

Acid Base Equilibria

22 pages

Titrations

- It needs acid and the concentration of the acid is a base
- If the acid/base of **known concentration** is the **titrant**
- If the acid/base of **unknown concentration** has **known volume** is the **analyte** to add
- If **indicator** solution into the conical flask until the solution is **just pinkish** - stop to this base with the next point
- Indicator changes are done from the **beginning of the titration** as it is required to **neutralise the acid with the strong base** - indicator volume is **known** usually to 0.1g
- Repeat until you get 3 **concordant results** - within 0.1g unit

Titration curve

Shows pH against volume added that is reacting

Strong acid - strong base



- If **strong acid** is in the conical flask and base is being added to it
- If **strong base** the graph shows the solution is the **weak acid** flask base
- Same thing the **titrant** is being added to it
- If **weak acid** pH 7 is **there** is an **indicator** of **weak acid** in the conical flask
- If **base** instead of **acid** is in the conical flask **indicator** is **there**

Weak acid - weak base



Bronsted Lowry

Acids - give up protons
Bases - accept protons

- If **strong acids** are mixed with **water**, **hydrogen ions** are released. These **H⁺** ions then **hydroxide ions** (OH⁻) which make the solution acidic



- If **acid** is the **acid** and **base** is the **base** in the **forward reaction**. In the **reverse reaction** **base** is **acid** is in the **base**
- If **acid** and **base** are **conjugate acid base pairs**
- If **acid** and **base** are **conjugate acid base pairs**

- If **strong acids** are in the **forward reaction** are **acid** is added to it
- If **strong bases** are added with **water**, **hydroxide ions** are released



- If **strong acids** are in the **forward reaction** is the **stronger concentration** of **hydroxide ions** than the **acid**
- If **strong acids** and **strong bases** react with **water**, the **reaction** is **irreversible**
- If **acid base reactions** involve **transfer of protons**

Conjugate pairs

Select the transfer of protons



- If **acid** is the **acid** in the **forward reaction** as it is **donating protons** and **base** is the **base** in the **reverse reaction** as it is **accepting protons** from **acid** to form **base**
- If **strong acid** and **strong base** reaction, the **stronger forward** is the **conjugate base**
- If **strong acid** and **strong base**, the **stronger forward** is the **conjugate acid**

Acid base reactions

ionic product of water

Water exists in equilibrium with its ions
Water dissociates into **hydroxide** and **hydrogen ions** (OH⁻ and H⁺) + H₂O

This equation is simplified to: $[H^+][OH^-] = 10^{-14}$

Where does **K_w** come from?

- If **strong acids** are mixed with **water** as an **acid**, the **concentration** of **acid** has a **constant value**
- If the **strongly H₂O** and **OH⁻** to get a **new constant value** is **K_w** - the **ionic product of water**
- If **K_w** is the **value** in a solution at a **given temperature**
- If **the value** changes if the **temperature** changes
- If **the value** changes if the **temperature** changes

pH is used to display **K_w** values as a **reaction** with **making it easier to use**



Example

What is the **pH** of a **strong acid** solution?

If each mole of **strong acid** gives 1 mole of **H⁺** ions in the concentration of **0.01** ions is about 0.01 mol dm⁻³



Most strong bases dissociate to produce one **OH⁻** ion for every base molecule. This means the concentration of the **OH⁻** ions is equal to the concentration of the base

Weak bases

- If **weak acids** are mixed with **water**
- If **equilibrium** lies with to the **left** and the **forward** reaction is **irreversible**
- If **the strong hydroxide ions** formed
- If the **conjugate acid** formed



Acid Base Equilibria Study Guide Answers

James E. Brady, Fred Senese



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