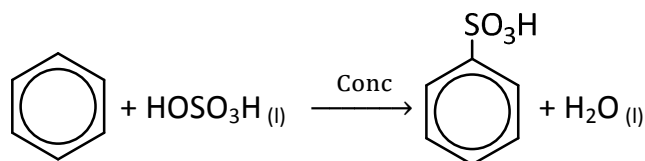
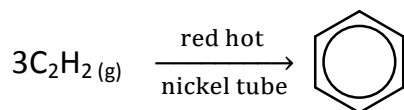
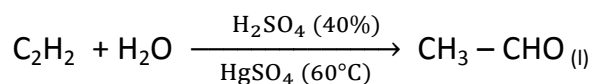
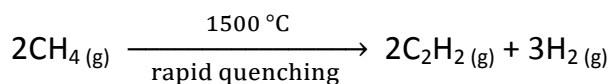




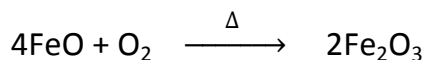
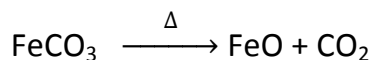
## Benzene sulphonic acid from ethyne



## Ethanal from Methane (Natural gas)

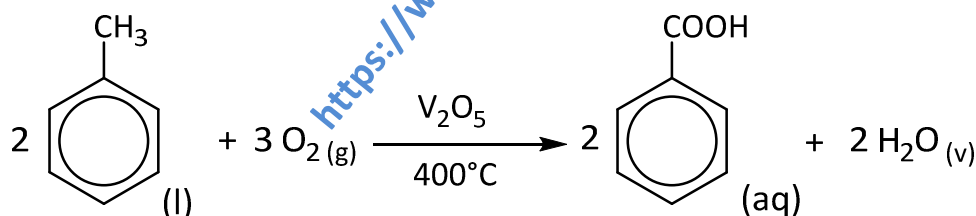


## Iron III oxide from Siderite

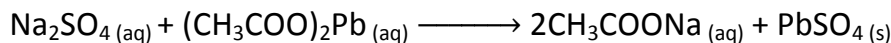
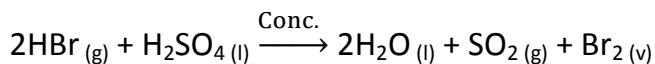


## Preparation of benzoic acid

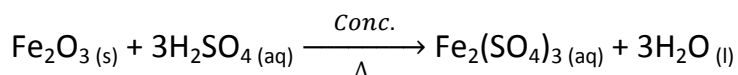
Benzoic acid can be prepared commercially by the oxidation of toluene

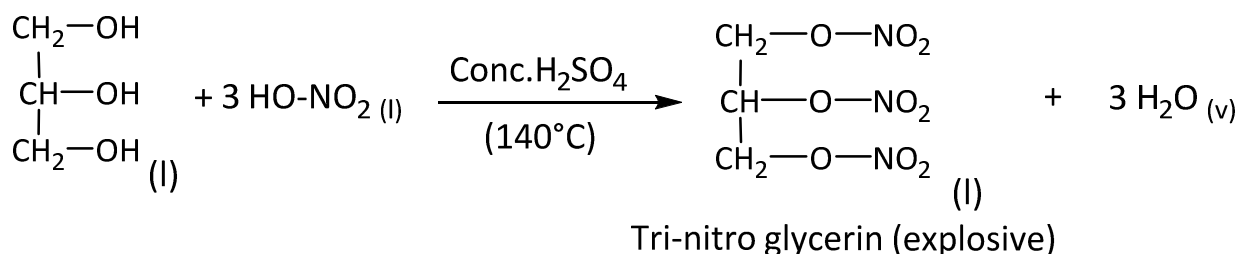


## Show by chemical equation



## Adding conc. Hot sulphuric acid to iron III oxide



**How to get****Verify Faraday's Second Law**

If we pass the same quantity of electricity in different groups of solutions such as copper II sulphate, silver nitrate and aluminum chloride.

The masses of the formed materials at the cathode in the cells of aluminum, copper and silver respectively are proportional to their equivalent masses

In the ratio  $\text{Al} : \text{Cu} : \text{Ag} = \frac{27}{3} : \frac{63.55}{2} : \frac{108}{1}$

or 9 : 31.78 : 108 respectively

**Conclusion:**

The masses of the different materials formed or consumed by the same amount of electricity that passes in different electrolytes connected in series are proportional equivalent masses.

