

CLASS TEST

PHYSICS

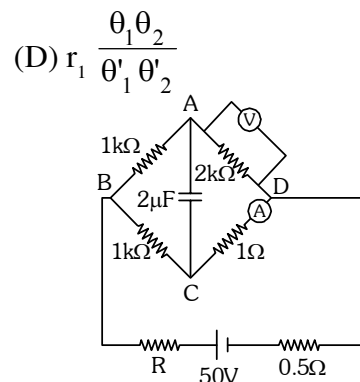
CLASS TEST # 33

SECTION-I

Single Correct Answer Type

3 Q. [3 M (-1)]

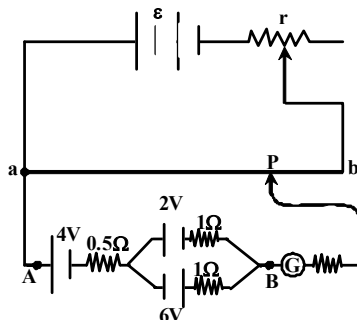
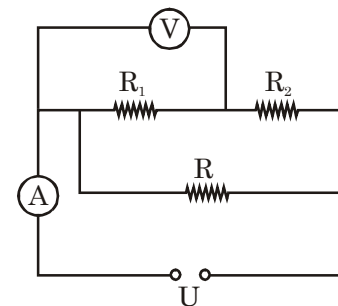
- Two ammeters, 1 and 2, have different internal resistances: r_1 (known) r_2 (unknown). Each ammeter has scale such that the angular deviation of the needle from zero is proportional to the current. Initially, the ammeters are connected in series and then to a source of constant voltage. The deviations of the needles of the ammeters are θ_1 and θ_2 , respectively. The ammeters are then connected in parallel and then to the same voltage source. This time, the deviations of the needles are θ_1' and θ_2' , respectively. r_2 in terms of r_1 , θ_1 , θ_2 , θ_1' and θ_2' is
 (A) $r_1 \frac{\theta_1 \theta_1'}{\theta_2 \theta_2'}$ (B) $r_1 \frac{\theta_2 \theta_1'}{\theta_1 \theta_2'}$ (C) $r_1 \frac{\theta_2 \theta_2'}{\theta_1 \theta_1'}$ (D) $r_1 \frac{\theta_1 \theta_2}{\theta_1' \theta_2'}$
- Calculate the energy stored in the capacitor of capacitance $2\mu\text{F}$, at the instant when the voltmeter 'V' gives a reading of 15V and the ammeter A reads 15 mA. Resistance of voltmeter is unknown and ammeter is 999Ω .
 (A) $5\mu\text{J}$
 (B) $10\mu\text{J}$
 (C) $0.5\mu\text{J}$
 (D) 0
- In a potentiometer, there are 10 identical cells (E , r -each) arranged in series in primary circuit. A cell of emf E_0 and internal resistance r_0 is balanced at ℓ_1 length of the potentiometer wire. Now, the polarity of two cells is reversed in primary circuit. The same cell of emf E_0 now gets balanced at ℓ_2 then ℓ_1/ℓ_2 is :-
 (A) $3/5$ (B) $5/3$ (C) $1/2$ (D) $2/1$



Multiple Correct Answer Type

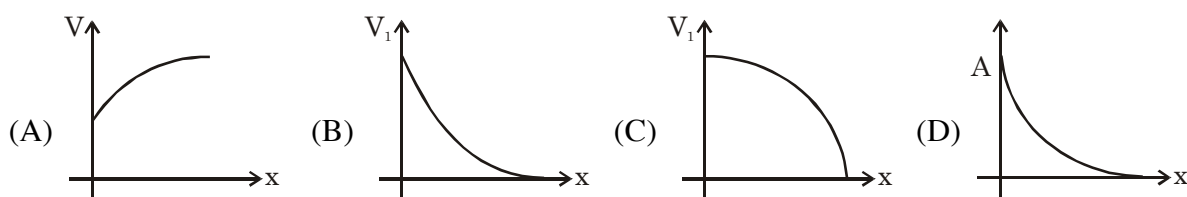
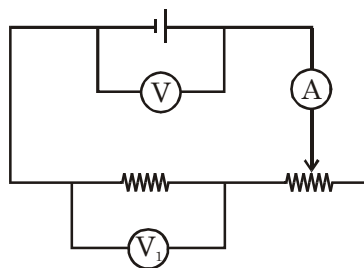
9 Q. [4 M (-1)]

