The following questions consists of two statements each, printed as Assertion and Reason. While answering these questions you are to choose any one of the following four responses.

Read the two statements carefully to mark the correct option out of the options given below. Select the right choice

(A) If both Assertion and Reason are true and the Reason is correct explanation of the Assertion.

(B) If both Assertion and Reason are true but Reason is not correct explanation of the Assertion.

(C) If Assertion is true but the Reason is false.

(D) If Assertion is false but Reason is true.

Q.1 **Statement I :** Potentiometer is based on wheat-stone bridge.

Statement II : Potentiometer is based on zero deflection method. **[D]**

Q.2 **Statement I :** Material used in the construction of a standard resistance is constantan or manganin.

Statement II : Its temperature coefficient of resistance is very small. **[A]**

Q.3 **Statement I :** A potentiometer of longer length is used for accurate measurement.

Statement II : The potential gradient for a potentiometer of longer length with a given source of e.m.f. becomes small. **[A]**

Q.4 **Statement I :** The e.m.f. of the driver cell in the potentiometer experiment should be greater than the e.m.f. of the cell to determined.

Statement II : The fall of potential across the potentiometer wire should not be less than the e.m.f. of the cell to be determined. **[A]**

Q.5 **Statement I :** If galvanometer is converted into an ammeter and milliammeter then the shunt resistance of ammeter is lower than that of milliammeter.

Statement II : The shunt resistance must allow more current to pass through in case of ammeter than that of milliammeter. **[A]**

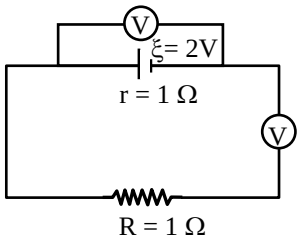
Q.6 **Statement –I :** In a Meter Bridge experiment, null point for an unknown resistance is measured. Now, the unknown resistance is put inside an enclosure maintained at a higher temperature. The null point can be obtained at the same point as before by decreasing the value of the standard resistance.

Statement –II : Resistance of a metal increases with increase in temperature. **[IIT-2008]**

[D]

Q.7 **Statement-1:** In the following circuit emf is 2V and internal resistance of the cell is 1Ω and R = 1 Ω, then reading of the voltmeter is 1V

Statement-2 : V = ξ – ir where ξ = 2V, i = 2/2 = 1A and R = 1 Ω.



Sol. [A]

Q.8 **Statement I :** In a meter bridge, if its wire is replaced by another wire having same length , made of same material but having twice the cross –sectional area, the accuracy decreases.

Statement II : If its wire is replaced by another wire of same material, having same cross – sectional area but of twice the length, accuracy increases.

Sol. **[D]**

Q.1 Match the column :

Column-I	**Column-II**
(a) ideal ammeter	(p) wheat stone bridge
(b) ideal voltmeter	(q) zero resistance
(c) meter bridge	(r) infinite resistance

(A) a $\rightarrow$ p, b $\rightarrow$ q, c $\rightarrow$ r

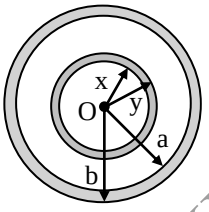
(B) a $\rightarrow$ q, b $\rightarrow$ r, c $\rightarrow$ p

(C) a $\rightarrow$ r, b $\rightarrow$ p, c $\rightarrow$ q

(D) a $\rightarrow$ p, b $\rightarrow$ r, c $\rightarrow$ q **[B]**

Q.2 In figure, a conducting spherical shell of inner radius 'x' and outer radius 'y' is concentric with a larger conducting spherical shell of inner radius 'a' and outer radius 'b'. The inner shell has a total charge + 3Q and the outer shell has a total charge +5Q. Let 'r' be the distance of any point from the common centre O.

Match Column – I with Column – II :

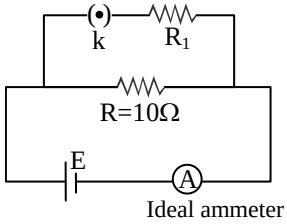


Column – I	**Column – II**
(A) Electric field strength is zero	(P) Outer surface of the larger spherical shell
(B) Electric field strength is non-zero	(Q) Inner surface of the larger spherical shell
(C) Magnitude of charge on this surface is 3 Q	(R) Outer surface of the smaller spherical shell
(D) Charge on this surface is + 8Q	(S) For a < r < b

Sol. A $\rightarrow$ S ; B $\rightarrow$ P,Q,R; C $\rightarrow$ Q,R; D $\rightarrow$ P

PHYSICS

Q.1 The internal resistance of the cell shown in the figure is negligible, on closing the key k, the ammeter reading changes from 0.25 amp to $\frac{5}{12}$ amp, then –



