EXPERIMENT 7

Determining the internal resistance of a given primary cell using cell using potentiometer:

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

Apparatus : a potentiometer , a battery , (or eliminator) , two one way key , a rheostat of low resistance , a galvanometer , a high resistance box , a fractional resistance box , an

ammeter , a voltmeter , a cell , a jockey , a set square , connecting wires , a piece of sand paper .

Theory:

When Key K_2 is open and K_1 is closed,

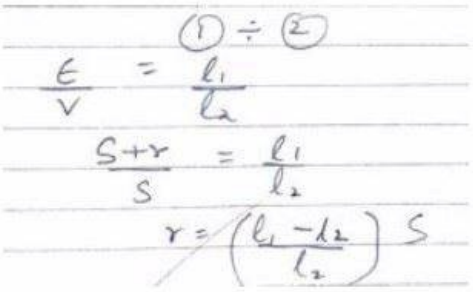
Let null point be obtained at a distance l_1 from A

: $E = Kl_1$ (1)

When key K2 is closed and K_1 is open,

Let null point be obtained at a distance l_2 from A

$V = Kl_2$ (2)



Where S is the shunt resistance in parallel with given cell.

l_1 and l_2; balancing length without & with shunt respectively.

R: internal resistance of the cell.

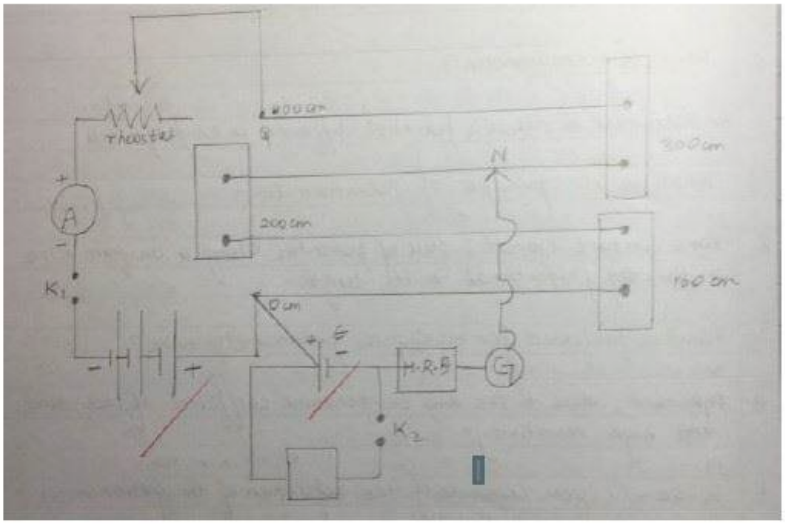
Procedure:

- Make the connection as shown in diagram.
- Clean the ends of the connecting wires with sand paper and make tight connection, tighten the plug of the resistance box.
- Check the emf of the battery and cell and see the emf of the battery is more than that of the given cell otherwise null or balance point won't be obtained (E` >E).

- Take maximum current from battery, making rheostat resistance small.

- Insert the plug key k, and adjust the rheostat so that a null point is obtained on the fourth wire of the potentiometer.
- Insert the 2000 ohm plug in its position in resistance box and obtain a null point by slightly adjusting the jockey.
- Measure the balancing length l_1.
- Take out the 2000 ohm plug from the resistance box. Introduce the plug in the key k_1 as well in key k_2.Take out a small resistance from the resistance box R connected in parallel with cell.
- Slide the jockey along the potentiometer wire and obtain a null point
- Insert the 200 ohm plug back in its position in RB and make further adjustment for sharp null point.
- Measure the balancing length l_2 from end P.
- Remove the plugs key k_1 and K_2. Wait for some time and repeat the activity for the same current.
- Record your observation

Circuit Diagram:



Observation table :

Value of Shunt resistance (S in ohm)	Balance Length l_1 ($K_2$is open) without Shunt (cm)	Balance length $l_2$with Stunt (K_2 is closed) (cm)	r = [(l_1-l_2)S]/l_2 (in ohm)	Mean 'r'
1.5	171.4	64	1.67	1.77 ohm
2	171.3	61.5	1.78	
2.5	171.1	59.6	1.87	

Calculation:

Mean 'r' = (1.67+1.78+1.87)/3 = 1.77 ohm

Result:

The internal resistance (R) of given cell is 1.77 OHM

Precaution:

For one set of observation the ammeter reading should be constant.

Current should be passed for short time.

Jockey should be rubbed against potentiometer wire.