- What are the resistances of the resistors R_1 and R_2 , shown in the figure, if the voltage supply is 40 V, and the power dissipated in resistor R is 80 W, the readings on the ammeter and on the voltmeter are 3 A and 30 V, respectively. (All devices are ideal)
 (A) $R_1 = 30\Omega$
 (B) $R_2 = 30\Omega$
 (C) $R_1 = 10\Omega$
 (D) $R_2 = 10\Omega$
- A potentiometer as shown in figure in which three batteries between A & B are connected when the point P is the null point, measured by the potentiometer arrangement. Then choose correct statement(s)



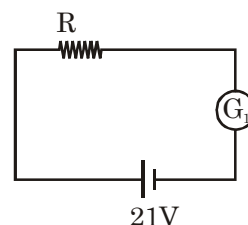
- current passing through 6 V battery is 4A
- current passing through 2 V battery is 4A
- $V_A - V_B = 2\text{V}$
- $V_A - V_B = 6\text{V}$

6. Two ideal voltmeters & an ideal ammeter are connected as shown. The battery is non ideal. Find the correct plot of A vs x , V vs x & V_1 vs x , where x is distance of slider on rheostat from left end.

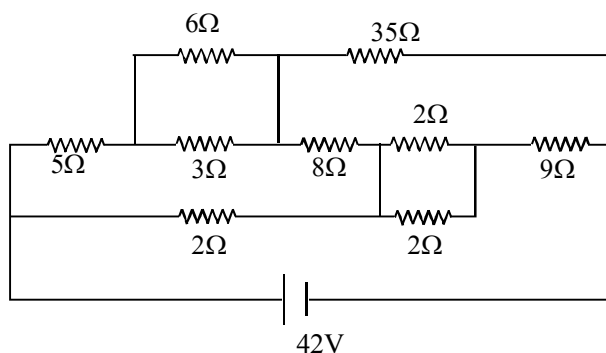


7. In the circuit shown, the battery is ideal. It has a voltage of 21 V. The galvanometer G_1 shows 0.42 A. When another identical galvanometer G_2 is connected across R , the reading of G_1 increases to 0.50 A :-

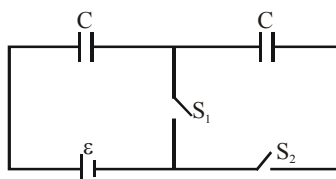
- (A) The resistance of galvanometer is $30\ \Omega$
 (B) The resistance $R = 40\ \Omega$
 (C) The reading of $G_2 = 0.20$ A
 (D) If instead of this, G_2 was connected parallel to G_1 , their reading would be same = 0.21 A.



8. In given circuit :-

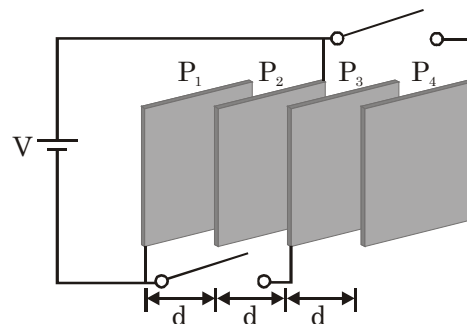


- (A) Power dissipated in $5\ \Omega$ resistor is 10 W. (B) Power dissipated in $5\ \Omega$ resistor is 5 W.
 (C) Power dissipated in $8\ \Omega$ resistor is 0 W. (D) Power dissipated in $8\ \Omega$ resistor is 2 W.
9. Figure shows two capacitors having same capacitance connected to a battery and two switches S_1 and S_2 . Initially S_1 and S_2 is closed :-



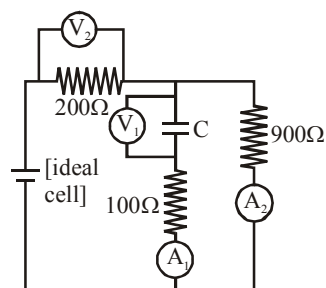
- (A) Before opening S_1 charge on left capacitor is $C\epsilon$.
 (B) After opening S_1 the final charge on both capacitor is equal to $\frac{1}{2}C\epsilon$
 (C) After opening S_1 the final charge on both capacitor is $C\epsilon$.
 (D) After opening S_1 the charge on left capacitor is $C\epsilon$.

