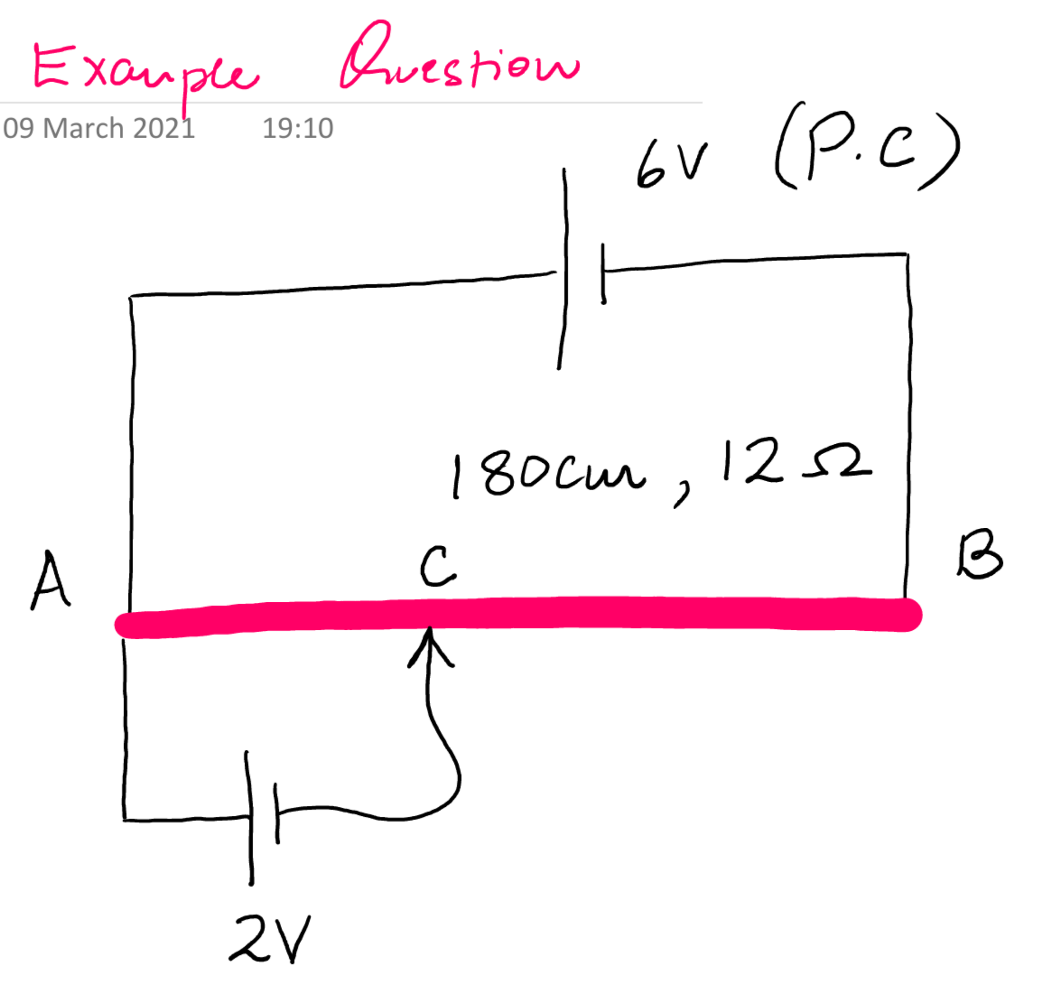
Example Question

09 March 2021 19:10

Slide 3



(i) Cal. length of AC required to achieve balance point ?

