Second Semester Final
Chemistry

The following material will be covered on the second semester final:

Chapter 11 Stoichiometry

1. Nitrogen trifluoride gas reacts with steam according to the following reaction: (balanced?) (17.3L)

$$\underline{2}\ NF_{3(g)} + \underline{3}\ H_2O_{(g)} \rightarrow \underline{6}\ HF_{(g)} + \underline{\quad}\ NO_{(g)} + \underline{\quad}\ NO_{2(g)}$$

What volume of nitrogen dioxide, NO_2, is formed when 34.6 liters of NF_3 are reacted?

2. Determine the mass of antimony produced when 2.35 g of antimony (III) oxide reacts with carbon. (balanced?) (1.96g)

$$\underline{2}\ Sb_2O_{3(s)} + \underline{3}\ C_{(s)} \rightarrow \underline{4}\ Sb + \underline{3}\ CO_{2(g)}$$

3. Hydrogen is produced when methane (CH_4) with water. Using 70.0 g of methane and 17.3 g of water, how many liters of H_2 can be produced at STP? What is the limiting reactant? (Balanced?) (43.0L) (H_2O)

$$\underline{\quad}\ CH_{4(g)} + \underline{2}\ H_20_{(l)} \rightarrow \underline{4}\ H_{2(g)} + \underline{\quad}\ CO_{2(g)}$$

4. How many liters of oxygen will be needed to from 123.0 grams of Al_2O_3? (Balanced?) (40.5L)

$$\underline{4}\ Al_{(s)} + \underline{3}\ O_{2(g)} \rightarrow \underline{2}\ Al_2O_{3(s)}$$

Chapter 12 Heats of Reactions

5. Using your Heat of Formation chart, calculate the ΔH for the following reaction: (-279.4 Kcal)

$$4\ NH_{3(g)} + 5\ O_{2(g)} \rightarrow 4\ NO_{(g)} + 6\ H_2O_{(l)}$$

Is the reaction endothermic or exothermic?

6. Use the equations below to determine ΔH for the following reaction:

$2\ ZbO(s) + ½\ O_2(g) \rightarrow Zb_2O_3(s)$ -128.0 kJ
$2\ ZbO(s) + 3/2\ O_2(g) \rightarrow Zb_2O_5(s)$ -344.5 kJ

find the value for

$$Zb_2O_3(s) + O_2(g) \rightarrow Zb_2O_5(s) \qquad \Delta H = -216.5\ KJ$$

7. A sample of chromium weighing 254 g was initially at a temperature of 25.88 °C. It required 843 joules of heat energy to increase the temperature to 32.75 °C. What is the specific heat of the chromium? (.483 J/g°C)

Chapter 13 Gas Laws

8. What pressure will 75.0 grams of nitrogen gas exert in a cylinder with a volume of 1500 mL at a temperature of 25 °C? (43.1 atm)

9. The total pressure of a mixture of helium, nitrogen, oxygen, and argon is 925 mm Hg. What is the pressure exerted by nitrogen if the partial pressure of helium is 265 mm Hg, the partial pressure of oxygen is 250 mm Hg and the partial pressure of argon is 225 mm Hg? (185 mm Hg)

10. A 2.50 mL air bubble forms in a deep lake where the temperature is 10.5 °C at a pressure of 2.00 atm. The bubble rises to a depth where the temperature is 15.0 °C and the pressure is 1.2 atm. What is the new volume of the bubble? (4.23 mL)

11. The pressure of a gas is 735 mm Hg when its volume is 285.0 mL. Calculate the pressure if the gas is allowed to expand to 725 mL at constant temperature. (289 mm Hg)

12. At a temperature of 23.0 °C, the pressure in a tire is 2.1 atm. What will the pressure be if the temperature increases to 85.0 °C? Volume remained constant. (2.5 atm)

13. A volume of gas in a gas thermometer is 120. mL at 15.0 °C. What is the temperature, °C, when the volume is 75. mL. Assume pressure is constant. (-93°C)

Chapter 14 Liquids and Solids

Review the chapter for intermolecular forces (dispersion forces, dipole-dipole interactions, and hydrogen bonds.)

14. How many calories are needed to warm 125.0 grams of sodium from 100 °C to 725 °C? (19500 cal)

15. How many kilocalories are released when 14.5 moles of chlorine are changed from gas to liquid? (70.8 Kcal)

Chapter 15 Solutions

16. If 75.0 g of KNO_3 is dissolved in enough water to make 750. mL of solution, what will be the molarity? (mm = 101.11 g) (.989 M)

17. How would you prepare 825 mL of 4 M HCl from 12.0 M HCl? (275 mL HCl to 550 mL H_2O)

18. How many grams of oxalic acid, $H_2C_2O_4$, are required to make a 3.50 m solution using 4500 grams of water? (mm = 90.04 g) (1440g)

Review your solubility chart.

Chapter 16 Equilibrium

20. For the following reaction:

$$N_{2(g)} + O_{2(g)} \Leftrightarrow 2\ NO_{(g)}$$

The equilibrium concentrations are found to be $[N_2] = 0.041$ M, $[O_2] = 0.0078$ M and $[NO] = 4.7 \times 10^{-4}$ M. Calculate the K_{eq} for the reaction. Write the equilibrium law expression. (6.9×10^{-4})

21. For the reaction

$$2\ H_2O_{(g)} \Leftrightarrow 2\ H_{2(g)} + O_{2(g)}$$

$K_{eq} = 2.4 \times 10^{-3}$, at equilibrium it is found that $[H_2O] = 1.1 \times 10^{-1}$M and $[H_2] = 1.9 \times 10^{-2}$M. What is the concentration of O_2 under these conditions? Write the equilibrium law expression. (.080M)

22. Consider the reaction:

$$\text{heat} + (NH_4)_2CO_{3(s)} \Leftrightarrow 2\ NH_{3(g)} + CO_{2(g)} + H_2O_{(g)}$$

Given the following changes, what will be the shift at equilibrium? (Towards products, towards reactants, no effect)

increase temperature _____

increase pressure _____

add H_2O _____

decrease CO_2 _____

add $(NH_4)_2CO_3$ _____