Chemistry 101 –Final Exam

December 14, 2019

Part I

1. Carbon dioxide ($CO_2(g)$) dissolves in water to produce carbonic acid H_2CO_3.

$$CO_2 + H_2O \rightarrow H_2CO_3$$

While carbonic acid is not stable it does do acid-base reactions in water until the CO_2 is consumed. Aluminum carbonate, $Al_2(CO_3)_3(s)$, can be used as an antacid (not the best choice however!). How many grams of aluminum carbonate can be formed from combination of 10.0 L of $CO_2(g)$ at STP with 500. ml of 0.543 M $Al(OH)_3$?

2. Given the data:

$$N_2(g) + O_2(g) \rightarrow 2\,NO(g) \qquad \Delta H = +180.7\ kJ$$

$$2\,NO(g) + O_2(g) \rightarrow 2\,NO_2(g) \qquad \Delta H = -113.1\ kJ$$

$$2\,N_2O \rightarrow 2\,N_2(g) + O_2(g) \qquad \Delta H = -163.2\ kJ$$

i. Use Hess's law to calculate ΔH for the desired reaction below:

$N_2O(g) + NO_2(g) \rightarrow 3\,NO(g)$

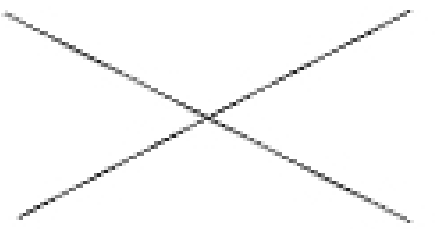
ii. Using the desired equation from (i), how much heat is needed if one starts with 22.0g N_2O and an excess of NO_2?

iii. What volume of NO(g) is produced if 100.kJ are required at 25°C and 1.00 atm for the reaction below?

$N_2O(g) + NO_2(g) \rightarrow 3\,NO(g)$

3. For each formula below:
   i. Draw the best Lewis structure
   ii. Calculate the Formal charge on all the atoms for your Lewis structure
   iii. Give the molecular geometry name
   iv. Circle if it has a dipole
   v. Indicate if resonance structures exist by circling yes or no
   vi. Give the hybridization of the central atom (where indicated).

a) SF_4

i. Lewis Structure:	ii. Formal Charges:	iv. Dipole: Polar Non-polar
		v. Resonance: Yes No
iii. Molecular Geometry Name:		

b) CO_3^{2-}

i. Lewis Structure:	ii. Formal Charges:	iv. Dipole: Polar Non-polar
		v. Resonance: Yes No
iii. Molecular Geometry Name:		vi. Hybridization:

c) ClO_3^-

i. Lewis Structure:	ii. Formal Charges:	iv. Dipole: Polar Non-polar
		v. Resonance: Yes No
iii. Molecular Geometry Name:		vi. Hybridization