

# O P JINDAL SCHOOL, SAVITRINAGAR

## CLASS NOTES

CLASS XII PHYSICS PRACTICAL (EXPERIMENT-03)

DATE : 13/05/20

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### Aim

To determine the internal resistance of a given primary cell using a potentiometer.

### Materials Required

1. 1 galvanometer
2. A battery
3. 1 potentiometer
4. 1 rheostat of low resistance
5. A fractional resistance box
6. 1 ammeter
7. 2 numbers keys (one-way)
8. Connecting wires
9. A jockey
10. 1 high resistance box
11. Sandpaper
12. 1 Leclanche cell
13. 1 set square
14. 1 voltmeter

### Theory

The potentiometer is a device used to measure the internal resistance of a cell and is used to compare the e.m.f. of two cells and potential difference across a resistor. The relation between potential difference, emf, and internal resistance of a cell is given by

$$I = \frac{E}{R + r} \quad \text{or} \quad E = I(R + r)$$

Hence  $V = IR = E - Ir$

This indicates the value of  $V$  is less than  $E$  by an amount equal to the fall of potential inside the cell due to its internal resistance.

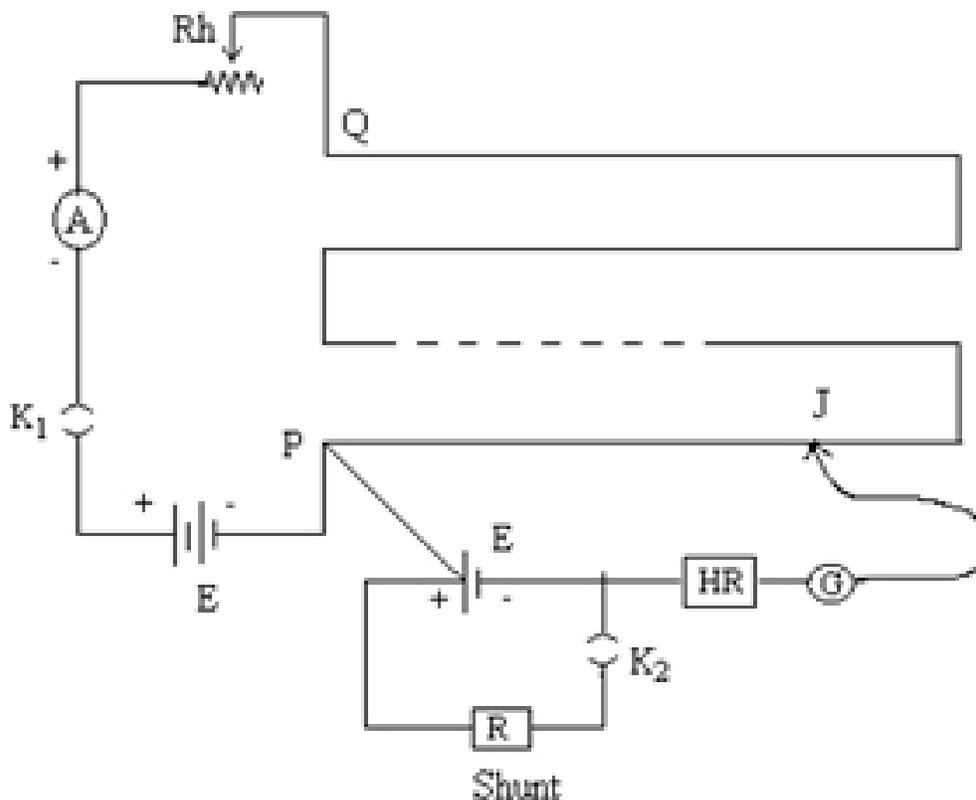
From the above equation

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

The internal resistance of the cell is given by

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

## Circuit Diagram



Here the internal resistance of the cell is given by

$$r = \left( \frac{l_1 - l_2}{l_2} \right) \cdot R$$

Where  $l_1$  and  $l_2$  are balancing lengths without shunt or with the shunt.  $R$  is the shunt resistance in parallel with the given cell.

## Procedure

1. The connections should be according to the diagram shown above.
2. Using sandpaper clean the ends of the connecting wires and make sure that the connections are tight.
3. The plugs in the resistance box should be tight.
4. The e.m.f of the cell and battery is more than that of the cell. If it is not then the null point won't be obtained.
5. Rheostat resistance can be made minimum by taking maximum current from the battery.
6. To check if the circuit connections are correct, the galvanometer deflections should be in the opposite direction. This is done by inserting the key  $K_1$  and making note of ammeter reading.
7. To obtain the null point on the fourth wire, the rheostat should be adjusted without inserting the key  $K_2$ .
8. take the small resistance between 1-5 ohm from resistance box  $R$  connected in parallel with the cell.
9. Slide the jockey and obtain the null point
10. Record your observation

## Observations

Least count of voltmeter = .....

Range of voltmeter = .....

E.M.F of cell = .....

E.M.F of battery = .....

### Table for lengths

Sl.no	Corrected ammeter reading (A)	Balance point when $E_1$ (Leclanche cell) in the circuit			Balance point when $E_2$ (Daniel cell) in the circuit			$(E_1/E_2) = (l_1/l_2)$
		$l_1$ (cm)			$l_2$ (cm)			

## Calculations

1. For each set of observation find mean and  $l_2$
2. Calculate the value of  $r$  for each set.
3. Take the mean of values of  $r$ .

## Result

The internal resistance of the given cell is found to be.....