(A) $R_1 = 10\ \Omega$

(B) $R_1 = 15\ \Omega$

(C) power drawn from the cell increases

(D) the current through R decreases by 40%

Sol. **[B,C]**

When k was open

Reading of (A) = $\frac{E}{10}$ amp = 0.25,

When k was closed

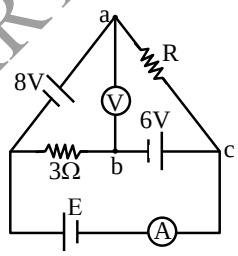
Reading of (A) = $\frac{E(10+R_1)}{10R_1} = \frac{5}{12}$

$\Rightarrow 12\ (5 + 0.5R_1) = 10R_1$

$R_1 = 15\ \Omega$, Power drawn = $\frac{V^2}{R_{eq}}$ as R_{eq} decrease

Power = $\frac{V^2}{R_{eq}}$ will increases, current through R = 0.25 amp (initially) after k is closed current through R = 0.25 amp.

Q.2 R = 10Ω and E = 13 V and voltmeter and ammeter are ideal, then -



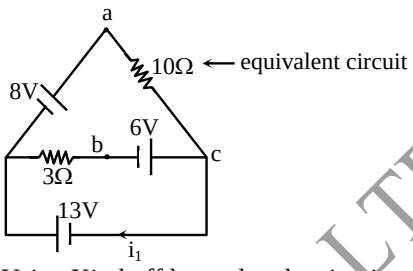
(A) Reading of ammeter is 2.4 A

(B) Reading of ammeter is 8.4 A

(C) Reading of voltmeter is 8.4 V

(D) Reading of voltmeter is 27 V

Sol. **[B,D]**



Using Kirchoff law solve the circuit.

Q.3 A voltmeter of resistance R_1 and an ammeter of R_2 are connected in series across a battery negligible internal resistance. When a resistance R is connected in parallel to the voltmeter reading of ammeter increases three times while that of voltmeter reduces to one third. The value of -

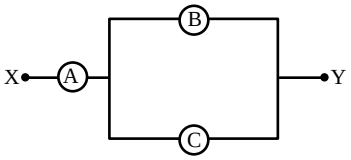
(A) R_1 is $\frac{8R}{3}$ (B) R_1 is 8R

(C) R_2 is $\frac{8R}{3}$ (D) R_2 is 8R

Sol. **[B, C]**

PHYSICS

Q.1 A, B and C are voltmeters of resistances R, 1.5 R and 3 R respectively. When some potential difference is applied between X and Y, the voltmeter readings are V_A, V_B and V_C respectively -

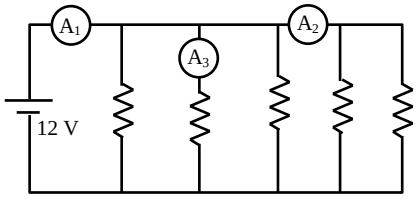


(A) $V_A = V_B = V_C$ (B) $V_A \neq V_B = V_C$

(C) $V_A = V_B \neq V_C$ (D) $V_B \neq V_A = V_C$

[A]

Q.2 In the circuit, each resistance is 20 Ω. The readings of A_1, A_2 and A_3 are respectively -



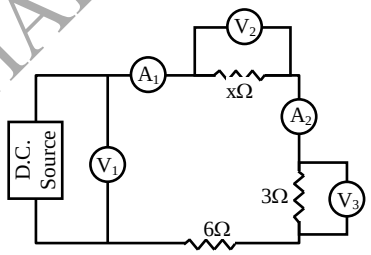
(A) 3A, 1.8A, 1.2 A

(B) 3A, 1.2 A, 0.6A

(C) 3A, 0.6 A, 1.2 A

(D) 3A , 0.6 A , 0.6 A **[B]**

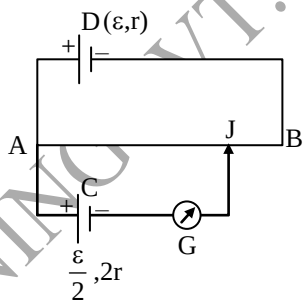
Q.3 In the electric circuit shown in figure, the reading of voltmeter V_1 is 26 volt, and the reading of ammeter A_1 is 2 ampere. The value of resistance x is –



(A) 2 Ω (B) 4 Ω (C) 6 Ω (D) 8 Ω

[B]

