Name Mr. Perfect Date F08

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

covalent ← 0.4 ≤ polar covalent ≤ 1.99 → Ionic

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

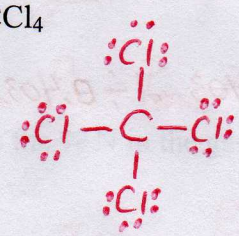
d. Cl-O

3.5 − 3.5 = 0

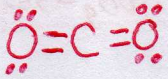
Covalent

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

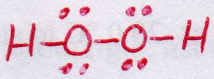
a. CCl_4



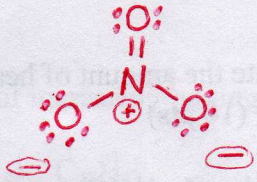
b. CO_2



c. H_2O_2

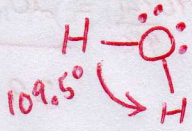


d. NO_3^-



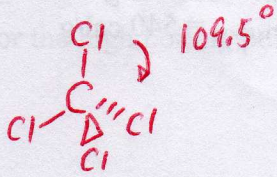
3. Draw the structures for the following compounds and clearly indicate the <u>electron geometry</u> and <u>molecular geometry</u> of each. Include expected bond angles for full credit. (10 pts)

a. H_2O



electron geometry = tetrahedral
molecular geometry = bent

b. CCl_4



electron geometry = tetrahedral
molecular geometry = tetrahedral

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4. Calculate the percentage of water in the following hydrate. (10 pts)

$CuF_2 \cdot 2H_2O$

$$\%H_2O = \frac{2(18)}{102+(2\times18)} \times 100 = \boxed{26\%\ H_2O}$$

5. Determine the water of crystallization for the following hydrate. The compound was found to contain 36.3% water. (10 pts)

$Na_2S_2O_3 \cdot XH_2O$ assume 100g of the sample:

H_2O $36.3g \times \frac{mol}{18g} = 2.017\,mol \div 0.403\,mol = \boxed{5} = X$

$Na_2S_2O_3$ $100g - 36.3g = 63.7g \times \frac{mol}{158g} = 0.403\,mol \div 0.403\,mol = \boxed{1}$

$$\boxed{Na_2S_2O_3 \cdot 5H_2O}$$

6. Calculate the amount of heat required to convert 38.5 g of ice at -20.0 °C to steam at 100.0 °C. (10 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

Ice $-20 \rightarrow 0°C$ $q = m \times S_{ice} \times \Delta T = 38.5g \times 0.50\frac{cal}{g°C} \times 20°C = 385\,cal$

melting $q = m \times H_{fus} = 38.5g \times 80.0\frac{cal}{g°C} = 3080\,cal$

water $0 \rightarrow 100°C$ $q = m \times S_{water} \times \Delta T = 38.5g \times 1.00\frac{cal}{g°C} \times 100°C = 3850\,cal$

vaporization $q = m \times H_{vap} = 38.5g \times 540\frac{cal}{g°C} = 20790\,cal$

$28105\,cal$

or

$\boxed{28.1\,kcal}$