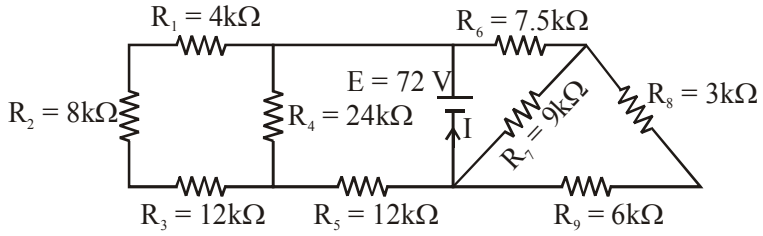
CLASS TEST

PHYSICS | CLASS TEST # 32

SECTION-I

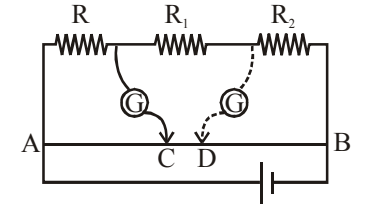
Single Correct Answer Type 6 Q. [3 M (–1)]

1. The current through the battery E in the network shown is



(A) Zero (B) 9 A (C) 6 mA (D) 9 mA

2. The diagram shows a modified meter bridge, which is used for measuring two unknown resistances at the same time. When only the first galvanometer is used, for obtaining the balance point, it is found at point C. Now the first galvanometer is removed and the second galvanometer is used, which gives balance point at D. Using the details given in the diagram, find out the value of R_1 and R_2 :-

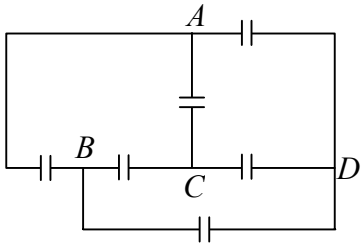


AB = L; AC = L/4 and AD = 2L/3

(A) $R_1 = 5R/3$, $R_2 = 4R/3$ (B) $R_1 = 4R/3$, $R_2 = R$

(C) $R_1 = 4R/3$, $R_2 = 5R/3$ (D) $R_1 = R$, $R_2 = R/3$

3. Choose the correct statement for the given capacitor arrangement. (All the 6 capacitor are of same capacitance).



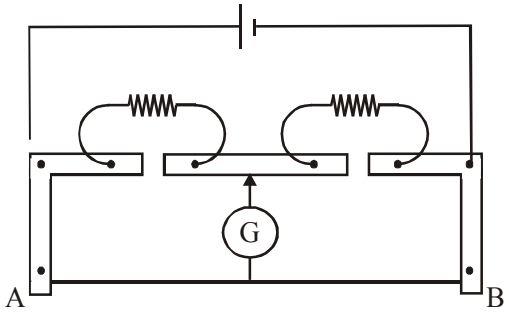
(A) If a battery is connected across *AB,* all 6 capacitors get charged.

(B) If a battery is connected across *AC,* all 6 capacitors get charged.

(C) If a battery is connected across *AD,* all 6 capacitors get charged.

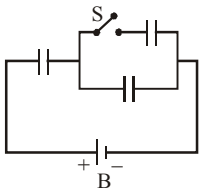
(D) It is not possible to charge all the 6 capacitors using single source.

4. A meter bridge set up as shown to determine end correction at A and B. When a resistance of 15Ω is used in left gap and of 20Ω in right gap, then null point comes at a distance 42cm from A. When these resistances are interchanged null point comes at a distance 57cm from A. Values of end corrections are :-



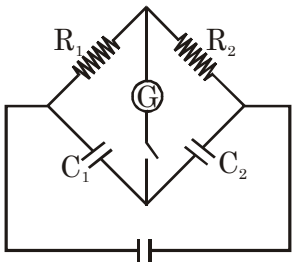
(A) 1 cm, 2 cm (B) 2 cm, 3 cm (C) 3 cm, 4 cm (D) 3 cm, 2 cm

5. In figure an arrangement of three identical capcitors is shown along with a switch S and a battery B. If the switch S is closed, then the ratio of the energy of the capacitors system in the final steady state to the initial state is :