Unitary method

180cm → 6V

l ← 2V

l (AC) = 60 cm

OR

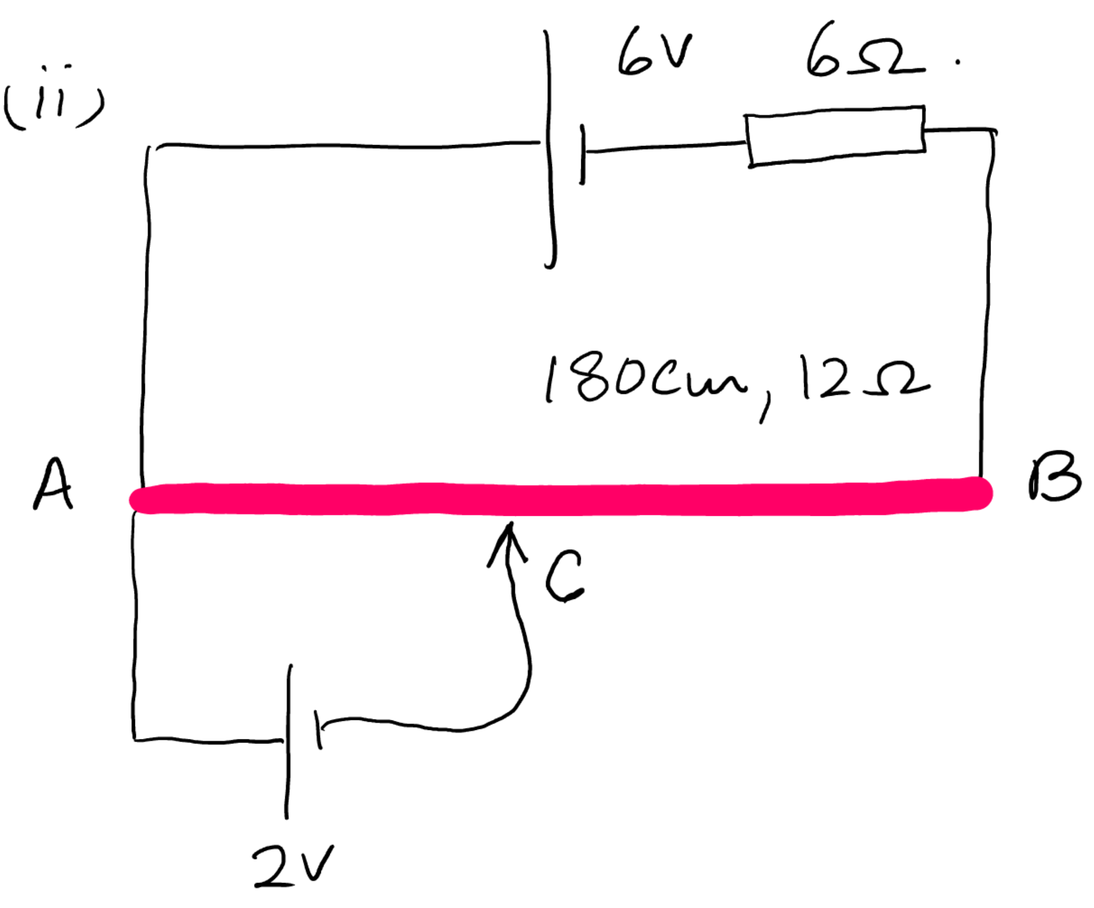
General formula

$V = \frac{l_{AC}}{l_{AB}} \times V_{P.C}$

$2 = \frac{l_{AC}}{180} \times 6$

$l_{AC} = 60cm.$

Part (ii)



Cal. the new length of AC now required if an additional 6Ω resistor is placed with the Primary cell.

