REVIEW OF THE PROPERTIES OF ACIDS AND BASE (ARRHENIUS)

Arrhenius: an acid is a substance which produces H_3O^{+1}, (hydronium ion) in water, and a base produces OH^{-1} (hydroxide) in water.

Electrolytes and Non-electrolytes

Pure substances and substances in solution that conduct electricity by the movement of ions are called electrolytes. Compounds that are 100 % dissociated or ionized in aqueous solution are called **strong electrolytes** (essentially all ionic compounds, also molecular acids .: good conductors of electricity). **Weak electrolytes:** many polar compounds, (essentially weak acids and weak bases), will dissolve in water with only partial ionization, .: an equilibrium is set up between the solute and its ions.

Non-electrolytes remain as molecules in solution. (In chemistry care must be taken not to use the terms strong and weak i.e. fully and partially dissociated correctly and not as synonyms for concentrated and dilute, i.e. a large or small number of moles in a given volume as is done in everyday speech).

PROPERTY	**Strong Acid** $HCl_{(aq)}$	**Weak Acid** $CH_3COOH_{(aq)}$	**Strong Base** $NaOH_{(aq)}$	**Weak Base** $NH_4OH_{(aq)}$
Taste				
Feel				
Red Litmus				
Blue Litmus				
Bromthymol Blue				
Methyl Orange				
Phenolphthalein				
$Mg_{(s)}$				
$NaHCO_{3(s)}$				
Conductivity of 0.1 mol dm^{-3} soln.				
Types of ions in solution				
ionic or molecular compound				
Ionization or Dissociation in water ?				
% as ions in solution				

Strong Acids

HCl, HBr, HI, HNO_3, H_2SO_4, $HClO_4$

Weak Acids

HF, CH_3COOH, H_3PO_4, HNO_2

Strong bases

NaOH, KOH, $Ca(OH)_2$, $Ba(OH)_2$

Weak bases

NH_3

Bronsted-Lowry Acids and bases

Acid: is a substance that acts as a donor of protons, (hydronium ions, H_3O^{+1}, a hydrated hydrogen ions, H^{+1})

Base: is a substance that acts as an acceptor of protons (hydronium ions)

Assignment

1. Write balanced molecular, ionic and net ionic equation for the reaction of

a) $HCl_{(aq)} + Mg_{(s)}$ b) $HCl_{(aq)} + NaHCO_{3(s)}$ c) $H_2SO_{4(aq)} + NaOH_{(s)}$

2. Define conjugate acid and conjugate base. Illustrate your answer with an example.

3. Write the formula of the conjugate base for each of the following Bronsted acids:

a) H_2O b) HI c) $H_2PO_4^{-1}$ d) NH_4^{+1} e) HSO_4^{-1} f) NH_3OH^{+1}

4. Write the formula of the conjugate acid for each of the following Bronsted bases:

a) NH_3 b) SO_4^{-2} c) CH_3COO^{-1} d) PO_4^{-3} e) $C_2O_4^{-2}$ f) $N_2H_5^{+1}$

5. In a mixture of concentrated nitric and sulphuric acids, the nitric acid acts as a base and the sulphuric acid as a weak monoprotic acid.

a) Write an equation for this and explain how your equation shows that the sulphuric acid is acting as a weak acid.

b) On your equation link together with lines the two conjugate acid-base pairs.

c) What is meant by the terms **monoprotic** and **diprotic acids,** and give an example of each.

6. The hydrogen-carbonate, (bicarbonate) ion, HCO_3^{-1} formed from carbonic acid, H_2CO_3, is described as being **amphiprotic**.

Describe what you understand by this term and give the formulae of the species formed.