(A) 2 : 1 (B) 4 : 3 (C) 3 : 2 (D) 3 : 4

6. Circuit shown is in steady state, now when switch is closed, galvanometer shows no deflection, then correct relation is :-



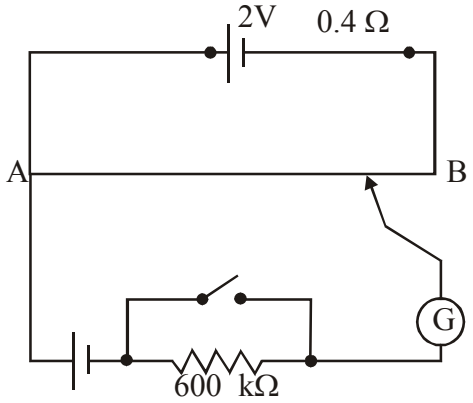
(A) $\frac{R_1}{R_2}=\frac{C_2}{C_1}$ (B) $\frac{R_1}{R_2}=\frac{C_1}{C_2}$

(C) $R_1R_2 = C_1C_2$ (D) $R_1\sqrt{C_1} = R_2\sqrt{C_2}$

Linked Comprehension Type (1 Para × 3Q. & 1 Para × 2Q.) [3 M (-1)]
(Single Correct Answer Type)

Paragraph for Questions 7 to 9

Figure shows a potentiometer with a cell of 2.0 V and internal resistance 0.40 Ω 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 upto a few mA) gives a balance point at 60 cm length of the wire. To ensure very low currents drawn from the standard cell, a very high resistance of 600 kΩ is put in series with it, which is shorted close to the balance point. The standard cell is then replaced by a cell of unknown emf ε and the balance point found similarly, turns out to be at 80 cm length of the wire.



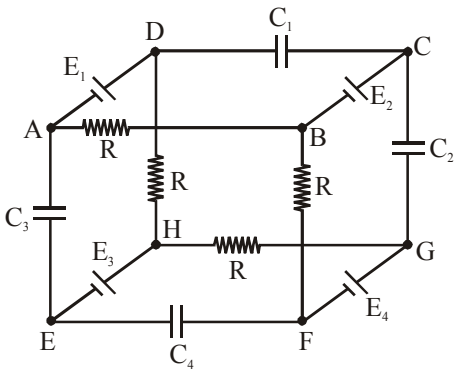
7. The value of emf of the unknown cell ε is
(A) 1.2 V (B) 1.36V (C) 1.5V (D) 2V

8. Would the method work in the above situation if the driver cell of the potentiometer had an emf of 1.0 V instead of 2.0 V ?
(A) Yes but the value of high resistance (600 kΩ) must be lowered.
(B) Yes it will work perfectly and no modification is needed to be done in the circuit.
(C) Yes only if the driver cell is ideal in nature.
(D) No as the driver cell has lower emf as compared to the unknown cell.

9. Would the circuit work well for determining an extremely small emf, say of the order of a few mV (such as the typical emf of a thermo-couple) ?
(A) Yes, with the same accuracy and with no further modification.
(B) Yes ,but with reducing the high resistance (600 kΩ) to a lower value.
(C) Yes, but by connecting using suitable resistance in series with the driver cell.
(D) No, as the balanced wheat stone bridge will not form with the lower emf of unknown cell.

Paragraph for Question no. 10 and 11

Four batteries of emf $E_1 = 4V$, $E_2 = 8V$, $E_3 = 12$ V and $E_4 = 16$ V and four identical capacitors each of 1 μF and four identical resistance are connected in circuit as in figure. Batteries do not have any internal resistances



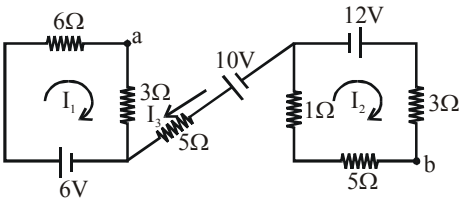
10. At steady state potential difference across C_2 is :
(A) 1V (B) 5V (C) 4V (D) 6V