**How to get copper from iron alloy**

Construct the following cell where

the anode iron alloy (impure copper)

the anode is pure copper

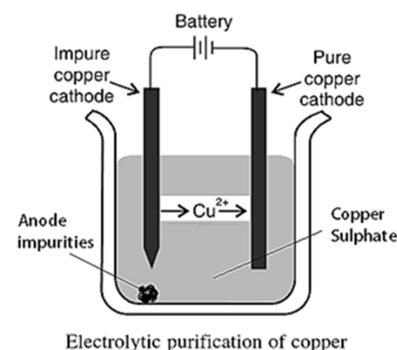
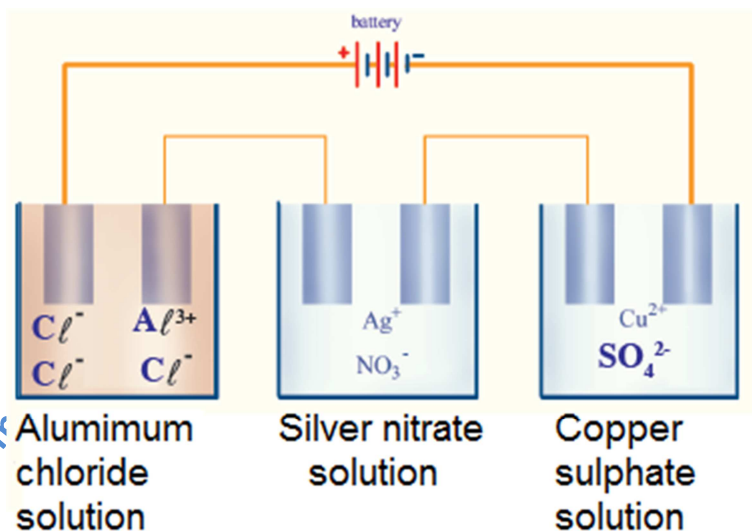
the electrolyte is copper sulphate

copper ions ( $\text{Cu}^{2+}$ ) which spread in solution and

redeposit in the form of pure copper at the cathode.

At anode:  $\text{Fe}^0_{(\text{s})} \longrightarrow \text{Fe}^{2+}_{(\text{aq})} + 2\text{e}^-$  and  $\text{Cu}_{(\text{s})} \longrightarrow \text{Cu}^{2+}_{(\text{aq})} + 2\text{e}^-$

At cathode:  $\text{Cu}^{2+}_{(\text{aq})} + 2\text{e}^- \longrightarrow \text{Cu}_{(\text{s})}$



Electrolytic purification of copper

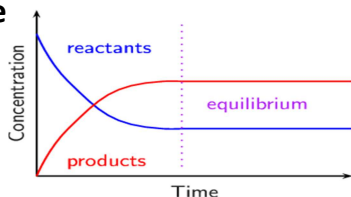


**Importance of chemical analysis in Environmental field:**

1. To identify and measuring the harmful environmental pollutants content in water and foods,
2. To identify percentages of carbon monoxide , sulphur dioxide , and nitrogen oxides gases in air.

**Scientific term**

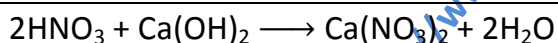
- A) Urea
- b) 1, 1, 1 trichloro ethane
- A) Vanadium
- B) Interstitial alloys
- A) Galvanic cells
- B) Electrolysis

**Choose**

b.

d. 2.07

c. 2-bromo propane



2

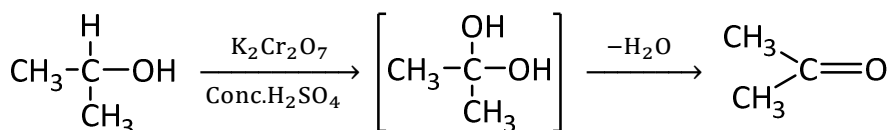
1

1

0.5

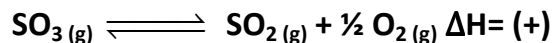
? so each 0.5 mole of HNO<sub>3</sub> will react with 0.25 Ca(OH)<sub>2</sub> and (0.5 - 0.25) will remain

b. Alkaline solution

**How to get**



In the following reaction

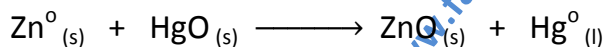


Increase the temperature will shift the react towards the product and the concentration of  $\text{SO}_2(g)$  and  $\text{O}_2(g)$  will increase