Step ① find the voltage now available for the length AB using ratio method

$\frac{12}{12+6} \times 6 = 4V$

180 cm → 4V

l ← 2V

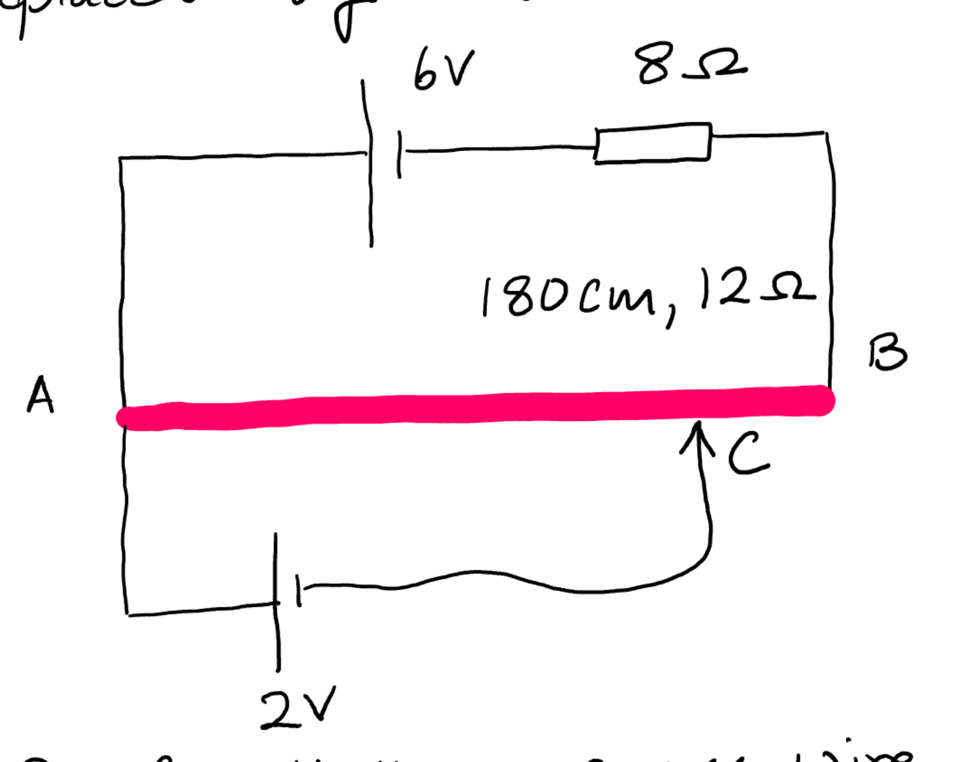
l = 90 cm

Conclusion :: If an extra Resistor is placed in the Primary circuit as shown, it causes the length of balance point to increase.

Q Give an explaination as to why the length of the balance pt has increased i.e from (60cm → 90cm)

Ans :: If an additional Resistor is placed in the P. Circuit, the voltage NOW AVAILABLE for the Resistance wire (AB) reduces ∴ for the same voltage of Secondary cell a much longer length is now required to achieve a balance pt.

Q :: What happens if 6Ω resistor is replaced by an 8Ω Resistor ?



Step ① Cal Voltage across wire AB

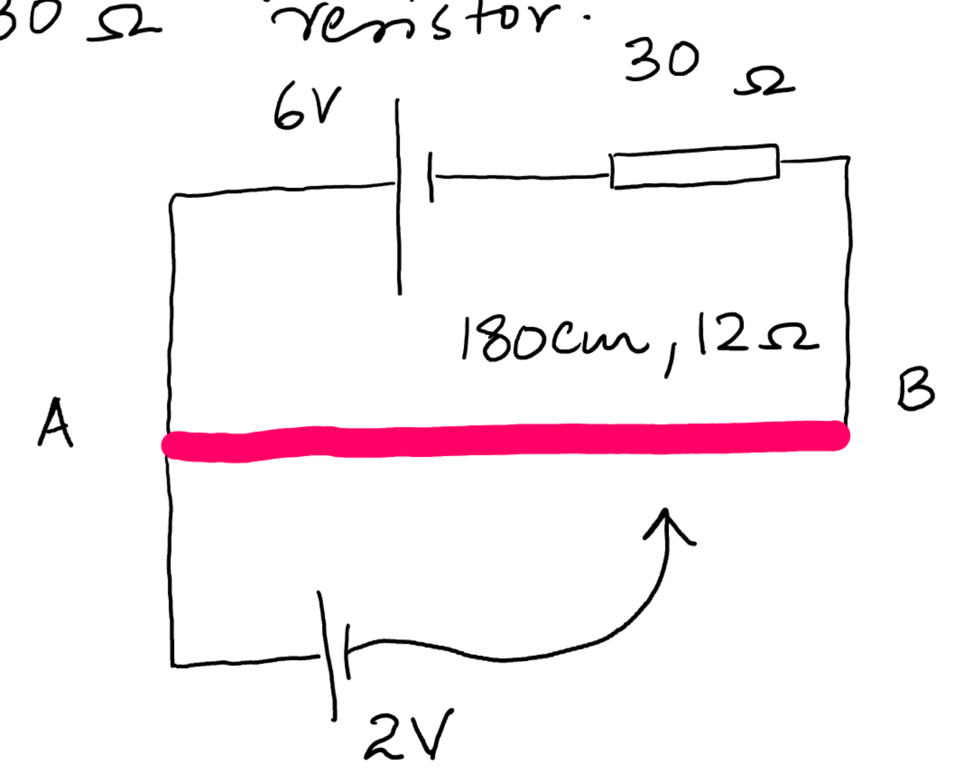
$V_{AB} = \frac{12}{12+8} \times 6 = 3.6V$

Step ② 180cm → 3.6V

l ← 2V

l_{AC} = 100cm

Q :: What happens if 6Ω resistor gets replaced with a 30Ω resistor.



$V(wire) = \frac{12}{12+30} \times 6$

V_{wire} = 1.71V

No possibility of achieving Balancing point in this Case

Conclusion :: Certain Rules must be Kept in mind for a Potentiometer circuit to work Properly

Rule ① +ve terminal of the P.C must be connected to the +ve terminal of the Secondary cell.

Rule ② Voltage of the Secondary Cell must be Less than or equal to the Voltage available for the wire.

