Chemistry Project

Submitted by:-

Certificate

This is to certify that **ROHIT SINGHAL**, student of Class XII A, **YUVA SHAKTI MODEL SCHOOL** has completed the project titled "**TO Study The Change In E.M.F Of a 'DANIEL CELL' due to Various Factors Such as Change In CONCENTRATION,TEMPERATURE & AREA OF ELECTRODE"** under my guidance & completed it to my total satisfaction.

Mrs.Shanthi Jaichandran. Date:-
(Teacher's Signature)

Acknowledgement

It gives me great pleasure to express my gratitude towards our chemistry teacher Mrs. **Shanthi Jaichandran** for her guidance, support and encouragement throughout the duration of the project. Without her motivation and help the successful completion of this project would not have been possible.

Rohit Singhal

XII-A

Objective

The goal of this project

Is to study the change in E.m.f of a

Daniel cell

Due to various factors such as

Change in concentration, temperature

And

Area of electrodes.

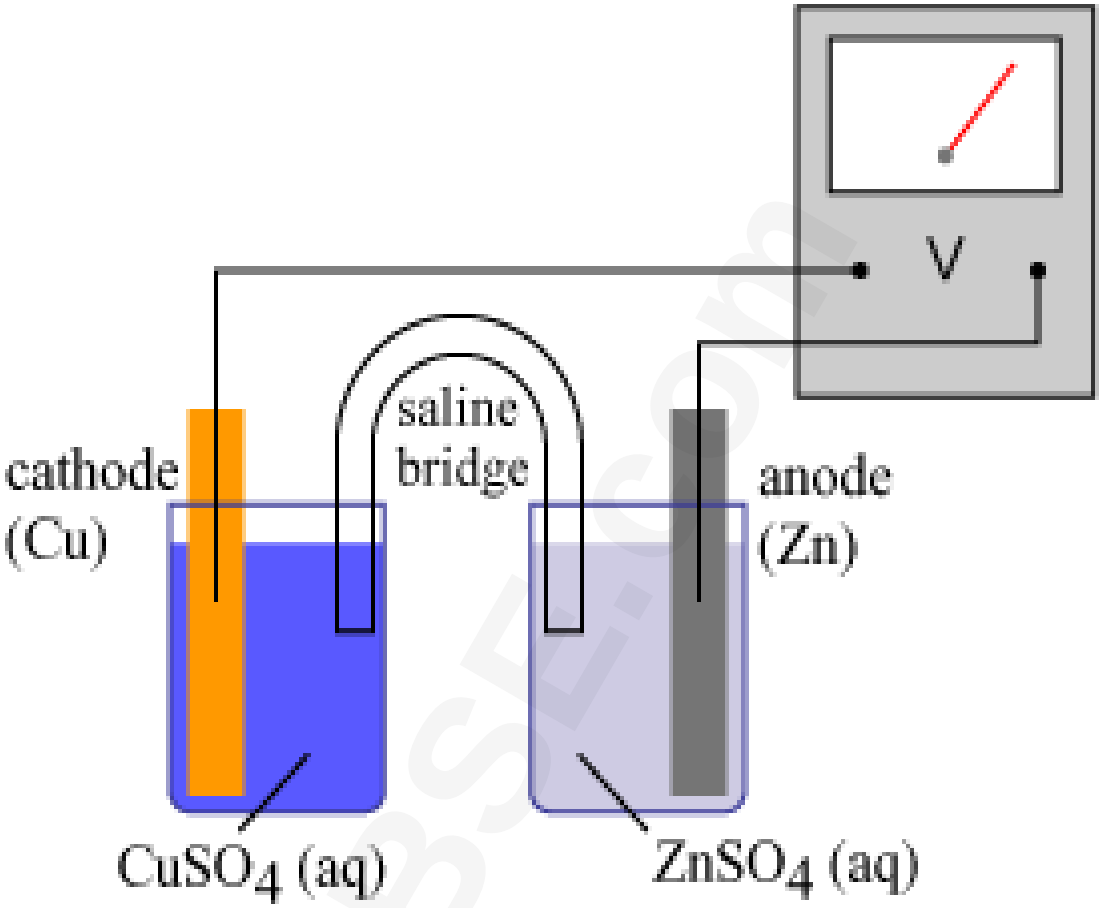
Materials and Equipment

To do this experiment we will need the following materials and equipment:

