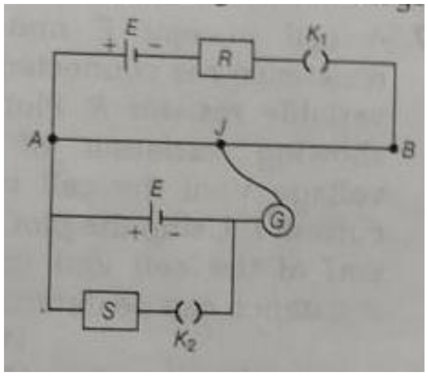
Q1. Two students X and Y perform an experiment on potentiometer separately using the circuit given below, keeping other parameters unchanged, how will the position of the null point be affected if,

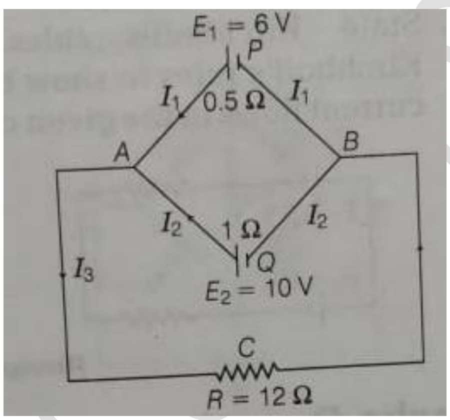


(i)X increases the value of resistance R in the setup by keeping the key K_1 closed and the key K_2 open ?

(i) Y decreases the value of resistance S in the setup while the key K_2 remains open and then K_1 closed ?

Justify your answer

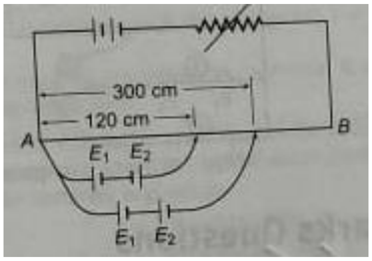
Q2. State the Kirchhoff's rules. Apply Kirchhoff's rule to the loops ACBPA and ACBQA to write the expressions for the currents I_1 , I_2 and I_3 in the network.



Q3.(a) A cell of emf E and internal resistance r is connected across a variable resistor R. plot a graph showing variation of terminal voltage V of the cell versus the current I. Using the plot, show the emf of the cell and its internal resistance can be determined.

(b)A potentiometer wire of length 1m has a resistance of 10Ω. Determine the emf of primary cell which gives a balance point at 40 cm

Q4. In the figure, a long uniform potentiometer wire AB is having a constant potential gradient along its length. The null points for the two primary cells of emfs E_1 and E_2 connected in the manner shown, are obtained at a distance of 120cm and 300cm from the end A.

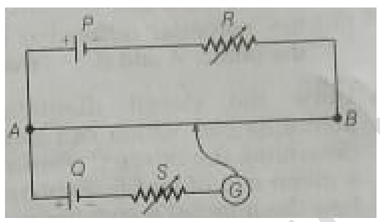


Find

(i)E_1/E_2 and (ii)position of null point for the cell E_1.

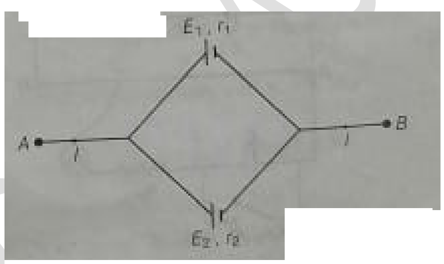
How is the sensitivity of a potentiometer increased.

Q5. State the underlying principal of a potentiometer. Write two factors on which the sensitivity of a potentiometer depends . In the potentiometer circuit shown in the figure, the balance point is at X. State giving reason, how the balance point is shifted when



(i)resistance R is increased (ii) resistance S is increased keeping R constant?