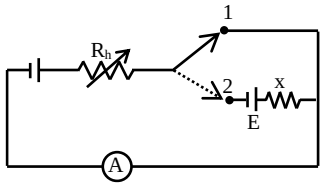
Q.4 In the figure, the potentiometer wire AB of length L and resistance 9r is joined to the cell D of emf ε and internal resistance r. The cell C's emf is ε/2 and its internal resistance is 2r. The galvanometer G will show no deflection when the length AJ is-



(A) $\frac{4L}{9}$ (B) $\frac{5L}{9}$

(C) $\frac{7L}{18}$ (D) $\frac{11L}{18}$ **[B]**

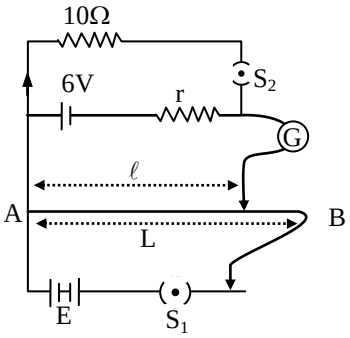
Q.5 In the circuit shown the variable resistance R_h is so adjusted that ammeter reads the same in both positions of the key. The reading of ammeter is I. The emf of the cell in series with x is E, the value of x is –



(A) $\frac{2E}{I}$ (B) $\frac{E}{I}$

(C) EI (D) 2EI **[B]**

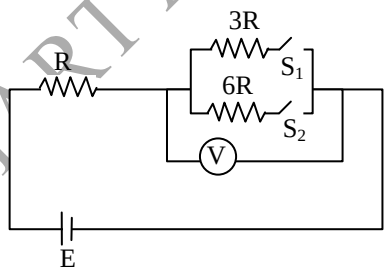
Q.6 In the arrangement shown in figure when the switch S_2 is open, the galvanometer shows no deflection for ℓ = L/2. When the switch S_2 is closed, the galvanometer shows no deflection for ℓ = 5L/12. The internal resistance (r) of 6 V cell, and the emf E of the other battery are respectively-



(A) 3Ω, 8V (B) 2Ω, 12V

(C) 2Ω, 24V (D) 3Ω, 12V **[B]**

Q.7 In the circuit shown in figure reading of voltmeter is V_1 when only S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then-

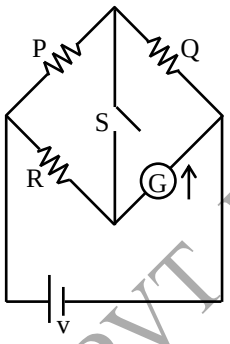


(A) $V_3 > V_2 > V_1$ (B) $V_2 > V_1 > V_3$

(C) $V_3 > V_1 > V_2$ (D) $V_1 > V_2 > V_3$

[B]

Q.8 In the circuit P ≠ R, the reading of the galvanometer is same with switch S open or closed. Then – **[IIT- JEE 99]**

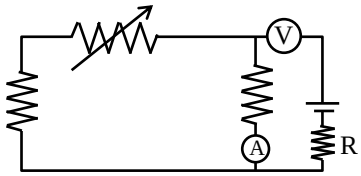


(A) $I_R = I_G$ (B) $I_P = I_G$

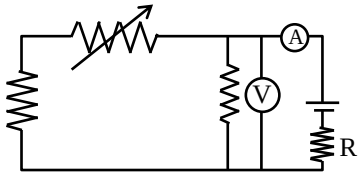
(C) $I_Q = I_G$ (D) $I_Q = I_R$ **[A]**

Q.9 Which of the following circuit is correct for verification of ohms law– **[IIT- JEE 2003]**

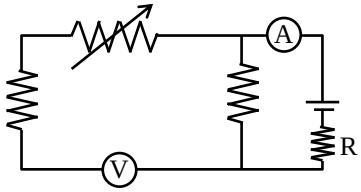
(A)



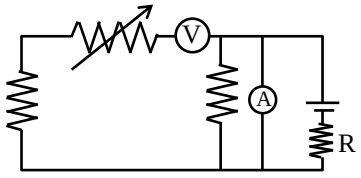
(B)



(C)

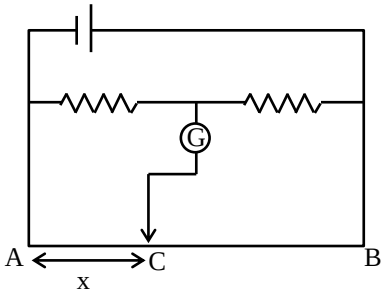


(D)



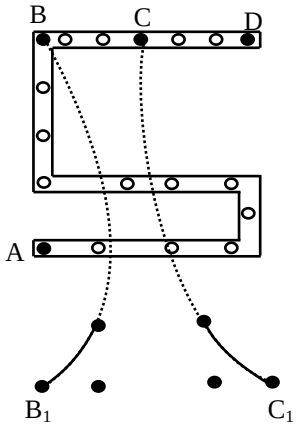
[B]

