**5.1 Acids and Bases**

**pH Scale**

The pH scale is: **a number scale that indicates how acidic or basic (alkaline) a solution is**

acidic neutral basic

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

Note: one unit on the pH scale = 10x change

*Determine the change in pH for each example:*

*a) pH 6 to pH 4*

*b) pH 4 to pH 6*

*c) pH 1 to pH 6*

*d) pH 12 to pH 9*

*e) pH 3 to pH 2*

**pH Indicators**

pH indicators:

* 1. Litmus:
  2. Universal indicator:
  3. Phenolphthalein:
  4. Bromothymol blue:
  5. v) methyl orange, methyl red, indigo carmine

Natural source pH indicator – e.g. red cabbage

pH 2 – red

pH 3 – red-pink

pH 4 – purple

pH 6 – violet

pH 8 – blue

pH 10 – blue-green

pH 12 – green-yellow

pH 13 - green

**Acids and Bases**

*Identifying acids and bases*

Acids and bases can be identified by their chemical formulas:

1) Acids:

Exception:

2) Bases –

*Examples: Acid or Base?*

*a) H2SO4 b) NH4OH*

*c) HI d) HClO2*

*e) Ca(OH)2 f) CH3COOH*

Naming Acids

|  |  |  |  |
| --- | --- | --- | --- |
|  | Non-oxygen Acids | Acids containing oxygen | |
| with polyatomic ion ending in “ate” | with polyatomic ion ending in “ite” |
| Example | HCl  Hydrogen chloride | H2CO3  Hydrogen  carbonate | H2SO3  Hydrogen  sulphite |
| Name change of negative ion | add hydro- and -ic | add -ic | add -ous |
| Name |  |  |  |

Naming Bases

Bases are named using their regular chemical name. (e.g. NaOH is sodium hydroxide)

*Examples:*

*a) HBr b) HClO4*

*c) NH4OH d) HNO2*

*e) Mg(OH)2 f) hydrochloric acid*

*g) sulphuric acid h) sodium hydroxide*

*i) phosphorous acid j) calcium hydroxide*

Properties of Acids and Bases

|  |  |  |
| --- | --- | --- |
| Property | Acid | Base |
| Example |  |  |
| Taste |  |  |
| Touch |  |  |
| Indicator tests |  |  |
| Reaction with  some metals |  |  |
| Electric conductivity |  |  |
| pH |  |  |
| Production of ions |  |  |

**5.2 Salts**

**Salts**

Salts are:

A salt is made up of a positive ion (e.g. Na+) from the base and a negative ion (e.g. Cl-) from the acid:

*Predict the salt that will be produced:*

*1) HCl + KOH → \_\_\_\_\_\_\_\_\_\_ + H2O*

*2) H2CO3 + Mg(OH)2 → \_\_\_\_\_\_\_\_\_\_ + H2O*

*3) CH3COOH + CsOH → \_\_\_\_\_\_\_\_\_\_ + H2O*

*4) H3PO4 + NaOH → \_\_\_\_\_\_\_\_\_\_ + H2O*

*5) HNO3 + Ca(OH)2 → \_\_\_\_\_\_\_\_\_\_ + H2O*

***Chemical Reactions that Produce Salts:***

**1) Acid-Base Neutralization**

Neutralization is the chemical reaction that occurs when

*Example:*

**2) Acid and Metal**

When metals react with acids to produce a salt, they usually release

*Example:*

**3) Acid and Carbonate**

When carbonates react with acids to produce a salt, they release and

*Example:*

*Predict the products for the reactions:*

*1) Neutralization*

*CH3COOH + Mg(OH)2 →*

*2) Acid and metal*

*HBr + Al →*

*3) Acid and carbonate*

*HNO3 + CaCO3 →*

**Chemical Reactions that Produce Acids and Bases:**

**1) Metal Oxide and Water**

When metal oxides dissolve in water, a \_\_\_\_\_\_\_\_\_\_ is produced:

**2) Non-Metal Oxide and Water**

When non-metal oxides dissolves in water, an \_\_\_\_\_\_\_\_\_\_ is produced:

*Predict the products for the reactions:*

*1) Metal oxide and water*

*CaO + H2O →*

*2) Non-metal oxide and water*

*CO2 + H2O →*

**5.3 Organic Compounds**

**Organic Compounds**

Organic compounds are compounds containing \_\_\_\_\_\_\_\_\_\_\_\_\_. Two common groups are hydrocarbons and alcohols:

1) Hydrocarbons:

*Examples:*

methane

ethane

propane

butane

2) Alcohols:

*Examples:*

Methanol

Ethanol

Isopropyl alcohol

**Inorganic Compounds**

Inorganic compounds are compounds that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_contain carbon.

1) Containing carbon

a) Carbonates – e.g. CaCO3, Na2CO3

b) Carbides – e.g. Al4C3, SiC

c) Oxides – e.g. CO, CO2

2) Not containing carbon – e.g. FeCl2, (NH4)2SO3, PBr3

*Examples: Classify as either organic or inorganic*

*a) CH3CH2OH b) K2HC6H5O7*

*c) Al4C3 d) C8H10CH2OH*

*e) CaCO3 f) FeCl2*

*g) CH4 h) PBr3*

*i) CO2 j) C6H5COOH*