

## Displacement reactions and metal extraction

potassium	most reactive	K
sodium		Na
calcium		Ca
magnesium		Mg
aluminium		Al
carbon		C
zinc		Zn
iron		Fe
tin		Sn
lead		Pb
hydrogen		H
copper		Cu
silver		Ag
gold		Au
platinum	least reactive	Pt

Reactivity depends on tendency to form metal ion



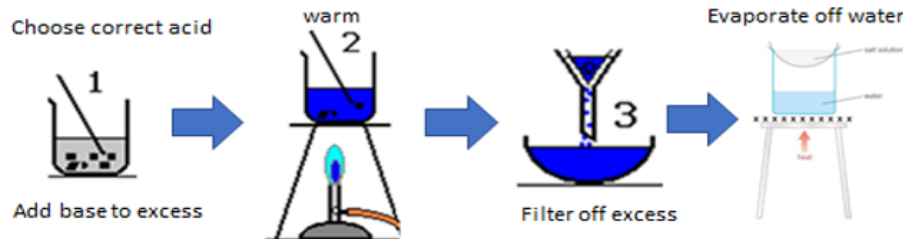
## Reactions of acids

- Acid + metal  $\rightarrow$  salt + hydrogen
- Acid + alkali  $\rightarrow$  salt + water
- Acid + insoluble base  $\rightarrow$  salt + water
- Acid + carbonate  $\rightarrow$  salt + water + carbon dioxide

HT: OILRIG  
 e.g.  $2HCl + Mg \rightarrow MgCl_2 + H_2$   
 Magnesium is oxidised  
 $Mg \rightarrow Mg^{2+} + 2e^-$

Hydrochloric Acid  $\rightarrow$  Chlorides  
 $HCl$   
 Nitric Acid  $\rightarrow$  Nitrates  
 $HNO_3$   
 Sulphuric Acid  $\rightarrow$  Sulphates  
 $H_2SO_4$

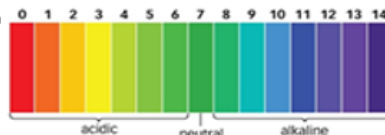
## RP: Preparation of a dry sample of a soluble salt



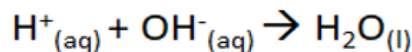
- Metal + Oxygen  $\rightarrow$  Metal Oxide
- Metal + Water  $\rightarrow$  Metal Hydroxide + hydrogen
- Metal + acid  $\rightarrow$  Metal salt + Hydrogen

## L26 – 36 Chemical Changes

## Neutralisation



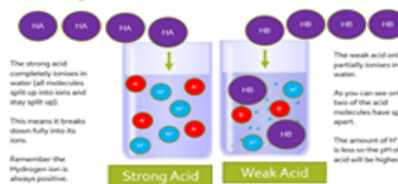
Acids produce  $H^+$  ions  
 Alkalis produce  $OH^-$  ions



HT: Strong and Weak acids

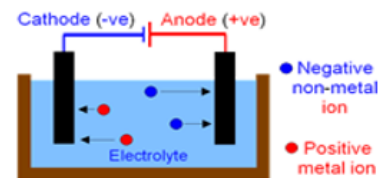
Concentration of hydrogen ions in $mol/dm^3$	pH
0.10	1.0
0.010	2.0
0.0010	3.0
0.00010	4.0

Strong and weak acid:



## Electrolysis

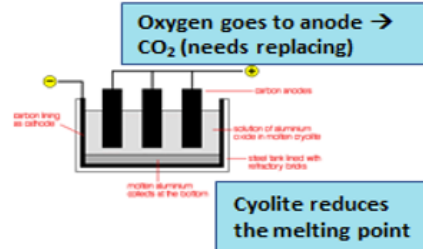
..of molten:



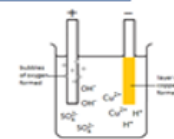
Higher:  
 At the cathode  
 $Pb^{2+} + 2e^- \rightarrow Pb$

Higher:  
 At the anode  
 $2Br^- \rightarrow Br_2 + 2e^-$   
 or  
 $2Br^- - 2e^- \rightarrow Br_2$

..to extract aluminium:



..of solutions:



At the anode:  
 Halide (Gp7)  
 Oxygen

At the cathode:  
 Least reactive

## Exothermic vs Exothermic

In some reactions more energy comes OUT than goes in



The reactants have more energy than the products.

e.g. combustion, oxidation, neutralisation.

### Exothermic Vs. Endothermic



In some reactions more energy goes IN than comes out.



The products have more energy than the reactants.

e.g. thermal decomposition

Uses

## Exothermic

Self heating cans, hand warmers



Chemicals react in an exothermic reaction and give OUT heat energy.

## Endothermic

Cool packs for sports injuries

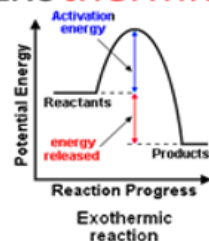


Chemicals react in an Endothermic reaction and take IN heat energy – therefore cooling the surroundings.

## L37 – 41 Energy Changes

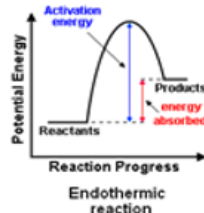
## Reaction Profiles

### Exothermic



Products at LOWER energy than reactants

### Endothermic



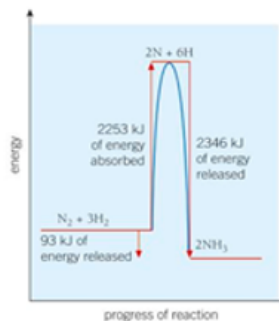
Products at HIGHER energy than reactants

**Activation Energy** is the energy needed to start a reaction.

## Bond energy Calculations (HT)

### Exothermic

More energy comes OUT making bonds



### Endothermic

More energy goes IN breaking bonds