Q6. Two cells of emf E1, E2 and internal resistance R1 and R2 respectively are connected in parallel as shown in the figure



Deduce the expression for

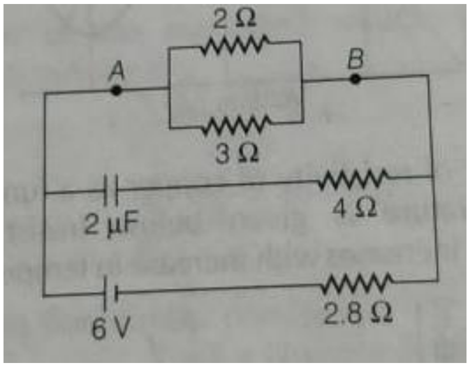
(i)the equivalent emf of the combination.

(ii) The equivalent resistance of the combination and

(iii) The potential difference between the points A and B.

Q7. Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance r of a given cell of emf E. Explain briefly how the internal resistance of the cell is determined?

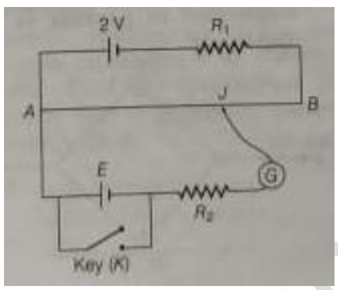
Q8. Calculate the steady current through the 2Ω resistor in the circuit shown in the figure



Q9. (A)Draw the circuit diagram of a potentiometer which can be used to determine the internal resistance r of a given cell of emf E. Explain briefly how the internal resistance of the cell is determined?

(B) (i)state the principle of working of a potentiometer

(ii) Figure shows the circuit diagram of a potentiometer for determining the emf of E cell of negligible internal resistance.



(a)what is the purpose of using the high resistance R_2?

(b) How does the position of balance point (J) change when the resistance R_1 is decreased ?

(c) why can not the balance point be obtained

* when the emf E is greater than 2V.

* when the key (k) is closed ?

Q10. (i)State the working principle of a potentiometer. With the help of the circuit diagram, explain how a potentiometer is used to compare the emf's of two primary cells. Obtain the required expression used for comparing the emf's.

(ii) write two possible causes for one sided deflection in a potentiometer experiment.

(iii)Which material is used for potentiometer wire and why?

(iv)how can the sensitivity of a potentiometer be increased?

Q11. Answer the following

(i) Why are the connections between the resistor in a meter bridge made of thick copper strips?

(ii)Why is it generally preferred to obtain the balance point in the middle of the meter bridge wire?

(iii)which material is used for the meter bridge wire and why?

Q12. (i)State with the help of a circuit diagram, the working principle of a meter bridge. Obtain the expression used for determining the unknown resistance.

(ii) what happens if the galvanometer and cell are interchanged at the balance point of the bridge?

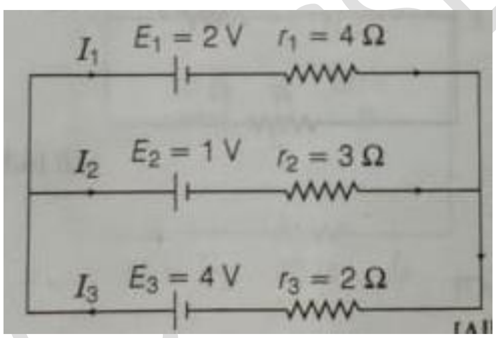
(iii) why is it considered important to obtain the balance point near the mid- point of the wire?

Q13. (a) A cell of emf E and internal resistance r is connected across a variable resistor R. Plot a graph showing the variation of terminal potential V with resistance R.

(b) Plot a graph showing the variation of terminal potential difference across a cell of emf E and internal resistance r with current drawn from it. Using this graph how does one determine the emf of the cell?

Q14. Two conducting wires X and Y of same diameter but different materials are joined in series across a battery. If the number of density of electrons in X is twice than that in Y, then find the ratio of drift velocity of electrons in the two wires.

