Final Exam (Chapters 7, 8 & 10)

7.78 Your spaceship has docked at a space station above Mars. The temperature inside the space station is a carefully controlled 24 ºC at a pressure of 745 mmHg. A balloon with a volume of 425 mL drifts into the airlock where the temperature is -95 ºC and the pressure is 0.115 atm. What is the new volume, in milliliters, of the balloon if n remains constant and the balloon is very elastic?

7.81 A sample of hydrogen (H_2) gas at 127 ºC has a pressure of 2.00 atm. At what temperature (ºC) will the pressure of the H_2 decrease to 0.25 atm, if V and n remain constant?

7.83 How many moles of CO_2 are in 35.0 L of $CO_{2(g)}$ at 1.2 atm and 5 ºC?

7.84 A container is filled with 0.67 mole of O_2 at 5 ºC and 845 mmHg. What is the volume, in milliliters, of the container?

7.85 A 2.00-L container is filled with methane gas (CH_4) at a pressure of 2500. mmHg and a temperature of 18 ºC. How many grams of methane are in the container?

7.86 A steel cylinder with a volume of 15.0 L is filled with 50.0 g of nitrogen gas at 25 ºC. What is the pressure, in atmospheres, of the N_2 gas in the cylinder?

7.87 When heated, calcium carbonate decomposes to give calcium oxide and carbon dioxide gas. If 56.0 g of $CaCO_3$ react, how many liters of CO_2 gas are produced at STP?

$$CaCO_{3(s)} \xrightarrow{\Delta} CaO_{(s)} + CO_{2(g)}$$

7.93 A sample of gas with a mass of 1.62 g has a volume of 941 mL at a pressure of 748 torr and a temperature of 20 ºC. What is the molar mass, g/mole, of the gas?

7.94 What is the molar mass, g/mole, of a gas if 1.15 g of the gas has a volume of 225 mL at STP?

7.96 What is the volume, in liters, of H_2 gas produced at STP from the reaction of 25.0 g of Al?

$$2Al_{(s)} + 3H_2SO_{4(aq)} \rightarrow Al_2(SO_4)_{3(aq)} + 3H_{2(g)}$$

7.99 A gas mixture contains oxygen and argon at partial pressures of 0.60 atm and 425 mm Hg. If nitrogen gas added to the sample increases the total pressure to 1,250 torr, what is the partial pressure, in torr, of the nitrogen added?

7.100 A gas mixture contains helium and oxygen at partial pressures of 255 torr and 0.450 atm. What is the total pressure, in mmHg, of the mixture after it is placed in a container one-half the volume of the original container?

8.87 If sodium chloride has a solubility of 36.0 g of NaCl in 100 g of H_2O at 20 °C, how many grams of water are needed to prepare a saturated solution containing 80.0 g of NaCl?

8.88 If the solid NaCl in a saturated solution of NaCl continues to dissolve, why is there no change in the concentration of the NaCl solution?

8.89 Potassium nitrate has a solubility of 32 g of KNO_3 in 100 g of H_2O at 20°C. State if each of the following forms an unsaturated or saturated solution at 20°C, 32 g of KNO_3 and 200. g of H_2O

8.92 Indicate whether each of the following ionic compounds is soluble or insoluble in water Na_3PO_4

8.93 Write the net ionic equation to show the formation of a solid (insoluble salt) when the following solutions are mixed. Write *none* if there is no precipitate. $AgNO_{3(aq)}$ and $LiCl_{(aq)}$

8.95 Calculate the mass percent (m/m) of a solution containing 15.5 g of Na_2SO_4 and 75.5 g of H_2O.

8.97 What is the molarity of a solution containing 8.0 g of NaOH in 400. mL of NaOH solution?

8.99 How many grams of solute are in each of the following solutions? 2.20 L of a 3.00 M $Al(NO_3)_3$ solution

8.102 A patient receives an intravenous solution of a 5.0% (m/v) glucose solution. How many liters of the glucose solution would the patient be given to obtain 75 g of glucose?

8.103 How many milliliters of a 12% (v/v) propyl alcohol solution would you need to obtain 4.5 mL of propyl alcohol?

8.105 Calculate the concentration, percent or molarity, of the solution when water is added to prepare each of the following solutions:

a. 25.0 mL of a 0.200 M NaBr solution diluted to 50.0 mL
b. 15.0 mL of a 12.0% (m/v) K_2SO_4 solution diluted to 40.0 mL

10.71 Identify each of the following as an acid, base, or salt, and give its name LiOH

10.72 Identify each of the following as an acid, base, or salt, and give its name H3PO4

10.73 Identify the conjugate acid–base pairs in each of the following equations and state whether the equilibrium mixture contains mostly products or mostly reactantsNH3(aq) + HNO3(aq) F NH4+(aq) + NO3-(aq)

10.75 Complete the following table:

Acid Conjugate Base - Base Conjugate Acid (See homework… it is a table)

10.77 Are each of the following solutions acidic, basic, or neutral? rain, pH 5.2

10.81 Determine the pH for the following solutions:

b. [H3O+] = 5.0 x 10-2 M
c. [OH-] = 3.5 x 10-4 M

10.85 What are the [H3O+] and [OH-] for a solution with each of the following pH values? 3.00

10.88 A solution of borax (A) has a pH of 9.2, and human saliva (B) has a pH of 6.5.

a. Which solution is more acidic?
b. What is the [H3O+] in each?
c. What is the [OH-] in each?

10.89 What is the [OH-] in a solution that contains 0.225 g of NaOH in 0.250 L of solution?

10.90 What is the [H3O+] in a solution that contains 1.54 g of HNO3 in 0.500 L of solution?

10.91 What is the pH of a solution prepared by dissolving 2.5 g of HCl in water to make 425 mL of solution?

10.92 What is the pH of a solution prepared by dissolving 1.00 g of Ca(OH)2 in water to make 875 mL of solution?

10.93 a. Write the neutralization equation for KOH and H3PO4.
b. Calculate the volume (mL) of a 0.150 M KOH solution that will completely neutralize 10.0 mL of a 0.560 M H3PO4 solution.

10.94 a. Write the neutralization equation for NaOH and H2SO4.
b. How many milliliters of a 0.215 M NaOH solution are needed to completely neutralize 2.50 mL of a 0.825 M H2SO4 solution?