PHYSICS

BOOKS - NN GHOSH PHYSICS (HINGLISH)

POTENTIOMETER

Example

1. A battery of enf 2 V internal resistance 1 Ω is used to send a current through a

potentiometer wire of length 200 cm and resistance 4 Ω What length of the potentiometer wire will be required to balace a Daniell cell of enf 1.08 V?

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2. In a ptentiometer experiment it is found that no current passes through the galvanometer when the terminals of a cell are connected across 509 cm of the potentiometer wire. When the cell is cnnected

across 490 cm of the wire Find the internal resistance of the cell.

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3. A 5- Wire potentiometer is connected to a storage cell of steady emf 2 V and 1 Ω resistance. A primary cell is balanced against 305 m of it.What resistance will be required in series with the storage cell to push the null point to the center of the last wire, i.e 4.5 m? (The wire has 3 Ω resistance per metre)

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Exercises

1. A metre bridge wire of resistance 3 Ω is connected to a cell of emf 2 V and internal rsistance 1 Ω Claculate the p.d cm of the wire What length of this wire will balace a fesh dry cell of emf 1.5 V?

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2. A potentiometer having a wire of 4 m lengths is connected to the terminals of a battery with steady voltage. A leclanche cell has a null point at 1m. If the length of the potentiometer wire is increased by 1 m, the position of the null points is

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3. A potentiometer , with a wire of length 10 m, is connected to an accululator of steady

voltage. A lenchlanche cell gives a null point at 7.5 m If the length of the potentiometer wire is increaseed by 1 m, find the new posistion of the null point.

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4. An accumulator with a steady emf of 2 V is connected across a potentiometer wire at 6.732 m If a resistance of 2.5 Ω is put in series with the wire find the new position of the null point.

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5. A 10 wire fpotentiometer is connected to an accumulator of steady voltage A7.8 m length of it balances the emf of a cell on open circuit When the cell delivers current through a conductor of resistance 10 Ω it is balaced against 7.0 m of the same potentiometer.Calculate the internal resistance of the cell.

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6. A secondary cell of emf 2 V and finternal resistance 0.1 Ω is connected to the ends of a uniform wire of length 1 m and resistacne 12 Ω .A primary cell of emf 1.5 V in series with a galvancometer is connected to two points on the wire. If the galvanometer shows no deflection find the distance between the points.

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7. In a potentiometer experiment it is found that no current passes through the galvanometer when the terminals of the cell are connected across $0.52m$ of the potentiometer wire. If the cell is shunted by a resistance of 5Ω balance is obtained when the cell connected across$0.4m$ of the wire. Find the internal resistance of the cell.

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8. The resistance of a potentiometer wire 8 m long is 8 ohm. A high resistance box and a 2-volt accumulator are connected in series with it. What should be the value of the resistance in the box, if it is desired to have a potential drop of 1 micro volt per mm?

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9. The terminals of a cell are cnnected to resistance R and the falll of potential across R

is balaced against the fall of potential on a potentiometer wire.When R is 20 Ω and 10 Ω respectively, the corresponding lengths of potentiometer wire are 1.5 m and 1.2 m Claculate the internal resistance of the cell

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10. An accumulator of emf $2V$ and negligible internal resistance is connected across a uniform wire of length 10 m and resistance 30Ω The appropriate terminals of a cell of emf

$1.5V$ and internal resistance 1Ω is connected to one end of the wire and the other terminal of the cell is connected through a sensitive galvanometer to a slider on the wire. What is the length of the wire that will be required to produce zero deflection of the galvanometer? How will the balancing length change?

(a) When a coil of resistance 5Ω is placed in series with the accumulator.

(b) The cell of $1.5V$ is shunted with 5Ω resistor?

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11. A certain thermocouple (treat is as a seat of emf) which has a total resistance of 10 Ω has one junction in melting ice and the other in stream .The emf between its ends as measured by a potentiometer is 4 mV. What would be its reading when it is connected to mellivoltmeter which has a resistance of 5Ω?

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12. A 10 wire potentiometer has a resistance of 10Ω and is connected to fan accumulator of 2 V and negligible internal resistance.There are two resistance boxes R_1 and R_2 in series with the accumulator and one can have any intergral values of resistance from resistance boxes . A standard-cell of 1.018 V with a sensitive galvanometer in series with it is connected across R_1.How would you proceed with the above arrangement to obtain potential drop of 1 μ V per mm of the potentiometer wire? Calculate the vlue3s of

R_1 and R_2 requried. What length of this potentiometer will balance the thermo emf of and copper couple at $300^\circ C$ which develops $17 \mu V /^0 C$?

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13. A five- wire potentiometer is connected to an accumulator emf 2.2 V and internal resistance 1 Ω The potentiometer wire has resistance of 1 Ω per metre. What is the maximum voltage that you can measure with

this particular arrangement of the potentiometer? What length of this potentiometer will balance the emf of a Daniell cell(emf=1.18)? What resistance in series with the accumulatro will be required to balce this cell exactly at the centre of the last wire?

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14. A potentiometer wire of length 1000 cm has a resistance of 10 Ω It is connected in series with a resistance and fa cell of emf 2 V

and of negligliable internal resistance. A sourece of emf 10 mV is balanced against 40 cm of the potentiometer wire. What is the value of the external resistance?

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15. In a ten-wire potentiometer the first five wires are of radius r and the next five wires are of radius 2r.The wire is cnneceted to battery of steady voltage 2 V and negligible internal resistance What lenghts of this

potentiometric arrangement will balacne the emf of (a) a dainell cell (emf=1.0 volt),(b) a Lenhlanche cell (emf=1.5 V) (c) an unknown cell of emf 1.8 V?

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16. A potentiometer consisting of a uniform wire of length l and resistance R_0 is connected to a steady voltage source of V_0 find the voltage V supplied by it to a fixed load R as the funciton of the distance x of sliding

contact from the higher potential end Analyse the case when RgtgtR_0

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