Q.10 In this given circuit, no current is passing through the galvanometer. If the cross-sectional diameter of the wire AB is doubled then for null point of galvanometer the value of AC would– **[IIT -JEE 2003]**



(A) x/4 (B) 4x
(C) 2x (D) x **[D]**

Q.11 In the given post office box. Unknown resistance should be connected **[IIT- JEE 2004]**



(A) Between A & D
(B) Between A & C
(C) Between C & D
(D) Between B_1 & C_1 **[A]**

Q.12 A galvanometer gives a full deflection when a current of 0.2 mA is passed through it. The resistance of the galvanometer is 1000 Ω. To convert it to an ammeter of range 2 amp, the shunt resistance required is –

(A) 0.1 Ω (B) 0.01 Ω
(C) 1 Ω (D) 0.2 Ω **[A]**

Q.13 A galvanometer of resistance 100 Ω gives a full scale deflection for a current to 10^{-6} amp. To convert it into an ammeter capable of measuring up to one ampere, the shunt resistance should be–

(A) 10^{-5} Ω (B) 0.0001 Ω
(C) 0.01 Ω (D) 1 Ω **[B]**

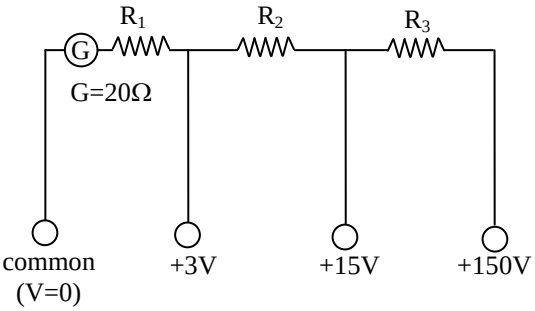
Q.14 If the positions of an ideal voltmeter and the ammeter are interchanged in a D.C. circuit, then-

(A) the voltmeter reads the emf of the source and the ammeter reading is zero
(B) the voltmeter reads the emf of the source and the ammeter shows of maximum current
(C) the voltmeter reading is zero and the ammeter reading is also zero
(D) voltmeter reading is zero and the ammeter current is infinite **[A]**

Q.15 A galvanometer is used in circuit of 9 volt. The value of current for full scale deflection is 2 mA if the resistance of the coil is 50Ω, then the value of necessary resistance in series for the full scale deflection in ohm is -

(A) 2450 (B) 3450
(C) 4450 (D) 5450 **[C]**

Q.16 Internal electric connections of a multi range voltmeter are shown in the figure. The terminals are marked 3 volt, 5 volt, 150 volt, resistance of the galvanometer is 20 Ω and the value of current is 1 mA for the full scale deflection of the galvanometer. The resistance of R_1 in KΩ is-



(A) 12 (B) 15
(C) 3 (D) 2.98 **[D]**

Q.17 The resistance of galvanometer coil is 0.1 KΩ. The current for full scale deflection is 100 μA. The value of the resistance put in series to convert it into a voltmeter of range 0.1 volt is-

(A) 1000 Ω (B) 100 Ω
(C) 10 Ω (D) 900 Ω **[D]**

Q.18 The resistance of 100 Ω and 200 Ω are connected in series with the 220 V mains. When a voltmeter of 1000 Ω resistance is connected in parallel to 100 Ω, then the reading of voltmeter is –

(A) 68.75 volt (B) 6.87 volt

(C) 587.5 volt (D) 58.75 volt **[A]**

Q.19 If only one hundredth part of total current flowing in the circuit is to be passed through a galvanometer of resistance G Ω, then the value of shunt resistance required will be -

(A) $\frac{G}{10}$ (B) $\frac{G}{100}$

(C) $\frac{G}{99}$ (D) $\frac{G}{999}$ **[C]**

Q.20 The shunt required for 10% of main current to be sent through the moving coil galvanometer of resistance 99 W, will be -

(A) 0.9 Ω (B) 11 Ω

(C) 90 Ω (D) 9.9 Ω **[B]**

Q.21 A galvanometer of resistance 100 Ω gives full scale deflection for 10 mA current. What should be the shunt required, so that it can measure 100 mA -

(A) 11.11 Ω (B) 9.9 Ω

(C) 1.1 Ω (D) 4.4 Ω **[A]**

Q.22 A galvanometer of resistance 100Ω gives full scale deflection for a current of 10^{-5} A. The shunt required to convert in into an ammeter of 1 ampere range will be -

