ST. LAWRENCE HIGH SCHOOL

A JESUIT CHRISTIAN MINORITY INSTITUTION

SOLUTION TO WORK SHEET 16

Subject : PHYSICS

15.6.20

CLASS : XII

Chapter : Current Electricity

Topic : Potentiometer to measure unknown Potential, comparing two e.m.f. of two cells, measuring internal resistance of a cell.

Multiple Choice Question : **1 x 15 = 15**

1. The advantage of using potentiometer for measuring e.m.f. of a cell is —
   (a) no current flows through the cell
   (b) current flows through the cell
   (c) half the value of current will flow through the cell
   (d) none of the above
   Ans. (a) no current flows through the cell

2. Which of the following draws no current from voltage source being measured?
   (a) Meter bridge (b) Wheatstone bridge (c) Potentiometer (d) None of these
   Ans. (c) Potentiometer

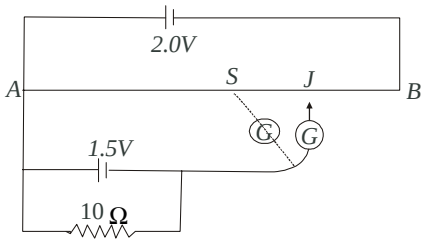
3. In a potentiometer, the null point is received at 7th wire. If now we have to change the null point at the 9th wire, what should we do?
   (a) attach resistance in series with battery (b) increase resistance in main circuit
   (c) decrease resistance in main circuit (d) decrease applied emf
   Ans. (b) increase resistance in main circuit

4. Potentiometer measures the potential difference more accurately than a voltmeter because
   (a) it has a wire of high resistance (c) it does not draw current from external circuit
   (b) it has a wire of low resistance (d) it draws a heavy current from external circuit
   Ans. (c) it does not draw current from external circuit

5. A cell can be balanced against 110 cm and 100 cm of potentiometer wire, respectively with and without being short circuited through a resistance of $10\,\Omega$. Its internal resistance is
   (a) $1.0\,\Omega$ (b) $0.5\,\Omega$ (c) $2.0\,\Omega$ (d) zero
   Ans. (a) $1.0\,\Omega$

6. A potentiometer wire is 100 cm long and a constant potential difference is maintained across it. Two cells are connected in series first to support one another and then in opposite direction. The balance points are obtained at 50 cm and 10 cm from the positive end of the wire in two cases. The ratio of emf is
   (a) 5:4 (b) 3:4 (c) 3:2 (4) 5:1
   Ans. (c) 3:2

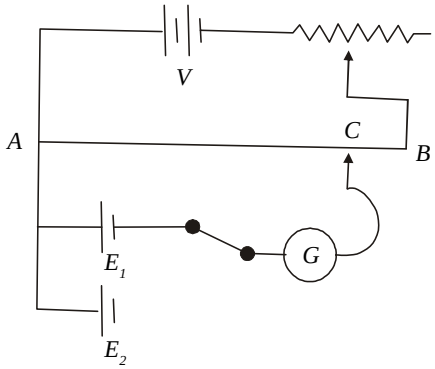
7. The figure below shows a 2.0 V potentiometer used for the determination of internal resistance of a 2.5 V cell. The balance point of the cell in the open circuit is 75 cm. When a resistor of $10\,\Omega$ is used in the external circuit of the cell, the balance point shifts to 65 cm length of potentiometer wire. The internal resistance of the cell is



(a) $2.5\,\Omega$ (b) $2.0\,\Omega$ (c) $1.54\,\Omega$ (d) $1.0\,\Omega$

Ans. (c) $1.54\,\Omega$

8. The circuit shown here is used to compare the emf of two cells E_1 and E_2 ($E_1 > E_2$). The null point is at C when the galvanometer is connected to E_1. When the galvanometer is connected to E_2, the null point will be



