times 10\text{-}3$ M, and $[O_2(g)] = 4.5 \times 10\text{-}4$ M. Calculate K for the process.
-Explain the collision model for chemical reactions. How does the collision model account for the observation that higher concentrations and higher temperatures tend to make reactions occur faster?
-What is LeChatelier's Principle?
-Suppose the reaction system: **$2SO_2(g) + O_2(g) \leftrightarrow 2SO_3(g)$**

has already reached equilibrium. Predict the effect of each of the following changes on the position of the equilibrium:

a. Additional $SO_2(g)$ is added to the system.
b. The $SO_3(g)$ is liquefied and removed from the system.
c. A very efficient catalyst is used.
d. The volume of the container is drastically reduced.

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-When a carbon atom is bonded to four other carbon atoms?
-What is an alkane, alkene, and alkyne and what suffixes do they have?
-What is a polymer and monomer?
-Know how to name alkanes, alkenes, and alkynes.
-What structures define the functional groups of alcohols, esters, and organic acids.