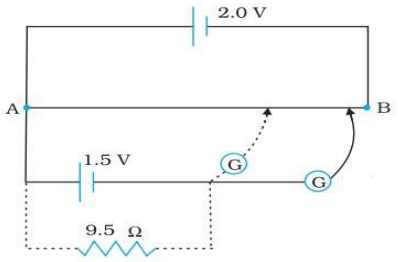
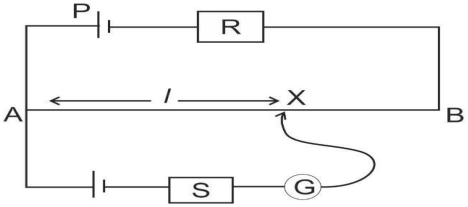
9. Potentiometer has several applications. Out of them, comparing emfs of two cell, measuring internal resistance of a cell. [NEB 2079 (Model)]
   a) Explain how you compare the emfs of two cells using potentiometer.
   b) Figure shows a 2.0 V potentiometer used for the determination of internal resistance of a 1.5 V cell. The balance point of the cell in open circuit is 76.3 cm. When a resistor of 9.5 Ω is used in the external circuit of the cell the balance point shifts to 64.8 cm length of the potentiometer wire. Determine the internal resistance of the cell.

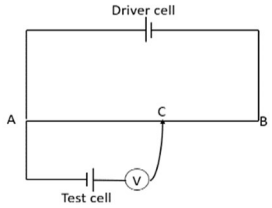


10. a) Using Kirchhoff's laws in electrical circuit: derive an expression for the balanced condition of wheat stone bridge. [NEB 2080]
    b) Conclude with the reason, where the balance point will be shifted, towards A or B when,
    i. Resistance R is increased, keeping all other parameters constant.
    ii. Resistance S is decreased, keeping R constant.

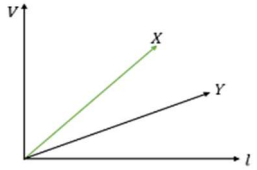


11. Potentiometer is an ideal voltmeter that measures the emf of the cell very accurately, [1+1+3]
    a) How is it superior to the voltmeter in the accurate measurement of emf?
    b) What is the working principle of potentiometer?
    c) The driver cell of a potentiometer has an emf of 2 V and negligible internal resistance. The potentiometer wire has a resistance of 3 Ω. Calculate the resistance needed in series with the wire if a p.d. 5 mV is required across the whole wire. The wire is 100 cm long and a balanced length of 60 cm is obtained for a thermocouple of emf E. What is the value of E?

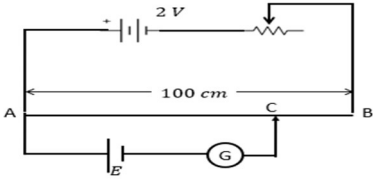
12. A student sets up a circuit as shown in figure below to measure the emf of a test cell. [NEB 2079 (Model)]
    a. Explain why he is unable to find a balance point and state the change he must make in order to achieve the balance.
    b. He obtained the balance point for a distance of 37.5 cm using a standard cell of emf 1.50 V. And for the test cell, the balance distance AB was 25 cm. Calculate the emf of the test cell.
    c. He could have used an ordinary voltmeter to measure the emf of the test cell directly. The student however, argues that the above instrument is more precise than an ordinary voltmeter. Justify his logic.



13. a) If the length of the wire be doubled, what will be the effect on the position of zero deflection in a potentiometer?
    b) The variation of potential difference V with length L in case of two potentiometers X and Y is as shown in diagram. Which one of these two will you prefer for comparing the emf of two cell? Justify your logic.



    c) The potentiometer wire has resistance of 10Ω. If the resistance R is maintained to be 40Ω, the source of unknown resistance E is balanced by 40 cm length of the potentiometer wire. What is the value of E?



14. Galvanometer is a very useful device, it can be used in various ways, [2+3]
    a) How galvanometer can be converted into voltmeter.
    b) The resistance of a galvanometer coil is 9.36 ohm, and the current required for full-scale deflection is 0.0224A. We want to convert this galvanometer to an ammeter reading 20 A full scale. The only shunt available has a resistance of 0.025 ohm. What resistance must be connected in series with the coil?
15. A shunt is used to convert a galvanometer of resistance G into an ammeter.
    a) A shunt must have very low resistance. Why?
    b) If the galvanometer shows the deflection out of range in the experiment, what conclusion can be drawn?
    c) While converting the galvanometer of resistance 10Ω into an ammeter in the range 1A, a very small resistance 0.1Ω in parallel and a resistor 89.9Ω