A) Iodide  $\text{I}^-$  /  $\text{AgI}_{(s)}$

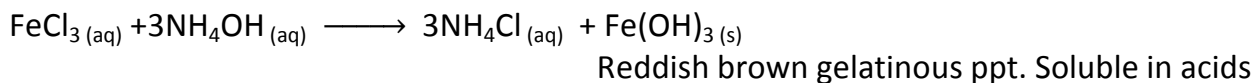
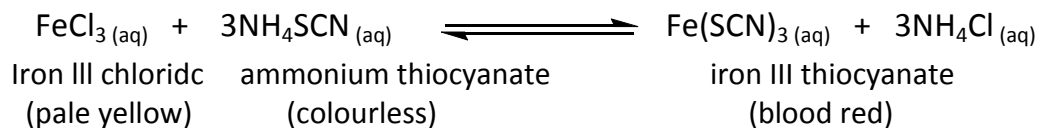
B) Bromide  $\text{Br}^-$  /  $\text{AgBr}_{(s)}$

the total mercury cell reaction



How to differentiate between

By adding  $\text{FeCl}_3$

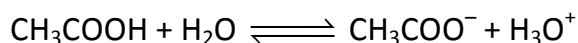




## explain

A) As concentration increase, the number of reacting molecules increase and consequently collision per unit volume increase. (The rate (speed) of reaction will be greater)

B) Because acetic acid is a weak electrolyte, incompletely ionized, But with dilution dissociation increases and the number of free ions increase and electric conductivity increase



## **A) transition elements is used in alloys**

Due to Small change in atomic radii as we move through first (relatively constant)

this is due to two opposite factors:

a- The first factor causes decreasing in the atomic radius

By increasing atomic number the effective nuclear charge for these elements increases and attraction to the electrons increases which cause decrease the atomic radius.

b- The second factor increasing in the number of the electrons in 3d sublevel will increase the repulsion force between them.(increase in atomic radius)

## **B) Titanium ion $\text{Ti}^{4+}$ is colorless**

Because titanium ion will has empty d orbital and colored substance must has partially filled

d orbital  $\text{Ti}^{4+} [\text{Ar}] 3d^0, 4s^0$

## **The potential of the hydrogen electrode may differ than zero**

The potential of the hydrogen electrode changes by changing the hydrogen ion concentration in the solution or by changing the partial pressure of the hydrogen gas or both.

First qualitative analysis to know it is pure sample of mixture then to identify the constituents of a mixture or compound and then quantitative analysis to identify the concentration of each element (percentage) in the compound





To protect it from rusting (as it is always in contact with salty water) oxidation reaction as magnesium act as sacrificial electrode It is more reactive and it is oxidized instead of iron (body of the ships) so protect it

## What is meant by

**Precipitation reactions** : reactions which are used for determination of substances that form sparingly soluble products in water using Precipitation Method

## Ionic product of water

The product of multiplying the concentrations of  $[H^+]$  and  $[OH^-]$  ions of water.

## Problems

On heating hydrated iron (II) sulphate crystals ( $FeSO_4 \cdot xH_2O$ ) calculate X

Mass of hydrated sample of iron (II) chloride = 5.41 g

Mass of anhydrous sample of iron (II) chloride = 3.25 g (Fe = 56, S = 32, H = 1, O = 16)

Sol. Mass of water of crystallization =  $5.41 - 3.25 = 2.16$  g.

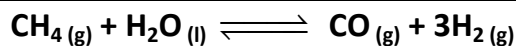
Molecular mass of  $FeSO_4 = 56 + 32 + (4 \times 16) = 152$  g.

152 g Of  $FeSO_4$   $\xrightarrow{\text{combines with}}$  X (18) g of  $H_2O$

3.25 g of  $FeSO_4$   $\longrightarrow$  2.16 g of  $H_2O$

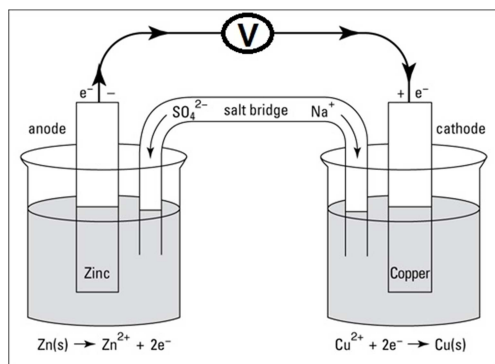
$$X = \frac{152 \times 2.16}{3.25 \times 18} = 5.6 \cong 7$$

The molecular formula of hydrated iron (II) chloride is  $FeSO_4 \cdot 7H_2O$ .



$$K_c = \frac{[CO].[H_2]^3}{[CH_4]} = \frac{0.08 \times (0.04)^3}{1.2} = 4.26 \times 10^{-6}$$





- A) By changing copper electrode with magnesium electrode the e.m.f value will change from 1.1 V to 2.2988 (other larger value) and the zinc become the cathode instead of being the anode
- B) the redox reaction will stop and the e.m.f will become zero

### The name of the compound

2-methyl 2-phenyl butane