

ACTIVITY NO – 2 – Measurement of EMF

Subject	Chemistry
Class	XII
Chapter/Unit	Electrochemistry
Topic	Nernst equation
Time	20 minutes
Nature of Activity	Pair Work

What will I Learn(Learning Outcome)?

- Construct electrochemical cells and measure E^0_{cell} for different pairs of metals and metal ion solutions
- Conclude that the chemical reactions involving oxidation-reduction lead to flow of electrons.

Skills: Applying, Analyzing and Creating.

What I have to do?

To construct an electrochemical cell using zinc sulphate and copper sulphate solution and measure EMF of each cell for different concentration.

What do I require?

- Salt Bridge
- Zinc Strip
- Copper Strip
- Voltmeter
- Zinc Sulphate Solution
- Copper Sulphate Solution
- Connecting Wires
- Sand Paper

What do I need to know?

- The primary measurement in electrochemistry is the *voltage (V)* of an electrochemical cell. The voltage describes the relative energies of electrons on different atoms and/or ions.
- The energy difference, or potential difference, between two electrons is measured in volts (joules/coulomb). The electrons may be on two ends of a wire, on two atoms, or on the cathode and anode of a battery having a potential difference.
- An *oxidation-reduction or redox reaction* is a chemical reaction in which one or more electrons from one molecule or atom are transferred to another.
- Thermodynamics can predict if electrons would prefer to be transferred from one species to another based on the free energy change of the system.

➤ Teacher's Activity

Teacher will

1. Give instructions as, a voltmeter is used to study the relative reduction potential of various metals and the concentration dependence of voltage in concentration cells.
2. Make pairs of the students and will explain the steps of the activities.
3. Ensure that each participant of the pair performs the activity on his/her own.

How will I proceed?

➤ Student's Activity

1. Take two clean beakers. In one beaker take 1 M copper sulphate solution and in the other take 1 M zinc sulphate solution.
2. Take a copper strip and clean it using a sand paper.
3. Dip the copper strip into the beaker containing the 1 M copper sulphate solution.
4. Similarly, take a zinc strip and clean it using a sand paper.

- Then dip it into the beaker containing 1 M zinc sulphate solution.
- Take a salt bridge and connect the two solutions using the salt bridge.
- Take a voltmeter and connect the copper strip to the positive terminal and the zinc strip to the negative terminal using connecting wires.
- Note the position of the pointer in the voltmeter and record the reading.
- Repeat the experiment by taking different concentrations of zinc sulphate and copper sulphate solutions.

At anode: $\text{Zn} \rightarrow \text{Zn}^{2+} + 2\text{e}^-$

At cathode: $\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$



- Anode** – Oxidation occurs at this electrode.
- Cathode** – Reduction occurs at this electrode.
- Salt bridge** – Contains electrolytes which are required to complete the circuit in a galvanic cell.
- Half-cells** – reduction and oxidation reactions are separated into compartments.

What have I observed?

Observation Table:-

Concentration of ZnSO_4 solution (M)	Concentration of CuSO_4 solution (M)	EMF of the Cell (V)
1 M	1 M	
1 M	0.5 M	
1 M	0.025 M	
1 M	0.0125 M	
0.5 M	1 M	
0.025 M	1 M	
0.0125 M	1 M	

What have I learnt?

- In general, all _____ reactions leads to the flow of _____.

What am I curious to learn?

- What is the effect of concentration in half cell electrode?
- What is Fuel cell?
- What is Galvanic cell?
- What is the difference between Electrolytic cell and Galvanic cell?

Let me evaluate myself

- What is the function of a galvanic cell?

2. How do you represent a galvanic cell?

3. Why cathode is positive in the galvanic cell?

4. Is Daniel's cell a galvanic cell?

5. How do you make a voltaic cell?
