

Discussion Section: Day _____

Rydberg constant = $1.097 \times 10^7 \text{ m}^{-1}$, velocity of light = $2.998 \times 10^8 \text{ m/sec}$, Planck's constant = $6.626 \times 10^{-34} \text{ J sec}$, mass of electron = $9.11 \times 10^{-31} \text{ kg}$, Avogadro's # = 6.022×10^{23} , $R = 0.08206 \text{ l atm/mol K}$, or 8.314 J/mol K

- (12) 1.) 10.0 g of steam at 100°C is blown over a mixture of 20.0 g of ice and 100 g of water. Find the final temperature of the water. The heat of fusion of ice = 334 J/g , the heat of vaporization of water 2259 J/g , and the specific heat of water = 4.184 J/g deg .
- (10) 2.) On raising the temperature of a certain liquid from 29°C to 56°C the vapor pressure of the liquid triples. Find the heat of vaporization of this liquid in kJ/mol .
- (10) 3.) NaCl crystallizes in a face centered cubic structure of Cl^- ions with the Na^+ ions occupying octahedral holes, so that along the edge of the unit cell we have Cl^- ions at the corners and Na^+ ions in the middle of the edge. There are also Cl^- ions on each of the faces of the cube, and finally there is a Na^+ ion in the middle of the cube that belongs exclusively to one unit cell. The radius of $\text{Cl}^- = 181 \text{ pm}$, and the radius of $\text{Na}^+ = 97 \text{ pm}$. Calculate the density of NaCl in g/cm^3 , assuming that the Na^+ ions touch the Cl^- along the edge of the cube. Hint you must first determine the number of NaCl ion pairs per unit cell. Atomic wt. : Na = 23.0, Cl = 35.45

(10) 4a.) The density of a 10.5 % solution of sucrose = 1.04 g/ml. Find the Molarity of this solution. The molecular weight of sucrose = 342.3

(10) b.) Find the molality of this solution and the freezing point of this solution. K_f of water = 1.86 deg/molality.

(10) 5.) A solution consists of 100 g of sucrose and 300 g of water. Sucrose is non volatile. Find the vapor pressure above the solution at 25°C , if pure water at this temperature has a vapor pressure 23.8 torr. Molecular wt of H_2O = 18.0

(3) 6.) Name the following compounds:

KClO_4 _____

N_2O_5 _____

$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ _____

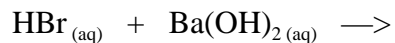
(3) 7.) Write down the formula for the following compounds:

Ammonium sulfite _____
Arsenic (V) bromide _____
2-butyl fluoride _____

(6) 8.) Find the percent oxygen in cupric sulfate penta hydrate. Atomic weights: Cu = 63.6, S = 32.1, H = 1.0, O = 16.0

(8) 9.) A certain compound of nitrogen and oxygen 36.86 % nitrogen. Find the empirical formula of this compound. Atomic weights: N = 14.01, O = 16.00

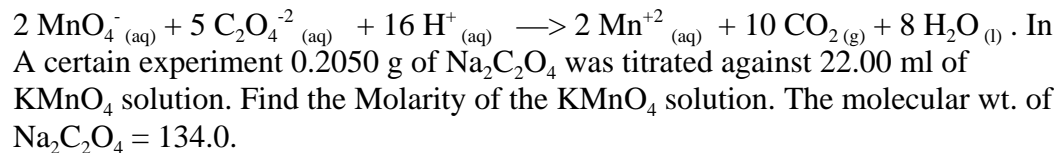
(9) 10.) Write balanced net ionic equations for the following reactions. Write NR if no reaction occurs:



(5) 11.) Balance the following redox reaction:



- (10) 12a.) An acidic solution of $\text{Na}_2\text{C}_2\text{O}_4$ may be used to standardize the concentration of KMnO_4 solution. The balanced redox equation between the 2 is:



- (10) b.) Find the volume of $\text{CO}_2 \text{(g)}$ produced in the above titration if the $\text{CO}_2 \text{(g)}$ was collected, dried and placed into a vessel at 25°C and the pressure was 740 torr.

- (10) 13.) The heat of combustion is defined as the heat of reaction when 1 mole of a compound is burned (in general producing carbon dioxide gas and water as a liquid). Write a balanced equation for the combustion of 1 mole of $\text{CH}_3\text{CH}_2\text{OH} \text{(l)}$ and find the heat of combustion given the following molar enthalpies of formation : $\text{CH}_3\text{CH}_2\text{OH} \text{(l)} = -277.6 \text{ kJ}$, $\text{H}_2\text{O} \text{(l)} = -285.8 \text{ kJ}$, $\text{CO}_2 \text{(g)} = -393.5 \text{ kJ}$.

- (6) 14.) Find the frequency of the second emission line in the Paschen series of hydrogen, which corresponds to a jump from $n = 5$ to $n = 3$.

- (3) 15.) Give the electron configuration for (start with the configuration of the nearest

noble gas)

P^{-3} _____

Ni^{+3} _____

U _____

- (3) 16.) How many electrons may be placed in the following orbital or energy level. Write a zero if the orbital does not exist:

7p _____, 2d _____, n = 6 level _____

- (4) 17.) Given the following atoms : Si, Mg, Cl, P, Rb

Choose the most electronegative element _____

Choose the element that has 5 valence electrons _____

Choose the element having the largest atomic radius _____

Choose the element that is most similar chemically to Sr _____

- (6) 18.) Give the shape, the hybridization of the center atom, and indicate whether the molecule is polar or not:

Molecule	shape	hybridization	Polar ?
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TeF_4

$AsCl_3$

- (2) 19.) The molecule $CH_2CHCHCH_2$ has _____ sigma bonds and _____ pi bonds.