(A) $10^{-2}\,\Omega$ (B) $1\,\Omega$

(C) $10^{-1}\,\Omega$ (D) $10^{-3}\,\Omega$ **[D]**

Q.23 A galvanometer of resistance 100 ohm gives a full scale deflection for a current of 10μA. To convert in into an ammeter of one ampere range, required shunt resistance would be -

(A) $10^{-2}\,\Omega$ (B) $1\,\Omega$

(C) $10^{-1}\,\Omega$ (D) $10^{-3}\,\Omega$ **[D]**

Q.24 The deflection in the galvanometer is reduced from 50 to 20 divisions when it is shunted by a resistance of 12 ohm. The resistance of galvanometer will be -

(A) 18 Ω (B) 24 Ω

(C) 30 Ω (D) 36 Ω **[A]**

Q.25 The resistance of a moving coil galvanometer is 20 Ω. It requires 0.01 ampere current for full scale deflection. The value of resistance to convert in into a voltmeter of range 20 volt will be -

(A) 198 Ω (B) 1980 Ω

(C) 20 Ω (D) 0 Ω **[B]**

Q.26 The range of a voltmeter of resistance G Ω is V volt. The resistance required to be connected in series with it in order to convert it into a voltmeter of range nV volt, will be -

(A) (n – 1) G (B) G/n

(C) nG (D) G/(n – 1) **[A]**

Q.27 The deflection of a moving coil galvanometer reduces to half on shunting it with a resistance of 60Ω. The resistance of galvanometer is -

(A) 30 Ω (B) 120 Ω

(C) 60 Ω (D) 15 Ω **[C]**

Q.28 When the current flowing in a galvanometer is (1/n) of the total current, the resistance of the shunt will be -

(A) G/n (B) (n – 1) G

(C) G / (n –1) (D) $G/(n^2 - 1)$ **[C]**

Q.29 A galvanometer can be converted into a voltmeter by connecting a –

(A) high resistance in parallel

(B) low resistance in series

(C) high resistance in series

(D) low resistance in parallel **[C]**

Q.30 Potentiometer is such an apparatus whose effective resistance is -

(A) zero

(B) infinite

(C) uncertain

(D) depending on external resistance **[B]**

Q.31 In every experiment with potentiometer in the null point state, the potential difference between the ends of the galvanometer is -

(A) zero

(B) infinite

(C) equal to the p.d. of the cell

(D) unknown **[A]**

Q.32 The specific resistance per unit area of cross section of a wire is equivalent to -

(A) charge/current

(B) resistance/length

(C) potential gradient

(D) current/area **[B]**

Q.33 If the length of the potentiometer wire is doubled, the sensitivity for obtaining null point will -

(A) increase

(B) remain unchanged

(C) decrease

(D) uncertain **[A]**

Q.34 The potential gradient of the potentiometer wire depends on -

(A) only on the current that flows

(B) only the resistance per unit length of the wire

(C) both the above mentioned

(D) none of the above **[C]**

Q.35 The potentiometer wire is replaced by another wire whose length thickness and specific resistance are double the previous one. The current strength flowing through it is also doubled. How many times will the potential gradient becomes ?

(A) 1 (B) 2

(C) 4 (D) 8 **[A]**

Q.36 If the current in a potentiometer increases, the position of the null point will -

(A) be obtained at a larger then the previous one

(B) be equal to the previous length

(C) be obtained at a smaller length than the previous

(D) none of the above **[C]**

Q.37 A battery of negligible internal resistance is connected to the ends of a potentiometer wire. The potential gradient can be changed by (r = R' = 0 for wire) -

(A) increasing the length of wire

(B) increasing the thickness of wire

(C) changing the direction of the current

(D) increasing its resistance **[A]**

Q.38 The length of a potentiometer wire is 10 m and a p.d. of 2 volt is applied to its ends. If the length of its wire is increased by 1 m, the value of potential gradient in volt/m will be -

(A) 0.18 (B) 0.22

(C) 1.3 (D) 0.9 **[A]**

Q.39 If the specific resistance of a potentiometer is (ρ) area of cross-section is A, and the current flowing in the wire is (I) then the potential gradient is -

(A) $I A \rho$ (B) IA/ρ

(C) $I\rho/A$ (D) ρ/IA **[C]**

Q.40 The potentiometer is an ideal apparatus for measuring potential differences because -

(A) it's resistance is low

(B) at null position its resistance is zero

(C) it's range is adjustable

(D) it does not draw any current when measuring p.d. **[D]**

Q.41 A potentiometer is based on the principle -

(A) of wheatstone bridge

(B) that the fall of potential along a wire is proportional to its lengths

(C) that the resistance of potentiometer wire is large

(D) of post office box **[B]**

Q.42 If the length of the potentiometer wire is increased , the sensitivity will -

