# ELECTROCHEMISTRY

by Apni Kaksha :)

Class XII BOARD EXAMS (Target 100)

These notes have been verified by CBSE Science toppers.

↳ No part of syllabus removed from these notes.

Previous 15 year Questions have been integrated in the notes.

Aman Bhattarwal

Target 100

# HOW TO STUDY THE NOTES?

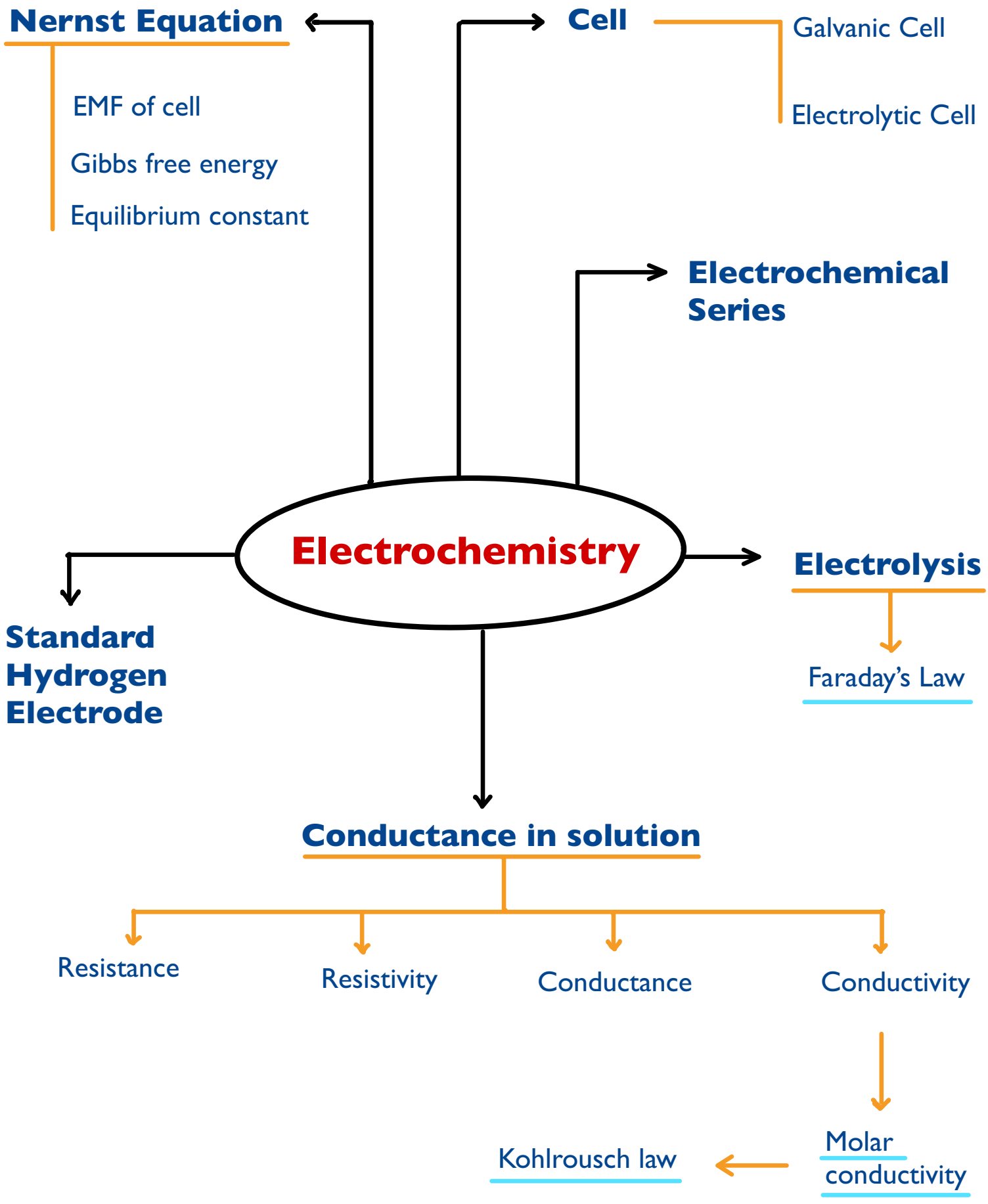
Apni Kaksha

-Coloured and double sided print
- Revise the notes at least 3-4 time
- Write to revise | 10% rule
- Keep track of previous year qs
- See the marking scheme

Jao Ab Phodo!

Aman Dhattarwal

# Flow Chart


Nernst Equation
EMF of cell
Gibbs free energy
Equilibrium constant
Cell
Galvanic Cell
Electrolytic Cell
Electrochemical Series
Electrochemistry
Standard Hydrogen Electrode
Electrolysis
Faraday's Law
Conductance in solution
Resistance
Resistivity
Conductance
Conductivity
Molar conductivity
Kohlrousch law

# Electrochemistry

→ It is study of production of electricity from energy which is released during spontaneous chemical reactions and the use of electrical energy to bring about non-spontaneous chemical transformation.



