**6.5 Strong and Weak Acids and Bases**

* the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of a substance depend on two things:

1. the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of the solution
2. the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** of the acid or base

## A. Strong Acids and Weak Acids

* an acid that ionizes almost **\_\_\_\_\_\_\_\_\_** in water is called a **\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* 100% of the **\_\_\_\_\_\_\_\_\_\_** becomes **\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_**
* the concentration of the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the **\_\_\_\_\_\_\_\_\_\_\_\_\_** as the concentration of the **\_\_\_\_\_\_\_\_\_** it came from
* strong acids are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* there are 6 strong acids:

perchloric acid HClO4(aq)

hydrobromic acid HBr(aq)

hydroiodic acid HI(aq)

hydrochloric acid HCl(aq)

sulfuric acid H2SO4(aq)

nitric acid HNO3(aq)

* a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and only a small percentage of the acid forms **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* we use the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** for weak acids
* weak acids are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

## B. Strong Bases and Weak Bases

* a basethat dissociates **\_\_\_\_\_\_\_\_\_** into ions in water is called a **\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are strong bases

eg)

* a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and only a small percentage of the base forms **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* we use the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** for weak bases

## C. Monoprotic and Polyprotic Acids

* acids that have only **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** per molecule that can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* monoprotic acids can be **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* acids that contain **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** that can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* acids with **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, with **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* when polyprotic acids ionize, only **\_\_\_\_\_\_\_\_\_\_** hydrogen is removed at a time, with each acid becoming **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

## D. Monoprotic and Polyprotic Bases

* bases that **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* bases that react with water in **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are called **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* as with polyprotic acids, only **\_\_\_\_\_\_\_\_** OH−(aq) is formed at a time, and each new base formed is **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** than the last

eg)

## E. Neutralization

* the reaction between an acid and a base produces an **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

eg)

* the products of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** are both **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* in a neutralization reaction or **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** between a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, the product is always **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

## F. Acid and Base Spills

* there are many uses for both acids and bases in our households and in industry
* due to their **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, special care must be used when they are being **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* the two ways to deal with acid or base spills are:

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** reduce the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** by adding **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
2. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** you always use a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** for the neutralization so you aren’t left with another hazardous situation

Properties of Strong and Weak Acids and Bases

1. Fill in the chart of expected results for acids that all have a concentration of 0.1 mol/L.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Acid** | **Chemical formula** | **pH**  **(slightly less than 7 or much less than 7)** | **Conductivity**  **(high or low)** | **Reactivity with magnesium metal (high or low)** |
| hydrochloric acid |  |  |  |  |
| ethanoic acid |  |  |  |  |
| boric acid |  |  |  |  |
| hydrofluoric acid |  |  |  |  |
| sulfuric acid |  |  |  |  |
|  | HClO4(aq) |  |  |  |
|  | H3PO4(aq) |  |  |  |
|  | HBr(aq) |  |  |  |
|  | H2SO3(aq) |  |  |  |

1. Two different acidic solutions have a concentration of 0.1 mol/L. Solution A conducts electricity extremely well, while solution B conducts very poorly. Which of the solutions will have a lower pH? Explain using a description of what is happening on a molecular level.

1. You have two basic solutions. One has a concentration of 1.0 mol/L and one has a concentration of 0.1 mol/L. You know one is a strong base and one is a weak base. Can you determine which solution is which based on pH? If so, explain how. If not, explain why not.

1. Describe how you can distinguish a strong base from a weak base using
   1. The formula of the solute in the solution
   2. The modified Arrhenius theory
2. For each acid or base write out the chemical equation for the reaction between the acid or base and water
   1. hydrochloric acid
   2. acetic acid
   3. hydrofluoric acid
   4. nitric acid
   5. phosphoric acid
   6. sodium hydroxide
   7. sodium carbonate
   8. sulfurous acid