(A) increase

(B) decrease

(C) be same

(D) none of the above **[A]**

Q.43 In an ammeter calibration experiment, the potentiometer is used to measure in the secondary circuit, the -

(A) resistance

(B) potential difference

(C) current

(D) power **[B]**

Q.44 In potentiometer the potential gradient is -

(A) resistance across the unit length of the wire

(B) current across the unit length of the wire

(C) potential difference across the unit length of the wire

(D) power across the unit length of the wire **[C]**

Q.45 If the potentiometer wire having resistance ρ ohm/m and I amp. current is allowed to pass through it. The potential gradient produced on the potentiometer wire will be -

(A) I/ρ (B) $I\rho$

(C) ρ/I (D) $I^2\rho$ **[B]**

Q.46 The principal of a potentiometer is –

(A) to compare two unknown resistances

(B) to compare two known resistance

(C) to find out unknown p.d. by comparing it with known p.d.

(D) to calibrate a voltmeter **[C]**

Q.47 The wire of potentiometer is made of –

(A) copper (B) steel

(C) manganin (D) aluminium **[C]**

Q.48 If the current in the primary circuit of a potentiometer wire of specific resistance is $40 \times 10^{-8}\Omega$-m and area of cross-section $8 \times 10^{-6}m^2$ is 0.5 amp. Then potential gradient of wire is -

(A) 25mV/m (B) 2.5mV/m

(C) 2.5mV/m (D) 25V/m **[A]**

Q.49 A cell of emf E and internal resistance r is balanced at length of a potentiometer wire. If another resistance R is connected in parallel with this, the new balancing length will be -

(A) $\frac{R}{R-r}\ell$ (B) $\frac{R-r}{R}\ell$

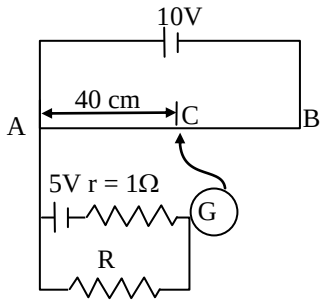
(C) $\frac{R}{r}\ell$ (D) $\frac{R}{R+r}\ell$ **[D]**

Q.50 The balancing length for a 1.2 volts cell of 5 ohm internal resistance is 900 cm. If a resistance of 10 ohm is connected to the terminals of the cell, the p.d. and balancing length at the ends of resistance will be -

(A) 0.8 volt, 600 cm (B) 0.3 volt, 300 cm

(C) 0.24 volt, 130 cm (D) 0.12 volt, 90 cm **[A]**

Q.1 A potentiometer wire AB is 100 cm long and has a total resistance of 10 ohm. If the galvanometer shows zero deflection at the position C, then find the value of unknown resistance R.

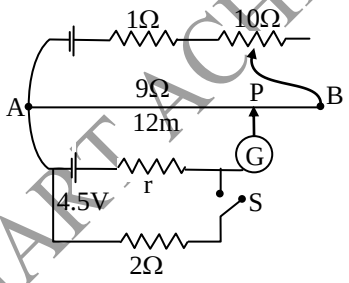


Ans. 4Ω

Q.2 In the primary circuit of potentiometer the rheostat can be varied from 0 to 10 Ω. Initially it is at minimum resistance (zero).

(a) Find the length AP of the wire such that the galvanometer shows zero deflection.

(b) Now the rheostat is put at maximum resistance (10Ω) and the switch S is closed. New balancing length is found to 8 m. Find the internal resistance r of the 4.5V cell.



Ans. (a) 6 m (b) 1Ω

Q.3 Figure shows a potentiometer with a cell of emf 2.0 V and internal resistance 0.04Ω maintaining a potential drop across the resistor wire AB. A standard cell which maintains a constant emf of 1.02 V (for very moderate currents up to a few ampere) gives a balance point of 67.3 cm length of the wire. To ensure very low currents drawn from the standard cell, a very high resistance of 600 kΩ is put is series with it which is shorted close to the balance point. The standard cell is then replaced by a cell of unknown emf E and the balance point found similarly turns out to be at 82.3 cm length of the wire.

(a) What is the value of E

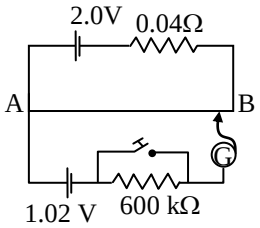
(b) What purpose does the high resistance of 600 kΩ have?

(c) Is the balance point affected by this high resistance?

(d) Is the balance point affected by internal resistance of the driver cell?

(e) Would the method work in the above situation if the driver cell of the potentiometer had an emf of 1.0V instead of 2.0 V?