## Some Basic Definitions –:

**Oxidation –:** Loss of electron $Zn \longrightarrow Zn^{+2} + 2e^-$

**Reduction –:** Gain of electron $Cu^{+2} + 2e^- \longrightarrow Cu$

**Electrolyte –:** A solution that contains ions is called electrolyte. Electrolyte is an ionic conductor.

**Electrode –:** Surface at which oxidation or reduction takes place.

**Redox Reaction –:** An oxidation-reduction (redox) reaction.

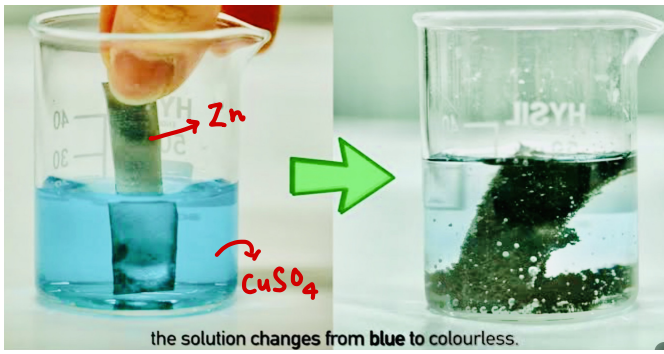
$$Zn + Cu^{+2} \longrightarrow Zn^{+2} + Cu$$

## Placing a Zn rod in $CuSO_4$ solution –:

→ $CuSO_4$ solution is blue in colour. But if we place a Zn rod in $CuSO_4$ solution, colour fades out. This is because of reduction of $Cu^{+2} \rightarrow Cu$.

→ $Zn + Cu^{+2} \longrightarrow Zn^{+2} + Cu$

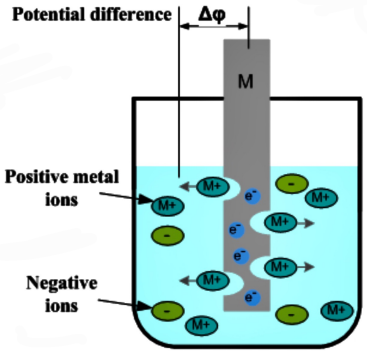
→ Above is a spontaneous reaction. It does not require any external work.



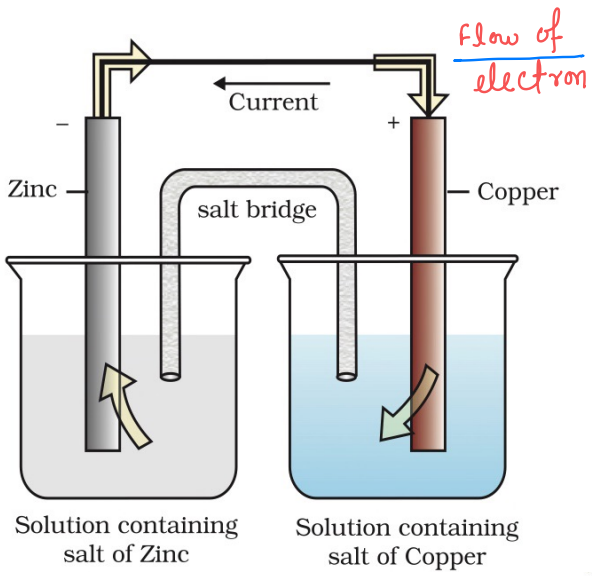

**Electrode Potential –:** Potential difference between metal and metal ion in which electrode is dipped is called electrode potential.

→ Electrode potential of Zn → $Zn \mid ZnSO_4$

Electrode potential of Cu → $Cu \mid CuSO_4$



**Galvanic or Voltic Cell** :— A galvanic cell is a an electrochemical cell that converts the chemical energy of a spontaneous redox reaction into electrical energy.




→ Spontaneous then $\Delta G = -ve$.

→ In this device $\Delta G$ of spontaneous redox reaction is converted into electrical work (which may be used for running a motor, fan, heater etc.)

**Construction** :— It consist of two mettalic electrodes dipping in electrolytic solutions. The solution in two compartment is connected through an inverted U shaped tube containing a mixture of agar-agar jelly and an electrolyte like KCl, $KNO_3$ etc. This tube is called salt bridge.

→ Salt bridge is necessary because [Delhi 2011C] 1M

(i) It connects the solution of two half cells, thus completes the cell circuit.

(ii) It prevents diffusion of solutions from one compartment to other.

→ In representation of cell, salt bridge is represented by ||.

→ In galvanic cell : oxidation at anode [negative plate]
Reduction at cathode [positive plate]

**Daniell Cell** :- Among the galvanic cells when cell is designed in such a manner to make the use of spontaneous reaction between Zn and Cu ion to produce an electric current, that cell is called Daniell cell.

Reaction : $Zn_{(s)} + Cu^{2+}_{(aq.)} \longrightarrow Cu_{(s)} + Zn^{+2}_{(aq.)}$

Cell Representation : $Zn \mid Zn^{+2}_{(aq.)} \parallel Cu^{+2}_{(aq.)} \mid Cu$ → phase boundary.

[Delhi 2013C] 1M

: Anode half cell || Cathode half cell
↳ salt bridge

→ Zn : Anode (oxidation) and Cu : Cathode (reduction)