SCHOOL NAME

Physics investigatory project

NAME:

CLASS: **XII**

ROLL N0:

SESSION: ***2023-24***

CERTIFICATE

This is to certify that

Student Name

has successfully completed her ***Physics*** *project titled*

INTERNAL RESISTANCE OF A CELL

under the supervision and guidance of

PHYSICS TEACHER

in the partial fulfillment of the Biology practical

assessment conducted during the academic year

2023-2024.

EXAMINER

TEACHER

ACKNOWLEDGEMENT

I would like to express my immense gratitude to my physics teacher **TEACHER NAME** for the help and guidance he/she provided for completing this project.

I also thank my parents who gave their ideas and inputs in making this project. Most of all I thank our school management, for providing us the facilities and opportunity to do this project.

Lastly, I would like to thanks my classmates who have done this project along with me. Their support made this project fruitful.

-STUDENT NAME

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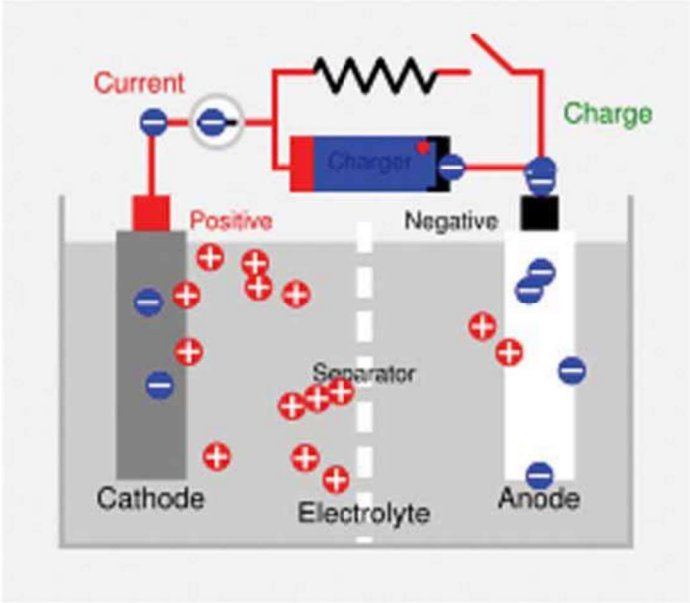
TOPIC

To study the various factor on which the Internal Resistance/e.m.f. of cell depends



INTRODUCTION

There is a great need of batteries in our daily use electronic appliances and the use is increasing every day. Thus, the batteries need to be made more powerful so that their potential can be increased greatly.

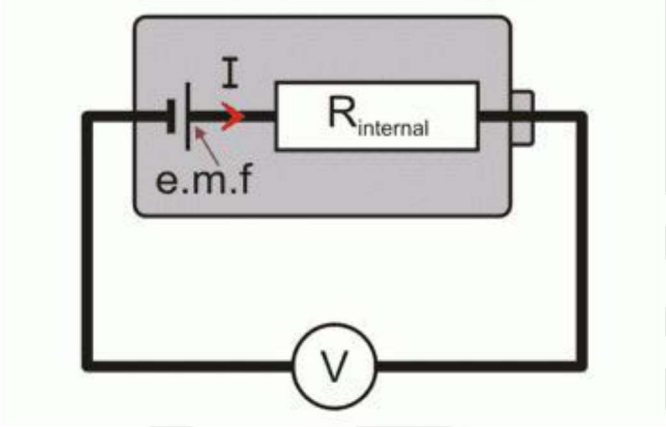
Thus, this project report is based on practical analysis for the factors affecting the internal resistance of a cell.

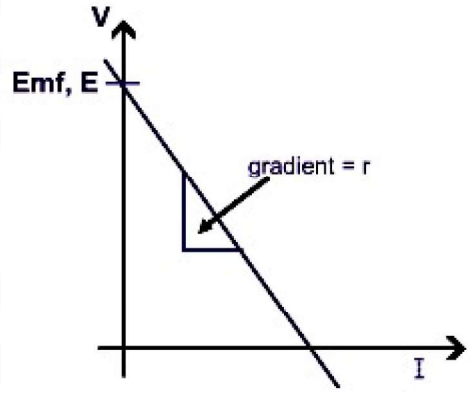
When the internal resistance of the cell is decreased we can increase the potential difference across it, and hence make it more reliable.

INTERNAL RESISTANCE

International resistance is defined as the resistance offered by the electrolyte of the cell to the flow of ions.

- It's S.I. unit is **Ohm (Ω)**





For a cell of e.m.f. (E) and internal resistance (r), connected to an external resistance (R) such that (I) is the current flowing through the circuit.

$$E = V + Ir$$

Internal Resistance $(r) = \frac{E-V}{I}$

PRACTICAL ANALYSIS

OBJECTIVE

To study the various factors on which the internal resistance of a cell depends.

APPARATUS

Potentiometer

Battery (or battery eliminator)

Two one-way keys

Rheostat

Galvanometer

Resistance box

Ammeter

Cell (Leclanche cell)

Jockey

Setsquare

Connecting wires and sand paper.