10. Four parallel metal plates P_1, P_2, P_3 and P_4 each of area A , are separated successively by a distance d as shown in figure. P_1 is connected to the negative terminal of a battery, and P_2 is connected to the positive terminal. The battery maintains a potential difference of V . Mark the correct statement(s) :-

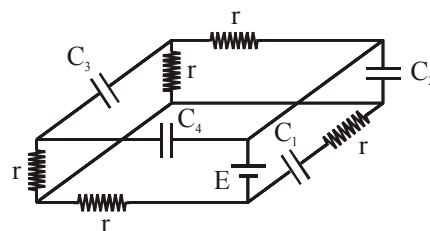


- (A) If P_3 is connected to the negative terminal, the capacitance of the three-plate system $P_1P_2P_3$ is $\frac{2\epsilon_0 A}{d}$.
- (B) If P_3 is connected to the negative terminal, the charge on P_2 is $2CV$, where C is $\frac{\epsilon_0 A}{d}$.
- (C) If P_3 is connected to the negative terminal and P_4 is connected to the positive terminal then the capacitance of the four-plate system $P_1P_2P_3P_4$ is $3C$, where C is $\frac{\epsilon_0 A}{d}$.
- (D) If P_3 is connected to the negative terminal and P_4 is connected to the positive terminal then charge on P_4 is $\frac{\epsilon_0 A}{d} V$.

11. An electrical circuit is shown in the given figure. The resistance of each voltmeter is infinite and each ammeter is 100Ω . The charge on the capacitor of $100\mu F$ in steady state is 4 mC . Choose correct statements (s) regarding above circuit :-



- (A) Reading of voltmeter V_2 is 16 V
- (B) Reading of Ammeter A_1 is 0 A and A_2 is $1/25\text{ A}$.
- (C) Reading of voltmeter V_1 is 40 V
- (D) EMF of the ideal cell is 66 V .
12. The network has C_1, C_2, C_3, C_4 four capacitors each of capacitance $C = 1\mu F$, all resistance are identical having $r = 1\Omega$. The battery has emf $E = 30\text{ V}$. The circuit is analyzed at steady state. Mark the **CORRECT** options.

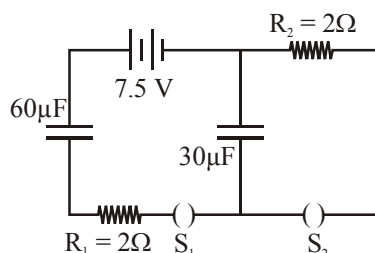


Linked Comprehension Type (1 Para $\times$ 2Q.)
(Single Correct Answer Type)

[3 M (-1)]

Paragraph for Question no. 13 and 14

In the given circuit all capacitor were uncharged initially. First switch S_1 is closed for long time when circuit reaches to steady state, switch S_1 is opened & S_2 is closed.



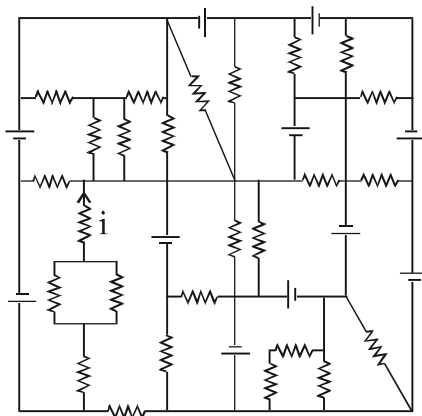
13. The current through R_2 , just after closing the switch S_2 is :-
 (A) 5A (B) 2.5 A (C) 3.75 A (D) 2A
14. Net heat produced in R_2 after closing switch S_2 :-
 (A) 375 μ J (B) 100 μ J (C) 250 μ J (D) 200 μ J

SECTION-III

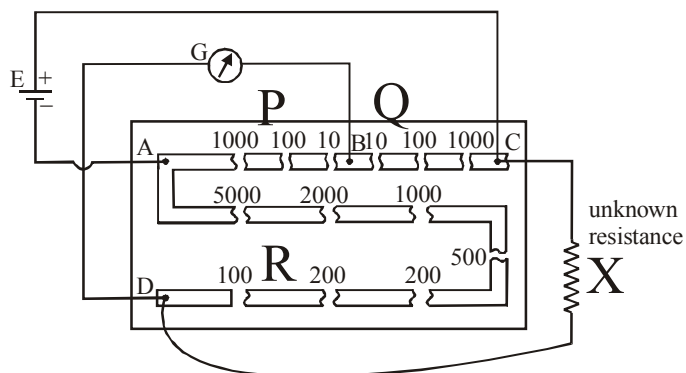
Numerical Grid Type (Ranging from 0 to 9)

4 Q. [4 M (0)]

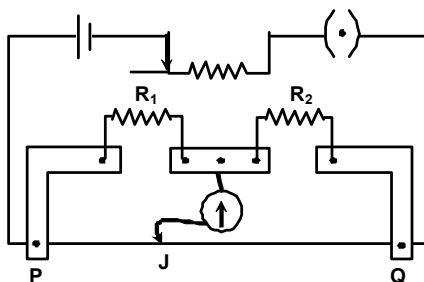
1. What is the size of current i (in A) in figure, where all resistances are 4.0Ω and all batteries have an emf of 10 V?



