ST. BEDE'S ACADEMY SENIOR SECONDARY SCHOOL,

SANTHOME, CHENNAI – 600 004

PRACTICAL

CLASS: XII

DATE: 15/10/2020

SUBJECT: Physics

EXPERIMENT NO 3: Compare the EMF of two given primary cells using a potentiometer.

AIM:

To compare the EMF of two given primary cells using a potentiometer.

MATERIALS REQUIRED:

A potentiometer, one way key, an ammeter, a rheostat, a galvanometer, two way key, a voltmeter, two primary cells, a battery, connecting wires, sand paper.

THEORY & FORMULAE:

Principle of potentiometer is that, for a constant current flowing through a wire of uniform area of cross-section, the fall of potential along the wire is directly proportional to its length.

$V \alpha l$

Consider that a cell of emf E_1 gives balance point for a length l_1 of the wire. According to principle of potentiometer,

$E_1 \propto l_1$

Or

$E_1 = k\, l_1$ ---------- (1)

Where k is constant of proportionality.

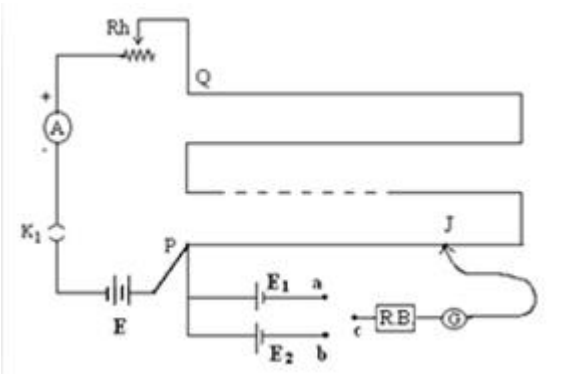
Similarly, if a cell of e.m.f E_2 gives balance point for a length l_2 then

$E_2 = k l_2$ ---------- (2)

Dividing (1) by (2) we get

$$\frac{E_1}{E_2} = \frac{l_1}{l_2}$$

CIRCUIT DIAGRAM:



PROCEDURE:

1. Draw the circuit diagram as shown in the figure.
2. Make the connections as shown and test that the deflections of the galvanometer are in the opposite directions.
3. Insert key k.
4. Include the cell E_1 in the circuit and find the null deflection point. Measure the length l_1 of the wire from A to J_1.
5. Include the cell E_2 in the circuit and find the null deflection point. Find the balance point l_2 on the potentiometer wire. Measure the length l_2 of the wire from A to J_2.
6. Take such three or four set of observations by changing the value of current using rheostat.
7. Measure the emf of both cells by voltmeter.

TABULATION:

To determine $\frac{E_1}{E_2}$

Trial No	Balancing length of Lechlanche cell $l_1 \times 10^{-2}$ m	Balancing length of Daniel cell $l_2 \times 10^{-2}$ m	$\frac{E_1}{E_2} = \frac{l_1}{l_2}$
1	789.5	568.5	1.39
2	809.5	583.5	1.39
3	829.5	597	1.39
4	849	611.5	1.39
5	868.5	625.5	1.39

Mean $\frac{E_1}{E_2} =$ 1.39 (No unit)

Calculation:

(i) Emf of Leclanche cell E_1 = 1.5 V

Emf of Daniel cell E_2 = 1.08 V

Ratio of Emf $\frac{E_1}{E_2}$ = 1.39 (No unit)

(ii) $\frac{E_1}{E_2} = \frac{l_1}{l_2}$

(a) 789.5/568.5 =1.39
(b) 809.5/583.5=1.39
(c) 829.5/597=1.39
(d) 849/611.5=1.39
(e) 868.5/625.5=1.39

(iii) **Mean**
$\frac{1.39+1.39+1.39+1.39+1.39}{5}$=1.39 (No unit)

Result:

(i) The ratio of emf of two cells $\frac{E_1}{E_2} = 1.39$ (No unit)

(ii) The value of $\frac{E_1}{E_2}$ measured by voltmeter = 1.39 (No unit)

Precautions:

1. All the connections must be clean and tight.
2. For one complete set of reading, the value of current should remain constant.
3. The emf of auxiliary battery must be greater than the primary cells.
4. Press the jockey gently. It should not be rubbed along the wire.

Sources of error:

The heading of potentiometer wire may introduce some error.