(f) Would the circuit work well for determining externally small emf, say, of the order of few mV (such typical emf of thermocouple)?



Ans. (a)1.25V

(b) The high resistance to kept the initial current low when null point is being located. This saves the standard cell from damage.

(c) This high resistance does not affect the balance point because then there is no flow of current through the standard cell branch.

(d) The internal resistance of driver cell affects the current through the potentiometer wire. Since potential gradient is changed, therefore, the balance point must be affected.

(e) No, It is necessary that the emf of the driver cell is more than the emf of the cells.

(f) This circuit will not work well for measurement of small emf. (mV) because the balanced point will be very near to and A, and percentage error in EMF measured due to length measurement would be very large $e = \frac{V}{100}\ell$

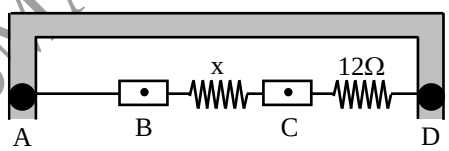
$\Rightarrow \frac{dE}{E} = \frac{d\ell}{\ell}$ will be large if ℓ is very small.

Q.4 A thin uniform wire AB of length 1m, an unknown resistance X and a resistance of 12Ω are connected by thick conducting strips, as shown in the figure. A battery and a galvanometer (with a sliding jockey connected to it) are also available. Connections are to be made to measure the unknown resistance X using the principle of Wheatstone bridge. Answer the following questions.

(a) Are there positive and negative terminals on the galvanometer ?

(b) Copy the figure in your answer book and show the battery and the galvanometer (with jockey) connected at appropriate points.

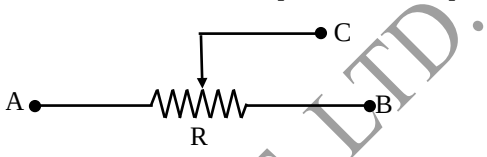
(c) After appropriate connections are made, it is found that no deflection takes place in the galvanometer when the sliding jockey touches the wire at a distance of 60 cm from A. Obtain the value of the resistance X. **[IIT -JEE 2002]**



Ans. (a) Galvanometer has no positive or negative terminals; (c) 8Ω

Q.5 As shown in the figure a battery is to be connected so that the rheostat behaves like potential divider. Indicate how the battery should be connected. Also indicate the points about which output can be taken

[IIT -JEE 2003]



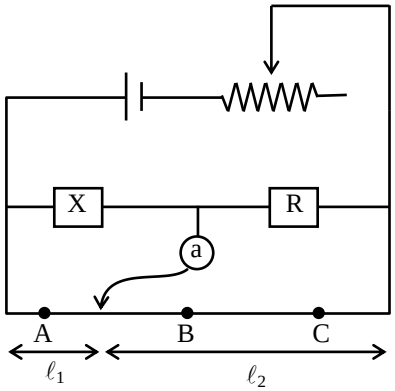
Ans. Output terminals are [A, C] or [B, C]

Q.6 Draw the circuit diagram to verify Ohm's Law with the help of a main resistance of 100 Ω and two galvanometers of resistances $10^6\Omega$ and 10^{-3} Ω and a source of varying emf. Show the correct positions of voltmeter and ammeter.

[IIT -JEE 2004]

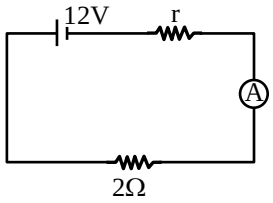
Ans.

Q.7 An unknown resistance is to be determined using resistance R_1, R_2, and R_3. If their corresponding null points are A, B and C. Which of the following will give most accurate reading ? **[IIT -JEE -2005]**

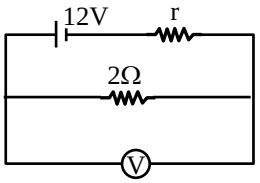


Ans. The null point at B will give most accurate reading

Q.8 A galvanometer (coil resistance 99 Ω) is converted into an ammeter using a shunt of 1 Ω and connected as shown in figure (a). The ammeter reads 3 A. The same galvanometer is converted into a voltmeter by connecting a resistance of 101 Ω in series. This voltmeter is connected as shows in figure (b). Its reading is found to be 4/5 of the full scale reading. Find-



(a)

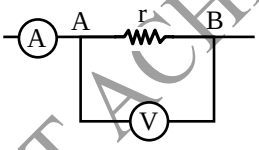


(b)

(a) internal resistance r of the cell
(c) full scale deflection current of the galvanometer

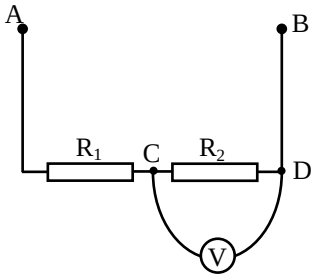
Ans (a) 1.01 Ω (b) 5 A, 9.95 V (c) 0.05 A

Q.9 Determine the resistance r if an ammeter shows a current of I = 5 A and a voltmeter 100 V. The internal reistacne of the voltmeter is R = 2,500 Ω.