(a) to the left of C (b) to the right of C

(c) at C itself (d) no change in null point

Ans. (a) to the left of C

9. A potentiometer wire of length L and a resistance r are connected in series with battery of emf Eo and a resistance r_1. An unknown emf is balanced at a length l of the potentiometer wire. The emf E will be given by

(a) $\frac{LE_0 r}{lr_1}$ (b) $\frac{E_0}{(r+r_1)}\cdot\frac{rl}{L}$ (c) $\frac{E_0 l}{L}$ (d) $\frac{LE_0 r}{(r+r_1)l}$

Ans. (b) $\frac{E_0}{(r+r_1)}\cdot\frac{rl}{L}$

10. In a potentiometer arrangement, a cell of emf 1.25 V gives a balance point at 35.0 cm length of the wire. If the cell is replaced by another cell and the balance point shifts to 63.0 cm, what is the emf of the second cell?

(a) 2.25 V (b) 3.25 V (c) 4.5 V (d) 6 V

Ans. (a) 2.25 V

11. Two cells of emf approximately 5 V and 10 V are to be accurately compared using a potentiometer of length 400 cm.

(a) the battery that runs the potentiometer should have a voltage of 8 V

(b) the battery of potentiometer can have a voltage of 15 V and R adjusted so that the potential drop across the wire slightly exceeds 10 V

(c) the first portion of 50 cm of wire itself should have a potential drop of 10 V

(d) potentiometer is usually used for comparing resistances and not voltages

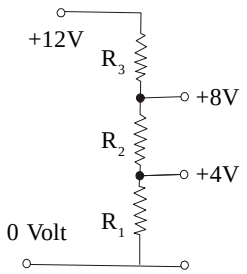
Ans. (b) the battery of potentiometer can have a voltage of 15 V and R adjusted so that the potential drop across the wire slightly exceeds 10 V

12. In a potentiometer experiment, the balancing with a cell is at length 240 cm. On shunting the cell with a resistance of $2\,\Omega$, the balancing becomes 120 cm. The internal resistance of the cell is

(a) $1\,\Omega$ (b) $0.5\,\Omega$ (c) $4\,\Omega$ (d) $2\,\Omega$

Ans. (b) $0.5\,\Omega$

13. A potential divider is used to give outputs of 4 V and 8 V from a 12 V source. Which combination of resistance (R_1 : R_2 : R_3) gives the correct voltages?



(a) 2:1:2 (b) 1:1:1 (c) 2:2:1 (d) 1:1:2

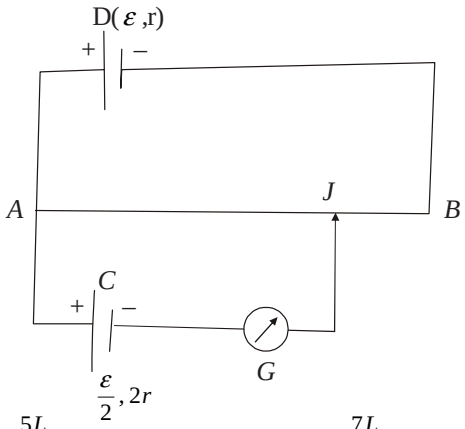
Ans. (b) 1:1:1

14. The length of a potentiometer wire is 5 m. An electron experiences a force of 4.8×10^{-19} newton in this wire. The e.m.f of the battery used in potentiometer is

(a) 1.5 volt (b) 15 volt (c) 3.0 volt (d) 4.5 volt

Ans. (b) 15 volt

15. In the figure, the potentiometer wire *AB* of length *L* and resistance $9r$ is joined to the cell *D* of emf ε and internal resistance *r*. The cell C's emf is $\varepsilon/2$ and its internal resistance is $2r$. The galvanometer G wiill show no deflection when the length *AJ* is —



(a) $\frac{4L}{9}$ (b) $\frac{5L}{9}$ (c) $\frac{7L}{18}$ (d) $\frac{11L}{18}$

Ans. (b) $\frac{5L}{9}$

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