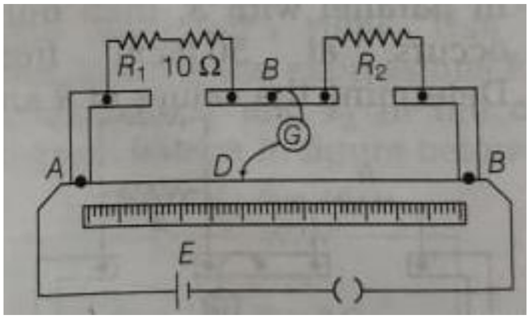
Q15. State Kirchhoff's rules.. Use these rules to write the expressions for the currents I_1, I_2 and I_3 in the circuit diagram shown in the figure below.



Q16. (i)State Kirchhoff's rules for an electric network. Using Kirchhoff's rules, obtain the balance condition in terms of the resistance of four arms of whetstone bridge.

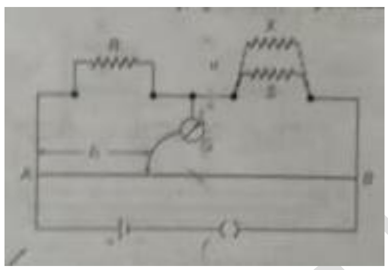
(ii) In the meter bridge experimental set up, shown in the figure, the null point D is obtained at a distance of 40 cm from end A of the meter bridge wire.

If a resistance of 10 Ω is connected in series with R_1, null point is obtained at AD= 60cm. Calculate the values of R_1 and R_2.

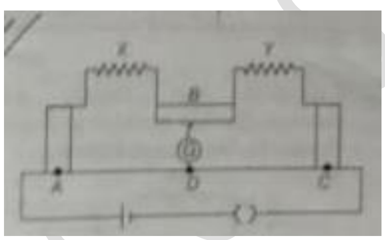


Q17. (i)State the principle of working of a meter bridge.

(ii)In a meter bridge balance point is found at a distance l_1 with resistances R and S as shown in the figure. When an unknown resistance X is connected in a parallel with the resistance S, the balance point shifts to a distance l_2. Find expressions for X in terms of l_1, l_2 and S.



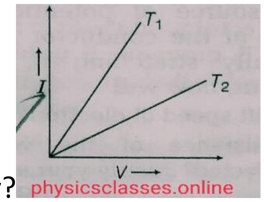
Q18. The figure shows experimental set up of a meter bridge. When the two unknown resistances X and Y are inserted. The null point D is obtained 40cm from the end A. when a resistance of 10 Ω is connected in series with X, the null point shifts by 10cm.



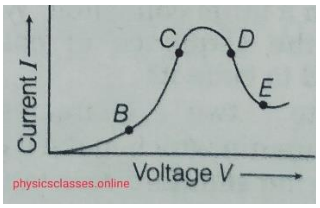
Find the position of the null point when the 10 Ω resistance is instead connected in series with resistance Y. determine the values of the resistance X and Y.

Q19. (i)Derive the relation between current density j and potential difference V across a current carrying conductor of length l, area of cross- section A and the number density n of free electrons.

(ii) Estimate the average drift speed of conduction electron in a copper wire of cross- sectional area 1.0 x 10^{-7}m^2 carrying a current of 1.5A. [assume that the number density of conduction electron is 9 x 10^{28} m^{-3}].

Q20. (i)I-V graph for a metallic wire at two different temperature T1 and T2 is as shown in the figure below. Which of the two temperature is lower and why? 

(ii)Graph showing the variation of current versus voltage for a material GaAs is shown in the figure. Identify the region of (a)negative resistance. (ii) where Ohm's law is obeyed?



(iii)Plot a graph showing variation of the current versus voltage for the material GaAs.

(iv)Show variation of resistivity of copper as a function of temperature in graph.

THE END