**CHE-2060 Lecture 5 Quiz: Acid-base chemistry**

This take-home quiz is due in at the end of the day on Friday. You are welcome to attach any additional pages needed. ***Please email if you have any questions.***

**5.1: Acids & bases – overview & basics**

1. Draw the conjugate base of this acid CH3CH2NH3+1, using a line bond drawing.

2. In the equation below, is the amide ion, NH2-1 , acting as an acid or a base?

RCCH + Na+1NH2-1 🡪 RCC:-1Na+1 + NH3

3. Label each as a Lewis acid or a Lewis base.

1. (CH3)3C:-1
2. (CH3)3B

**5.2: Acid & base strength**

4. Write the equilibrium expression for the Keq of acetic acid. No math, just the fraction or ratio that describes this Keq.

5. Use pKa values to identify the stronger acid.

1. H2O
2. CH3C(O)OH (acetic acid)

**5.3: Equilibrium acid-base reactions (with prediction of products)**

6. For the reaction between the two compounds shown below:

CH3NH2 + H3O+1 🡪

1. Label the reactants as electrophile and nucleophile.
2. Label the reactants as Lewis acid and Lewis base.
3. Use line-bond drawings to show the balanced chemical equation.
4. Add arrows to show the movement of electrons.
5. Use pKa values to predict whether reactants or products are favored.

**5.4: Leveling effects of solvents**

7. Ammonia, NH3, is a leveling solvent for HCl, HBr and HF. When mixed with ammonia, all three acids have the same strength. Why? You may find it useful to write out reactions and use pKas.

**5.5: Estimation of acidity using conceptual knowledge**

8. Why does structure (not pKa) one of these molecules the stronger acid?

1. H2O
2. CH3C(O)OH (acetic acid)

9. Which of the molecules is more acidic and *why*?

Br

O

OH

Br

O

OH

**5.6: Classes of organic acids & bases**

10. Explain why the acidity of positively charged nitrogen atoms is higher when the nitrogen is sp hybridized than when it is sp2 or sp3 hybridized.

**5.7: Functional groups acid-base nature**

11. Which oxygen-containing functional group is the strongest acid? Why?