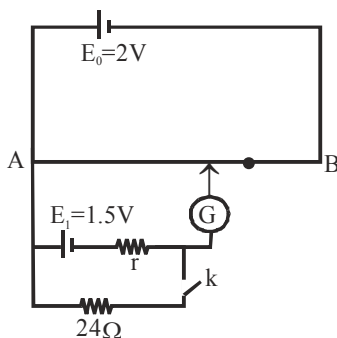
2. In the figure shown below, the maximum possible unknown resistance X (in Ω), that can be measured by the post office box are $X_{\max}$ is given by $R \times 10^5 \Omega$, then R is : (in this experiment, we take out only one plug in arm AB and only one plug in arm BC, but in arm AD we can take out many plugs).



3. The circuit diagram given in the figure shows the experimental setup for the measurement of unknown resistance by using a meter bridge. The wire connected between the points P and Q has non-uniform resistance such that the resistance per unit length varies directly as the distance from the point P. Null point is obtained with the jockey J with R_1 and R_2 in the given position. On interchanging the positions of R_1 and R_2 in the gaps, the jockey has to be displaced through a distance x from the previous position along the wire to establish the null point. If the ratio of $R_1/R_2 = 3$. The value of x is $50(\sqrt{K} - 1)$ cm. Find the value of K . (length of wire PQ = 1m)



4. For the arrangement of the potentiometer shown in the figure, the balance point is obtained at a distance 75 cm from A when the key k is open. The second balance point is obtained at 60 cm from A when the key k is closed. Find the internal resistance (in Ω) of the battery E_1 .



SECTION-IV

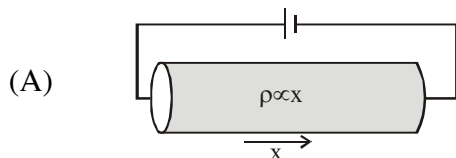
Matrix Match Type (4×5)

1 Q. [8 M (for each entry +2(0))]

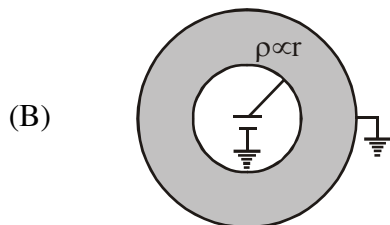
1. Column-I has some conductor across which battery is connected as shown. Variation of resistivity ρ is also indicated. Which of the quantities in column-II remain constant throughout the volume of conductor. (Assume that the free electron density is uniform in the material).

Column-I

Column-II

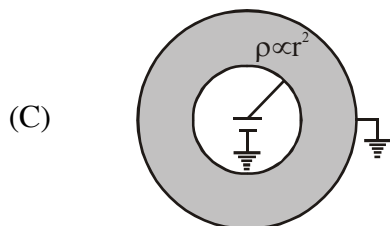


(P) Magnitude of electric field



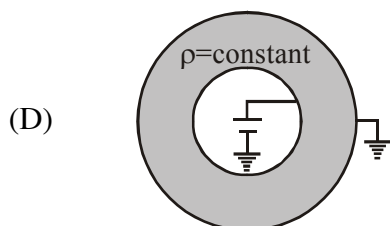
(Q) Magnitude of current density

Hollow cylinder



(R) Power dissipated per unit volume

Hollow sphere



(S) Drift speed of free electron

Hollow sphere

(T) Electric current

SECTION-I

Single Correct Answer Type**3 Q. [3 M (–1)]****1. Ans. (B)****2. Ans. (D)****3. Ans. (A)****Multiple Correct Answer Type****9 Q. [4 M (–1)]****4. Ans. (A,D)****5. Ans. (ABC)****6. Ans. (A,B,D)****7. Ans. (A,C)****8. Ans. (B,C)****9. Ans. (A,D)****10. Ans. (A,B,C,D)****11. Ans. (B, C)****12. Ans. (B, C)****Linked Comprehension Type****(1 Para × 2Q.)****[3 M (–1)]****(Single Correct Answer Type)****13. Ans. (B)****14. Ans. (A)**

SECTION-III

Numerical Grid Type (Ranging from 0 to 9)**4 Q. [4 M (0)]****1. Ans. 4****2. Ans. 9****3. Ans. 3****4. Ans. 6**

SECTION-IV

Matrix Match Type (4 × 5)**1 Q. [8 M (for each entry +2(0))]****1. Ans. (A) (Q,S,T) (B) (P,T) (C) (P,T) (D) (T)**