THEORY

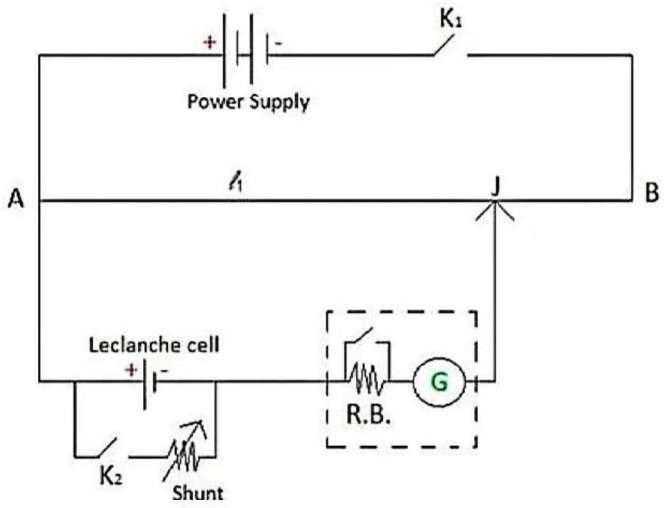
The internal resistance of a cell is the resistance offered by its electrolyte to the flow of ions. The internal resistance of a cell

- Is directly proportional to the distance between the electrodes.
- Is inversely proportional to facing surface area of the electrodes in electrolyte.
- Decreases with increase in temperature of electrolyte.
- Is inversely proportional to concentration of electrolyte.

The internal resistance of a cell is given by:

$$r = \frac{E - V}{R}$$

CIRCUIT DIAGRAM



PROCEDURE

- Clean the ends of the connecting wires with sand paper and make tight connections according to the circuit diagram.
- Tighten the plugs of the resistance box.
- Check the e.m.f. of the battery and of the cell and make sure that e.m.f. of the battery is more than that of the cell, otherwise null or balance point will not be obtained.

To study variation of internal resistance with distance of separation

- Keep both the electrodes at a distance of 16 cm.
- Take maximum current from the battery, making rheostat resistance small.
- Without inserting a plug-in key K_1, adjust the rheostat so that a null point is obtained on the last wire of the potentiometer.
- Determine the position of the null point accurately using a set square and measure the balancing length (1) between the null point and the end P.
- Next introduce plugs in both keys K_1 and K_2. At the same time, take out a small resistance (1-5 W) from the shunt resistance box

connected in parallel with the cell.

- Slide the jockey along a potentiometer wire and obtain the null point.
- Measure the balancing length (l_2) from end P. Record these obscrvations.
- Now keep the electrodes 12 cm apart.
- Then remove the plugs of keys K, and K2. Wait for some time and repeat steps 7 to 10.
- Next, keep the electrodes 9 cm apart to obtain another set of observations.

To study variation of internal resistance with area of electrodes

- Keeping all other factors constant, increase the area of electrodes in the electrolyte by dipping them into the electrolyte at different depths for each observation.
- Obtain three such observations by repeating steps 7 to 10. Record your readings.

To study variation of internal resistance with concentration of electrolyte

- Keeping all other factors constant, decrease the concentration of electrolyte by adding distilled water for different observations.
- Obtain three such observations by repeating step 7 to 10. Record your readings.

To study variation of international resistance with Temperature

- Keeping all other factors constant, increase the temperature of electrolyte
- Obtain three such observations by repeating step 7 to 10. Record your readings.

OBSERVATIONS

S.no.	Ammeter Reading (A)	Position of null point (cm)		Shunt Resistance R (Ω)	Internal Resistance r (Ω)
		With R (l_1)	Without R (l_2)		
1	0.3	660.5	35.5	1	0.94
2	0.3	660.5	77.2	2	1.77
3	0.3	660.5	108.3	3	2.51

Table for effect of separation between electrodes

S.no.	Separation between electrodes d (cm)	Balancing point l_1 (cm)	Balancing point l_2 (cm)	Internal Resistance r (Ω)	r/d
1	1.2	326.6	276.9	0.456	0.38
2	2.5	320.7	219.1	0.95	0.38
3	3.7	660.5	350.9	1.406	0.38

RESULT AND INFERENCES

- The Electromotive Force of the cell is constant and is equal to E = 0.98 Volt.

- The internal resistance of a cell is directly proportional to the separation between the electrodes.

- The internal resistance of a cell is inversely proportional to the area of the electrodes dipped in electrolyte.

- The internal resistance of a cell is inversely proportional to the temperature of electrolytes.

- The internal resistance of a cell is inversely proportional to the concentration of the electrolyte.

PRECAUTIONS

- The connections should be neat, clean and tight.
- The plugs should be introduced in the keys only when the observations are to be taken.
- The positive polls of the battery E and cells E, and E2 should, all be connected to the terminal at the zero of the wires.
- The jockey key should not be rubbed along the wire. It should touch the wire gently.
- The ammeter reading should remain constant for a particular set of observation. If necessary, adjust the rheostat for this purpose.

BIBLIOGRAPHY

- Wikipedia.com
- Google search engine
- Physics NCERT book for class XII

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