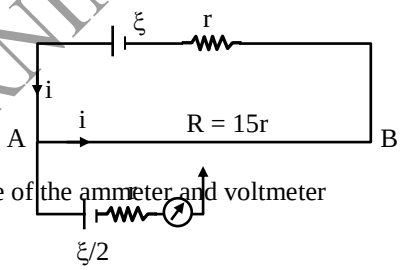
Ans 20.16 Ω

Q.10 Resistances R_1 and R_2, each 60 Ω, are connected in series. The potential difference between points A and B is 120 V. Find the reading of voltmeter connected between points C and D if its resistance r = 120 Ω.



Ans 48 V

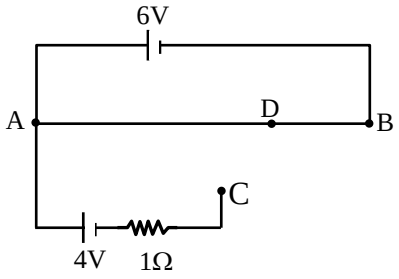
Q.11 Consider the potentiometer circuit arranged as in fig.. The potentiometer wire is 600 cm long.(a) At what distance from A should jockey touch the wire to get zero deflection in the galvanometer ? (b) If the jockey touches the wire at a distance of 560 cm from A, what will be the current in the galvanometer ?



(b) range of the ammeter and voltmeter

Ans. (a) ℓ = 320 cm (b) $i = \frac{3\xi}{22r}$

Q.12 A 6V battery of negligible internal resistance is connected across a uniform wire AB of length 100 cm. The positive terminal of another battery of emf 4 V and internal resistance 1Ω is joined to the point A as shown in figure. Take the potential at B to be zero.



(A) What are the potentials at the points A and C ?

(B) At which point D of the wire AB, the potential is equal to the potential at C ?

(C) If the points C and D are connected by a wire, what will be the current through it ?

(D) If the 4V battery is replaced by 7.5 V battery, what would be the answers of parts (a) and (b) ?

Sol. (a) 6V, 2V (b) AD = 66.7 cm

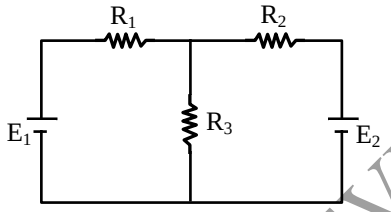
(c) zero (d) 6V, –1.5V, no such point D exists.

Q.13 The potential difference across the terminals of a battery is 8.4 V when there is a current of 1.50 A in the battery from the negative to the positive terminal. When the current is 3.50 A in the reverse direction, the potential difference becomes 9.4 V.

(a) What is the internal resistance of the battery ? (b) What is the emf of the battery ?

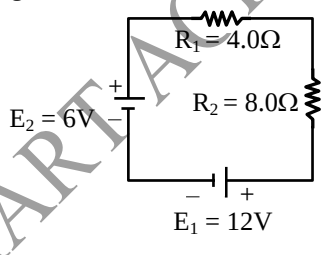
Ans. (a) 0.20 Ω (b) 8.7 V

Q.14 In the circuit shown in figure $E_1 = 7V$, $E_2 = 1V$, $R_1 = 2\Omega$, $R_2 = 2\Omega$ and $R_3 = 3\Omega$ respectively. Find the power supplied by the two batteries.



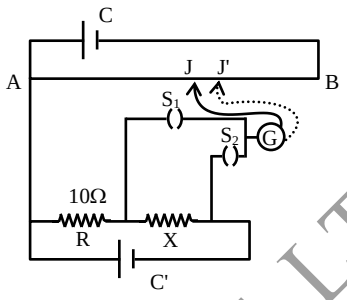
Ans. +14 W, –1 W

Q.15 Assume that the batteries in figure have negligible internal resistance. Find



Ans. (a) $\frac{1}{2}$ A (b) 1 W, 2 W (c) 6 W (supplied), 3 W (absorbed)

Q.16 Figure shows a potentiometer circuit for comparing two resistance. The balance point with R = 10Ω, when switch S_1 is closed and S_2 is open is found to be 58.3 cm, while that when S_2 is closed and S_1 is open is found to be 68.5 cm. Find the value of X.



Sol. 2