11. If points H and B are shorted, the new charge on C_2 at steady state will be :
(A) Zero (B) 5 μC (C) 4 μC (D) 1μC

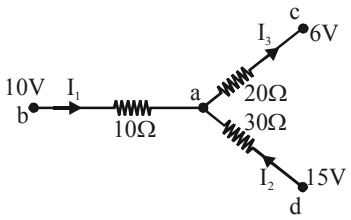
Matching List Type (4 × 4) 1 Q. [3 M (–1)]

12. Consider the electric circuits given in List-I and List-II gives values of some quantities from electric circuits. Match the corresponding quantities with correct circuit.

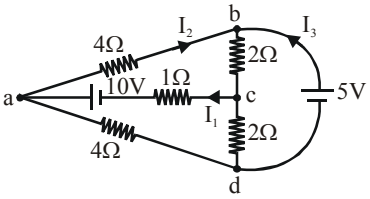
List-I **List-II**

(P) 

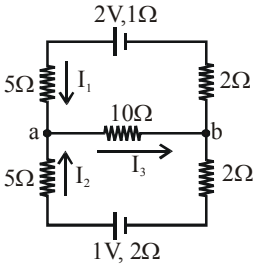
(1) $I_1 = \frac{1}{55}A$

(Q) 

(2) $I_2 = \frac{-1}{121}A$

(R) 

(3) $I_3 = \frac{15}{8}A$

(S) 

(4) $V_a - V_b = 4V$

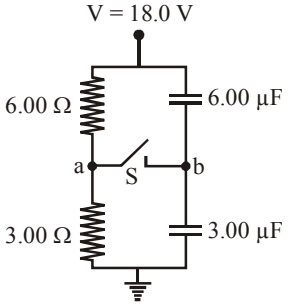
Code :

	P	Q	R	S
(A)	4	1	3	2
(B)	4	1	2	4
(C)	3	4	3	4
(D)	4	1	1	2

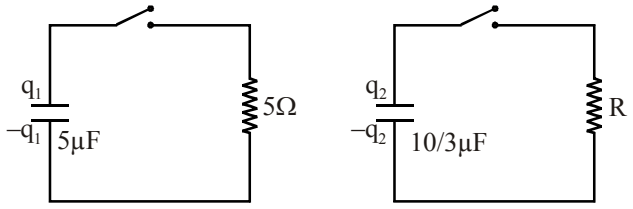
SECTION-III

Numerical Grid Type (Ranging from 0 to 9) 6 Q. [4 M (0)]

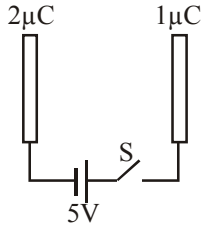
1. Initially switch S is open. Charge flows through switch S when it is closed is 6 × Q μC. Then find the value of Q ?



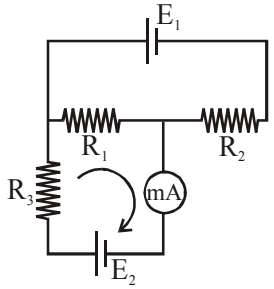
2. The figure shows two circuits with a charged capacitor that is to be discharged through a resistor as shown. The initial charge on capacitors is $\frac{q_2}{q_1} = 2$. If both switches are closed at t = 0, the charges become equal at $10^{-4}\, l$n2 sec. Find the resistance R (in Ω).



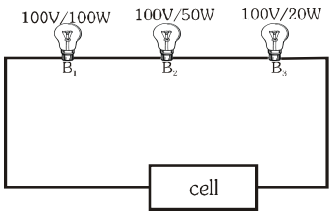
3. A parallel plate capacitor of capacitance 0.1 μF is shown in the figure. Its two plates are given charges 2 μC and 1 μC. Find the value of heat disipated (in μJ) after switch is closed.



