Chem 130 *Coastline College*
Fall 2016 *Dupon*

Practice Final Exam

(25 pts)
For review on Dec 7, 2016

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TOTAL	

1. **(a)** (*10 pts*) Normal air contains about 0.28 g of oxygen per liter. An average human inhales about 0.50 L of air per breath and takes about 20 breaths per minute. How many grams of oxygen does a human inhale per hour?

(b) (*10 pts*) Find the density of the metal used if a 42.55 g sample added to a graduated cylinder of water raises the level of water by 4.77 mL? (*Make sure that your answer has the correct # of significant figures*)

2. (a) Complete the following table**:**

Element	Atomic Symbol	Z	A	# protons	# neutrons	# electrons
	F^-					
		83	209			83
Cobalt-60						
				80	119	80
	Sr^{2+}				50	

(b) Complete the table below with the missing formula or name:

Ionic or Covalent?	Formula	Name
	P_4O_8	
		Strontium bromide
		Carbon tetraiodide
	$Ca_3(PO_4)_2$	
	$(NH_4)_2CO_3$	

3. (a) Hydrazine, N_2H_4, a substance used as rocket fuel, reacts with oxygen as follows:

$$N_2H_4(l) + O_2(g) \rightarrow NO_2(g) + H_2O(g)$$

How many grams of oxygen are needed to react with 165 g of hydrazine?

(b) The "French paradox" is a phenomenon noted where, despite a high fat diet, there is a relatively low mortality rate from coronary heart disease in France. Researchers have implicated *resveratrol*, a compound found in grapes as having a cardioprotective effect. Chemical analysis of red Bordeaux grapes showed the analytical results as follows:

%C = 73.68%
%H = 5.26%
%O = 21.06%

Based on the elemental data, suggest an empirical formula for resveratrol.

4. (a) (10 pts) 15 mL of a 0.07M solution of $Pb(NO_3)_2$ is mixed with 9 mL of a 0.15 M solution of Na_2SO_4. What is the mass of $PbSO_4$ that would be expected to precipitate?

$$Pb(NO_3)_{2(aq)} + Na_2SO_{4(aq)} \text{ ----------> } PbSO_{4(s)} + 2\ Na^+_{(aq)} + 2\ NO_3^-{}_{(aq)}$$

(b) (10 pts) Nitroglycerin ($C_3H_5N_3O_9$) is a powerful explosive that decomposes as follows:

$$4\ C_3H_5N_3O_9 \text{ ------> } 6\ N_2 + 12\ CO_2 + 10\ H_2O + O_2$$

If 200 g of nitroglycerin react and 6.55 g of oxygen are produced, what is the yield?

5. **(a)** Write electron configurations for the following atomic species:

(i) Se^{2-} (ii) Sc

(iii) Al (iv) Ca^{2+}

(v) Mn^{2+}

(b) Arrange the atomic species listed in order of <u>increasing</u> size:

(i) Na Al Cl (ii) Pb Si Sn

(iii) N N^{3-} C

(c) Arrange the atoms listed in order of decreasing electron affinity:

(i) K Br Ga (ii) As Sn S

6.(a) Sketch Lewis dot structures for the following covalent molecules:

(i) <u>B</u>Br_3 (ii) <u>C</u>HCl3

(iii) <u>C</u>H_2O (iv) N<u>C</u>Cl

(v) <u>S</u>$(CH_2CH_3)_2$

(b) For each of the molecules drawn in part (a), identify the geometry at the underlined atom.

7. (a) Microwaves emit electromagnetic radiation with a wavelength of 12.9 cm. What is the energy associated with microwaves?

(b) How much heat energy is released when 150 g of iron metal reacts with elemental chlorine gas:

$2Fe(s) + 3Cl_2(g) \text{ -----> } 2FeCl_3(s)$ $\Delta H^\circ = -799.0$ kJ/mol

8. (a) Hyperbaric oxygen therapy is the use of oxygen gas at level higher than normal atmospheric pressure, which is effective in treating carbon monoxide poisoning. If the chamber has a volume of 200 L, how many grams of oxygen are needed to pressurize the chamber to 3 atm at a temperature of 27°C?

(b) A sample of ammonia gas at 40°C exerts a pressure of 5.3 atm – what is the pressure if the temperature is raised to 100°C?

9. (a) Find the pH of the following solutions:
(i) freshly squeezed lemon juice: $[H_3O^+] = 3.47 \times 10^{-4}$ M

(b) bleach solution: $[H_3O^+] = 9.96 \times 10^{-12}$ M

10. (a) Balance the following chemical equations:

(i) __PbS + __O_2 ---> __PbO + __SO_2

(ii) __Na_3PO_4 + __$MgCl_2$ ----> __$Mg_3(PO_4)_2$ + __NaCl

(iii) __S_2Cl_2 + __NH_3 ---> __N_2S_4 + __NH_4Cl + __S_8

(b) For each of the equations in part (a), identify the type of reaction.

Conversion Factors

1.0 kilogram	2.2 pounds	1000 grams
1.0 kilometers	0.6214 miles	1000 meters
1 meter	39.37 inches	1000 millimeters
1 liter	1.057 quarts	0.264 gallons
1 cm^3	1 milliliter	0.0338 fluid ounces
°C = (°F – 32) x 5/9	°F =(°C x 1.8) +32°	K = °C + 273

Equations

$$\text{Density} = \frac{\text{mass}}{\text{volume}}$$

$C = \lambda \times \nu$ -= 2.9979 10^8 m/s

$E = h\nu$ $h = 6.626 \times 10^{-34}$ J S

Boyle's Law: $P_1V_1 = p_2V_2$

Charles' Law: $\frac{V_1}{T_1} = \frac{V_2}{T_2}$

Gay-Lussac's Law: $\frac{p_1}{T_1} = \frac{p_2}{T_2}$

Combined gas Law: $\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$

Ideal Gas Law: $pV = nRT$ $R = 0.082 \frac{\text{L atm}}{\text{mole K}} = 63.26 \frac{\text{L torr}}{\text{mole K}}$

Dalton's Law of Partial Pressures: $p_T = \sum(p_1 + p_2 + p_3 + \ldots.)$

$[H_3O^+][OH^-] = K_w = 1 \times 10^{-14}$ $pH = -\log_{10}[H_3O^+]$ $10^{-pH} = [H_3O^+]$