Example Question :

Slide (4)

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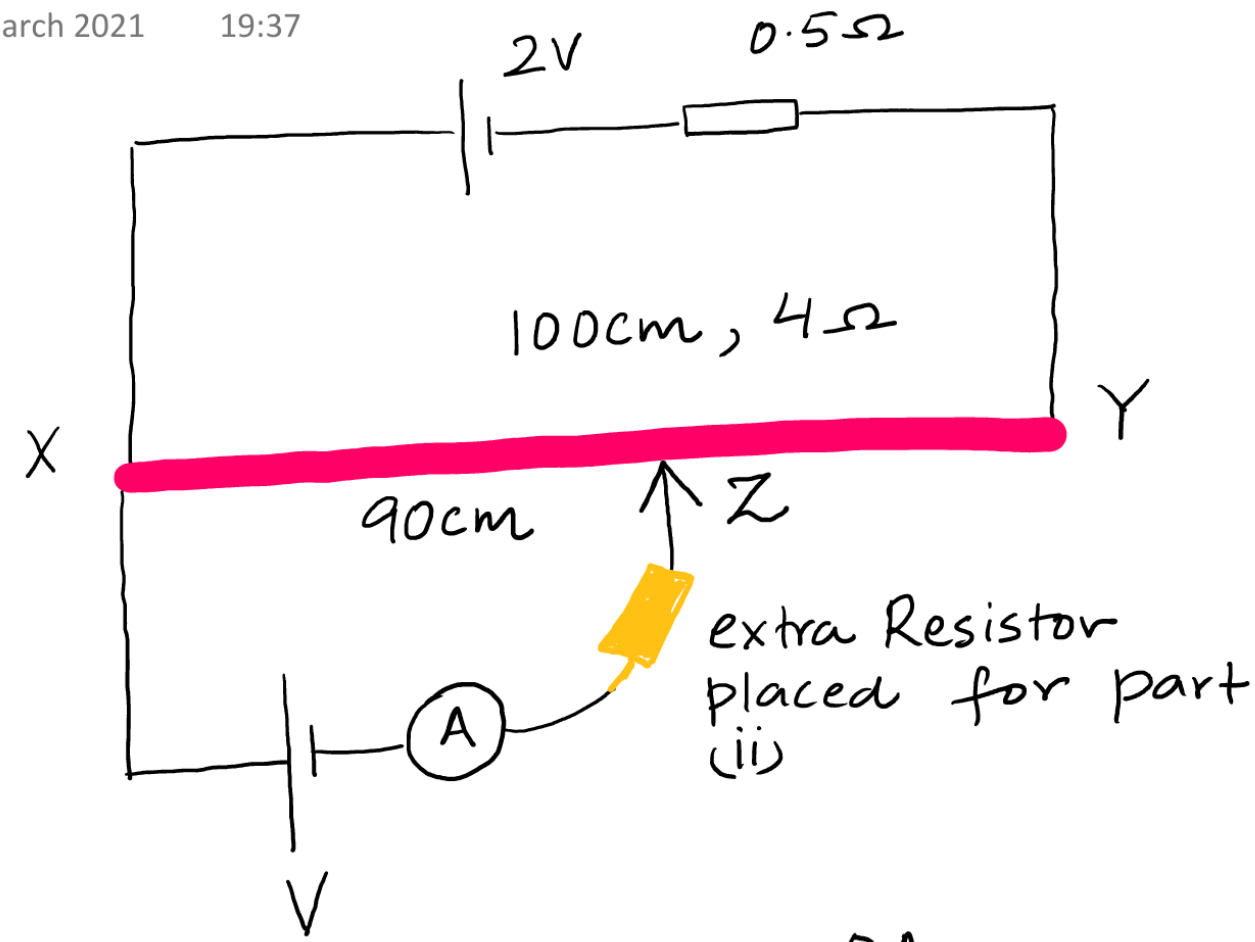

(i) If. that (A) reads 0A (null deflection). Cal. the unknown voltage V ?

Ans $V_{(XY)} = \frac{4}{4+0.5} \times 2 = 1.78V$ step (1)

Step (2) 100cm ⟶ 1.78V

∴ 90 cm ⟶ V

$V = 1.6V$

(ii) Suggest why placing an extra resistor in the Secondary circuit as shown will not have any effect on the balance pt.

Ans :. The term balance pt indicates that there is Zero Current in the Secondary circuit. Hence even if you place a resistor, based on $V = IR$ the voltage across this resistor will be $V = 0(R)$ i.e 0V ∴ it will not consume / develop any voltage across itself hence its presence or absence does not affect the Length of the balance point.