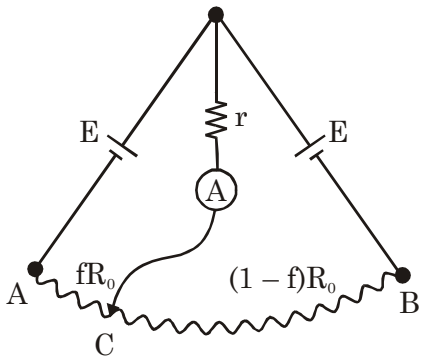
4. The circuit shown in the figure contains three resistors $R_1 = 100\ \Omega$, $R_2 = 50\Omega$ & $R_3 = 20\Omega$ and cells of emf's $E_1 = 2V$ & E_2. The ammeter indicates a current of 50mA. Find the emf (in V) of the second cell. (The internal resistance of the ammeter and of the cell should be neglected.)



5. Figure shows three bulbs connected in series. Their voltage rating shows that they will fuse if potential drop across them is greater than 100 Volt. Voltage of the cell can be varied. In each step voltage of the cell increases by 20 Volt. Initially the voltage of the cell is 100 V. If voltage of the cell is gradually increased and it is found that after N^{th} step current in the circuit becomes zero. Find the value of N.



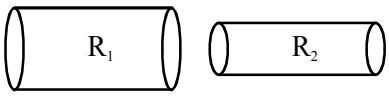
6. In Fig., the uniform-resistance wire between A and B has a total resistance R_0. The contact at C can divide the wire into resistors fR_0 and $(1 - f)R_0$. Consider the ideal ammeter for any $0 < f < 1$. Assume that the batteries are identical and have negligible internal resistance. For what value of f is the ammeter reading is minimum. Fill value of 12f.



SECTION-IV

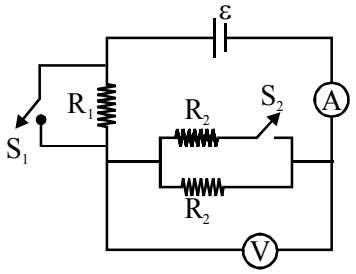
Matrix Match Type (4 × 5) **1 Q. [8 M (for each entry +2(0)]**

1. Figure shows two cylindrical uniform specimen of electrical resistances with their characteristics.



Resistivity :	$\rho_1 = \rho$	$\rho_2 = 2\rho$
Length :	$\ell_1 = \ell$	$\ell_2 = 2\ell$
Area of cross-section :	$A_1 = A$	$A_2 = A/2$

R_1 and R_2 are connected in circuit as shown in figure. Voltmeter and ammeter connected in the circuit are ideal. Comparison of electric field, drift speed and power dissipated per unit volume should be done only if R_1 carries current (both the materials have same electron density).



	Column-I		Column-II
(A)	S_1 is open S_2 is closed	(P)	Reading of voltmeter is maximum
(B)	S_1 is closed S_2 is open	(Q)	Reading of ammeter is maximum
(C)	S_1 and S_2 both are closed	(R)	Magnitude of electric field in R_2 is greater than in R_1
(D)	S_1 and S_2 both are open	(S)	Drift speed of electrons is greater in R_2 than in R_1
		(T)	Power dissipated per unit volume is greater in R_2 than in R_1

CLASS TEST # 32 **ANSWER KEY**

SECTION-I

Single Correct Answer Type **6 Q. [3 M (–1)]**

1. Ans. (D) **2. Ans. (A)** **3. Ans. (D)** **4. Ans. (D)**
5. Ans. (B) **6. Ans. (A)**

Linked Comprehension Type **(1 Para × 3Q. & 1 Para × 2Q.) [3 M (-1)]**
(Single Correct Answer Type)

7. Ans. (B) **8. Ans. (D)** **9. Ans. (C)** **10. Ans. (B)**
11. Ans. (A)

Matching List Type (4 × 4) **1 Q. [3 M (–1)]**

12. Ans. (A)

SECTION-III

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

1. Ans. 9 **2. Ans. 6** **3. Ans. 5** **4. Ans. 4**
5. Ans. 3 **6. Ans. 6**

SECTION-IV

Matrix Match Type (4 × 5) **1 Q. [8 M (for each entry +2(0)]**

1. Ans. (A) → (R, T) ; (B) → (P) ; (C) → (P, Q) ; (D) → (R, S, T)