Name ______Mr. Perfect____________________________ Date ____Sp 11_________

1. Classify each of the following compounds as ionic, covalent, or polar covalent. (10 pts)

a. C-N

3.0 – 2.5 = 0.5
Polar Covalent

b. H-H

2.1 – 2.1 = 0
Covalent

Electronegativity

H	2.1
C	2.5
N	3.0
P	2.1
O	3.5
Cl	3.5

c. C-P

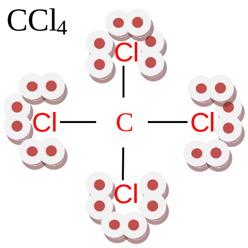
2.5 – 2.1 = 0.4
Polar Covalent

d. Cl-O

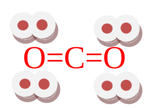
3.5 – 3.5 = 0
Covalent

2. Draw the Lewis structures for each of the following: (10 pts)

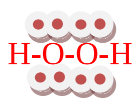
a. CCl_4



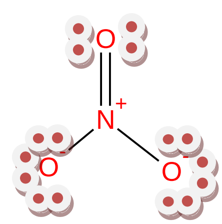
b. CO_2



c. H_2O_2

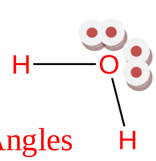


d. NO_3^-



3. Draw the structures for the following compounds and clearly indicate the <u>electron geometry</u> and <u>molecular geometry</u> of each. Include expected bond angles for full credit. (10 pts)

a. H_2O

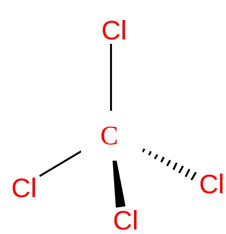


Bond Angles
~109.5 °

Electron Geometry
Tetrahedral

Molecular Geometry
Bent

b. CCl_4



Electron Geometry
Tetrahedral

Molecular Geometry
Tetrahedral

Bond Angles
~109.5 °

Name ______Mr. Perfect____________________________ Date ____Sp 11_________

4. Calculate the amount of heat required to convert 38.5 g of ice at -20.0 °C to steam at 100.0 °C. (15 pts)

Specific Heat (cal/g°C)

Ice	0.50
Water	1.00
Steam	0.48

H_{fusion} = 80.0 cal/g
$H_{vaporization}$ = 540 cal/g

$\Delta T = T_f - T_i$

(Ice): q = m x s x ΔT = 38.5 g x 0.50 cal/g°C x (0 °C – (-20 °C)) = 385 cal

(melting): q = m x H_{fusion} = 38.5 g x 80.0 cal/g = 3080 cal

(Water): q = m x s x ΔT = 38.5 g x 1.00 cal/g°C x (100 °C – 0 °C) = 3850 cal

(Vaporization): q = m x $H_{vaporization}$ = 38.5 g x 540 cal/g = 20790 cal

28105 cal or **28.1 kcal**

5. Calculate the (m/m) % of a solution containing 32.5 g of NaCl in 1000 mL of water. (Assume the density of water to be 1.00 g/mL) (5 pts)

$$\left(\frac{m}{m}\right)\% = \frac{mass\ of\ solute}{mass\ of\ solution} \times 100 = \frac{32.5\ g}{1000\ g + 32.5\ g} \times 100 = \mathbf{3.15}\ \%$$

6. What is the (m/v) % of a 0.236 M ($C_6H_{12}O_6$) glucose solution? (10 pts)

$$\left(\frac{m}{v}\right)\% = \frac{grams\ of\ solute}{100\ mL\ of\ solvent} x100$$

$$0.236 \frac{mol}{L} \times \frac{180\ g}{mol} \times \frac{1\ L}{1000\ mL} \times 100 = \mathbf{4.25}\ \%$$

Name ______Mr. Perfect____________________________ Date ____Sp 11_________

7. Calculate the following concentrations if you dissolve 0.58 g of $NaNO_3$ into 250 mL of water. (Report the answer to 3 significant figures in scientific notation) (10 pts)

a. Molarity =

$$\frac{0.58\ g \times \frac{mol}{85g}}{0.250\ L} = \mathbf{2.73\ x\ 10^{-2}\ mol/L}$$

b. Osmolarity =

2 particles

$NaNO_3 \rightarrow Na^+ + NO_3^-$

2 x (2.73 x 10^{-2}) = **5.46 x 10^{-2} osmol**

8. If the total pressure of a gas mixture of N_2 and O_2 is 1.5 atm, what is the partial pressure of N_2 if there are 0.371 g of O_2 at a volume of 0.90 L and 5.00 °C? (15 pts)
(R = 0.0821 L atm/mol K) T = 5 + 273 = 278 K
Ideal Gas Law: PV = nRT

$$P_{O2} = \frac{n_{O2}RT}{V} = \frac{\left(0.371\ g\ x\frac{mol}{32\ g}\right)\left(0.0821\frac{Latm}{molK}\right)(278\ K)}{(0.90L)} = 0.29\ atm$$

$P_{N2} = P_{Total} - P_{O2}$ = 1.5 atm – 0.29 atm = **1.2 atm**

What is the % N_2 in the gas mixture? (5 pts)

$$\%N_2 = \frac{P_{N2}}{P_T} \times 100 = \frac{1.2}{1.5} \times 100 = \mathbf{80}\ \%$$

9. From left to right, list the following compounds in order of increasing boiling points. (10 pts)

H_2O CH_4 $CH_3CH_2CH_3$ CH_3-O-CH_3

CH_4 < $CH_3CH_2CH_3$ < CH_3-O-CH_3 < H_2O

10. (Extra Credit) Calculate the percentage of water in the following hydrate. (5 pts)
$CuF_2 \cdot 2H_2O$

$$\%\ H_2O = \frac{mass\ of\ water}{mass\ of\ hydrate} \times 100 = \frac{2 \times 18}{137.55} \times 100 = \mathbf{26.2}\ \%$$