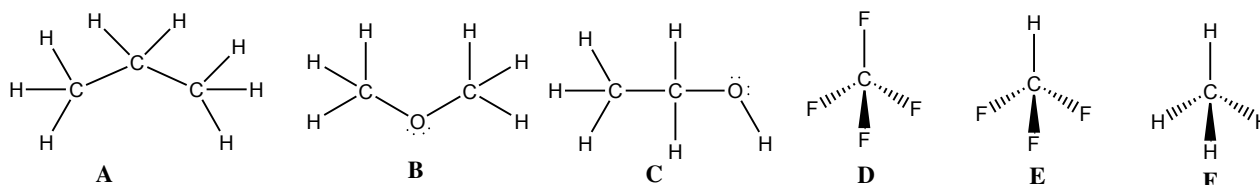**Name:** _____

Report the results of calculations with the correct number of significant figures, and the correct units.
Show complete work in order to receive partial credit for incorrect results.

1. The following questions make reference to the compounds shown below. Electronegativity values are on page 4.

i) Which intermolecular attractive forces can form between the molecules of compound **B?**

     a. Dispersion forces only
     b. Dipole-Dipole attractions only
     c. **Dispersion forces and Dipole-Dipole attractions**
     d. Dispersion forces, Dipole-Dipole attractions, and Hydrogen bonding

ii) Which intermolecular attractive forces can form between the molecules of compound **D?**
     a. **Dispersion forces only**
     b. Dipole-Dipole attractions only
     c. Dispersion forces and Dipole-Dipole attractions
     d. Dispersion forces, Dipole-Dipole attractions, and Hydrogen bonding

iii) Which compound would you expect to have a higher boiling point? **D or E?**
E It can form dipole-dipole attractions…D cannot

iv) Which compound would you expect to have a higher boiling point? **A or F?**
A Both compounds are limited to only exhibiting dispersion forces. The dispersion forces between molecules of A will be stronger due to the larger size of the molecules

v) Which compound would you expect to be more soluble in water? **B or C?**

C Ethanol can form more hydrogen bonding interactions with the water molecules than can the ether (B)
vi) Which compound would you expect to be more soluble in water? **A or B?**
B The ether is more polar than propane and thus should form stronger attraction interactions to the water molecules

18_____

2. Identify the acid, base, conjugate acid, and conjugate base in the following reaction.

     PO_4^{3-} + NH_4^+ ⇋ HPO_4^{2-} + NH_3
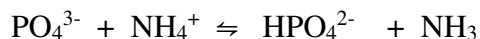
Acid: _____ NH_4^+_____Conjugate Acid: _____ HPO_4^{2-}_____

Base: _____ PO_4^{3-}_____   Conjugate Base: __ NH_3_____

8_____

3. a. Write the acid ionization reaction equation for hypochlorous acid (HClO) (i.e. the reaction of HClO with water).

HClO(aq)   +   H₂O   ⇄   H₃O⁺ (aq)   +   ClO⁻ (aq)

b. The acid ionization constant for hyporchlorous acid is $K_a = 3.0 \times 10^{-8}$. Is hypochlorous acid a **weak or strong acid?**

Weak Acid (low Ka value)

12_____

4. Concentrated nitric acid (HNO_3; MM = 63.01 g/mol) contains 68.0 g of HNO_3 per every 70.4 mL of solution. Calculate the molarity of the solution.

$$68.0 \; g \; HNO_3 \; \times \; \frac{1 \; mol \; HNO_3}{63.01 \; g \; HNO_3} = 1.08 \; mol$$

$$70.4 \; mL \; soln \; \times \; \frac{1 \; L}{1000 \; mL} = 0.0704 \; L$$

$$M = \frac{1.08 \; mol}{0.0704 \; L} = 15.3 \; M$$

14_____