- Two beakers.
- Zinc and Copper plate.
- Filter paper.
- Voltmeter.
- Connecting wires.
- Card board.
- KNO3 solution.
- 1 M, 0.1M, 0.01 M solution of :-

  a. CuSO4
  b. ZnSO4

Daniel Cell



When an external circuit is connected, the chemical equation for the zinc side (anode) half cell is:

$$Zn\ (s) \rightarrow Zn^{2+}\ (aq) + 2\ e^-$$

For the copper sulphate side (cathode) half cell:

$$Cu^{2+}\ (aq) + 2\ e^- \rightarrow Cu\ (s)$$

Therefore, the overall reaction of the Daniel cell is:

$$Zn\ (s) + Cu^{2+}\ (aq) \rightarrow Zn^{2+}\ (aq) + Cu\ (s)$$

Introduction

It is an arrangement to convert the chemical energy of the redox reaction into electric energy.

$$Zn\ (s) + Cu^{2+}\ (aq) \rightarrow Zn^{2+}\ (aq) + Cu\ (s)$$

Features of Daniel Cell:-

- **Zinc rod at which oxidation occurs is called the anode while the copper rod at which the reduction takes place is called cathode.**
- **The overall reaction occurring in electrochemical cell is due to two half-cell reaction, one occurring in each beaker.**
- **The half-cell reaction occurring at anode is called oxidation -half cell reaction while the occurring at cathode is called reduction.**
- **The two half-cell reactions always take place simultaneously i.e. . . Half cell reaction cannot take place immediately.**
- **Since electrons are produced at zinc electrode, it is rich in electrons and pulls these electrons into the external circuit and hence acts as negative pole. The copper electrode on the other hand is deficient in electrons and thus pulls the electrons from the external circuit and act as positive pole.**

- **The electrons flow from negative pole to positive pole in the external circuit. However, conventionally the current is said to flow in opposite direction i.e. from positive pole to negative pole in the external circuit.**
- **The concentration of copper sulphate solution decreases with passage of time as the cell operates, consequently the current fall with passage of time.**

❖ Salt Bridge :-

It consists of a tube filled with semi-solid paste obtained by adding gelative or agar to the solution of strong electrolyte such as Nacl , NH_4NO_3.KNO_3 etc, which does not change chemically during the process.

❖ Function of salt bridge:-

To complete the electrical circuit by allowing the solution to flow from one solution to another without mixing the two solutions.

To maintain electrical neutrality of solution in two half-cells.

❖ EMF of Cells:-

When a current flows through two points a potential difference generated by a cell when the cell draws no current is called EMF.

Procedure

I. **Take two beakers and pour the required chemicals in respective beaker and mark them for identification.**
II. **Take two square to slide in and connecting wire to their screw.**
III. **Connect negative of the voltmeter to the anode and its positive to the cathode**
IV. **Take filter paper long enough to dip into both the solution. Dip the filter paper in KNo_3 solution and put it as a salt bridge.**
V. **Put on the electrode voltmeter set up. Note the reading quickly and then put of the electrode voltmeter set up.**
VI. **For measuring variation with temperature with change in area of electrode use the different size of electrode and then do step 5 again.**
VII. **For measuring variation with temperature heat the solution and then do step 5 again.**
VIII. **For measuring variations with change in concentration of electrolyte ,use the electrolytes of different molarity and then do step 5 again.**

Observations:-

- **Electrode Potential of Zinc =……V**
- **Electrode Potential of Copper=……V**

Variation with Concentration:-

Molarity of CuSO4(M)	Molarity of ZnSO4(M)	Voltmeter Reading (V)

Variation with change in area of electrodes:-

With increase in area or decrease in area of electrode EMF of cell remains same.

❖ Variation with temperature:-

$CuSO_4$(·c)	$ZnSO_4$(·c)	Voltmeter Reading(V)

Conclusions:-

- **The EMF varies non-linearly with change in concentration of reactants.**
- **Increase in concentration of ions in anode half-cell decreases EMF and vice-verse.**
- **The EMF is independent of area of electrode.**
- **The EMF increases with increase in temperature.**