CHAPTER 3 – Galvanic Cell

First Bell

Electrochemical Cell

Galvanic cell   ## Electrolytic cell

(Chemical Energy ⟶ Electrical energy)   **(Electrical energy ⟶ Chemical Energy)**


Galvanic Cell
Galvanic cell or Voltaic cell is an arrangement in which chemical energy is converted into electrical energy by means of redox reaction.

Points to be remember:
➔ **To make a galvanic cell, a metal rod should be dipped in the salt solution of the same metal.**
➔ **In Galvanic cell, the more reactive electrode act as Anode and the less reactive electrode act as Cathode.**
➔ **In Galvanic cell, Anode is Negative and Cathode is Positive.**
➔ **Oxidation takes place at Anode and Reduction takes place at Cathode.**
➔ **The direction of electron flow is from Anode to Cathode.**
➔ **The Salt Bridge completes the circuit by transfer of ions and maintains the electrical neutrality of the cell.**
➔ **In Galvanic cell, the transfer of electrons produced by the Redox reaction causes the flow of electric current in the cell**

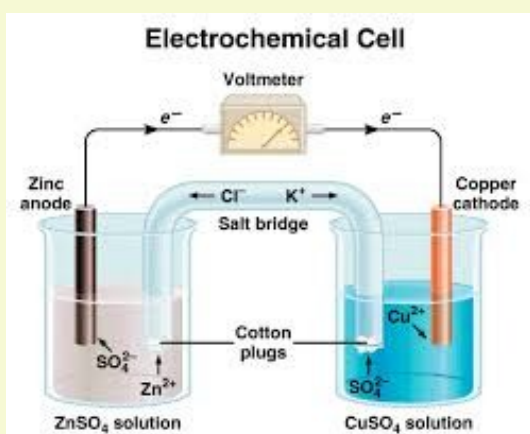# **Zn- Cu Cell**
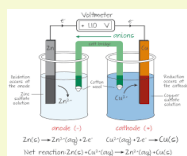
Electrochemical Cell

Figure 1

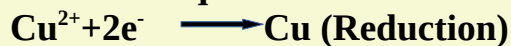**Analyse the video and figure 1 complete the worksheet**

1. **Which is more reactive ,Zn or Cu? (Refer reactivity series)**
   Ans: Zn
2. **Which is the anode?**
   Ans: Zn electrode (The more reactive metal act as anode)
3. **Which is the cathode?**
   Ans: Cu electrode
4. **Which electrode undergoes oxidation?**
   Ans: Anode (Zn electrode)
   Each Zn atom looses 2 electrons forming Zn^{2+} ion.
5. **Write the equation for oxidation?**
   Zn $\longrightarrow$ Zn^{2+}+ $2e^{-}$ (Anode)

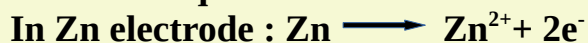6. **Which electrode undergoes reduction?**
   Ans: Cathode (Cu electrode)
   Each Cu^{2+} ion in the $CuSO_4$ solution gains 2 electrons and reduced to Cu atom.
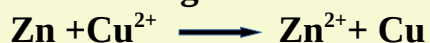7. **Write the equation for reduction?**
   $Cu^{2+} + 2e^- \longrightarrow Cu$ (Reduction)
8. **Write the equation for the redox reaction?**
   In Zn electrode : $Zn \longrightarrow Zn^{2+} + 2e^-$
   In Cu electrode : $Cu^{2+} + 2e^- \longrightarrow Cu$
   By combining these 2 equations
   $Zn + Cu^{2+} + 2e^- \longrightarrow Zn^{2+} + 2e^- + Cu$
   Cancelling $2e^-$ on both sides we get the equation as follows:
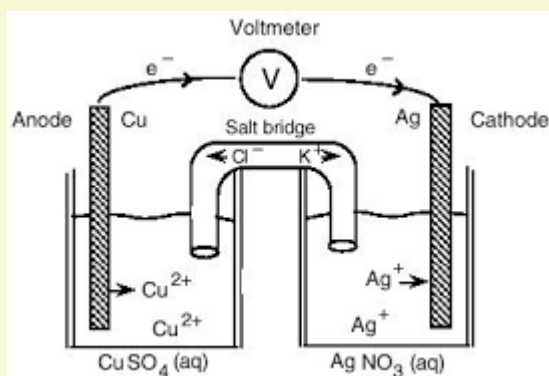   **$Zn + Cu^{2+} \longrightarrow Zn^{2+} + Cu$**
9. **What is the direction of electron flow?**
   From Zn electrode (Anode) to Cu electrode (Cathode)

Worksheet

1. Analyse the following diagram answer the questions given below

(a) **Which is the anode?**

(b) **Which is the cathode?**

(c) **Name the reaction takes place at anode ? Write its equation.**

(d) **Name the reaction takes place at cathode? Write its equation.**

(e) **Write the equation for the redox reaction taking place?**

(f) **What is the direction of electron flow?**

2. Complete the table by writing anode, cathode and the equations for the oxidation/reduction reactions.

Cell	Anode/Oxidation	Cathode/Reduction
● Zn-Cu cell	-------------------- --------------------	------------------ ------------------
● Mg-Cu cell	-------------------- --------------------	------------------- -------------------
● Cu-Ag cell	Cu electrode $Cu \longrightarrow Cu^{2+}+2e^-$	Ag electrode $2Ag^+ + 2e^- \longrightarrow 2Ag$
● Mg-Ag cell	------------------ ------------------	---------------- ----------------

3. You are given $ZnSO_4$ solution, $MgSO_4$ solution, a Zn rod and a Mg ribbon. Draw the diagram of a galvanic cell by using these?
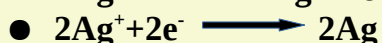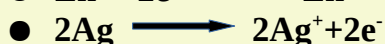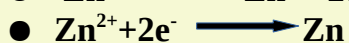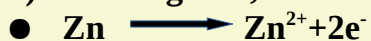
Write down the reactions taking place at anode and cathode.

4. When galvanic cells are made by using the metals like Zn, Mg, Ag, Cu, Fe
(Reactivity: Mg > Zn > Fe > Cu > Ag)
a) Which metal will always acts as cathode ?
b) Which metal will always act as Anode ?
c) In Zn-Ag cell ,select the equations for the oxidation and reduction reactions.
● $Zn \longrightarrow Zn^{2+}+2e^-$
● $Zn^{2+}+2e^- \longrightarrow Zn$
● $2Ag \longrightarrow 2Ag^+ + 2e^-$
● $2Ag^+ + 2e^- \longrightarrow 2Ag$

5. Write the equation for the redox reaction in Zn-Ag cell.

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`Prepared by- USHAKUMARY. S , HST PHYSICAL SCIENCE,
GOVT. HSS   KARUNAGAPPALLY