**Salt Lake Community College, Chemistry Department**

**Chem 1110 Workshop 12**

**Topic: Acids and Bases Part I**

***Objective:***

**• Acids and Bases Definitions and Strengths**

**• To be able to use the pH scale and relate it to [H3O+]**

**Arrhenius definition of an acid:**



**Bronsted Lowry Acid and Base:**



* Brønsted-Lowry: acid donates H+ and base accepts H+.
* Brønsted-Lowry base does not need to contain OH−.
* Water can behave as either an acid or a base.

**Acid and Bases Strength:**



**Conjugate Acid-Base Pairs:**



**Acid Dissociation Constants:**

****

* A special constant Ka is used to represent this equilibrium. - The concentration of water, which is essentially constant, is included in the value of Ka. - Strong acids have large Ka values. Weak acids have small Ka values.

**Practice Problems:**

1. When acids and bases react the product other than water is a (Acid Base rxn🡪 salt + H2O)

1. hydrogen ion.
2. hydroxide ion.
3. hydronium ion.
4. metal.
5. **salt.**

2. A Brønsted-Lowry acid is a substance which

1. produces hydrogen ions in aqueous solution.
2. produces hydroxide ions in aqueous solution.
3. **donates protons to other substances.**
4. accepts protons from other substances.
5. accepts hydronium ions from other substances.

3. A Brønsted-Lowry base is a substance which

1. produces hydrogen ions in aqueous solution.
2. produces hydroxide ions in aqueous solution.
3. donates protons to other substances.
4. **accepts protons from other substances.**
5. accepts hydronium ions from other substances.

4. Classify each of these solutions as Brønsted-Lowry acid or base.

|  |  |
| --- | --- |
| CN- | Brønsted-Lowry Base |
| HClO4 | Brønsted-Lowry Acid |
| PO43- | Brønsted-Lowry Base |
| HBr | Brønsted-Lowry Acid  |

5. Give the formula of:

(a) the conjugate base of this acid C2H5NH3+ : \_\_ C2H5NH2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_.

(b) the conjugate acid of this base H2PO4− : \_\_\_H3PO4\_\_\_\_\_\_\_\_\_\_\_\_\_.

6. What is the pH of a 0.01 *M* solution of HCl?

**pH = -log [H+]**

 **= -log (0.01) = 2**

7. Find [H+] in a solution with pH 5.43.

**pH = -log [H+]**

**5.43 = -log [H+]**

**10-pH = [H+] 🡪 3.76 x 10-6**

8. What is the pH of a 0.0032 *M* solution of NaOH?

**1 x 10-14 = [H+] x [OH-]**

**1 x 10-14 / [OH-] = [H+] 🡪 1 x 10-14 / 3.2 x 10-3 = 3.1 x 10-12**

**pH = -log [H+]**

 **= -log (3.1 x 10-12) = 11.5**

9. A cleaning solution is found to have [OH–] of 1 × 10–3 *M*. What pH is this?

**[H+] = 1 x 10-14/ 1 x 10-3 🡪 1 x 10-11 M**

**pH = -log [H+]**

 **= - log (1 x 10-11) = 11.0**