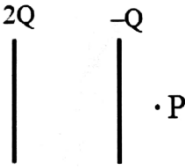
CURRENT ELECTRICITY

1. The potential across a 3 F capacitor is 12 V when it is not connected to anything. It is then connected in parallel with an unchanged 6 F capacitor. At equilibrium, the charge and potential difference across the capacitor 3 F and 6 F are listed in column I. Match it with column II.

Column-I	Column-II
(a) charge on 3 F capacitor	(p) 12C
(b) charge on 6 F capacitor	(q) 24 F
(c) potential difference across 3F capacitor	(r) 8 V
(d) potential difference across 6F capacitor	(s) 4 V

(a) a-r, b-p, c-s, d-q (b) a-p, b-q, c-s, d-s
(c) a-r, b-p, c-q, d-q (d) a-r, b-q, c-s, d-q

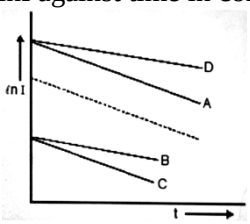
2. In the figure shown the plates of d parallel plate capacitor have unequal charges. Its capacitance is 'C' P is a point outside the capacitor and close to the plate of charge –Q. The distance between the plates is'd* select incorrect alternative



(a) A point charge at point 'P' will experience electric force due to capacitor
(b) The potential difference between the plates will be 3Q/2C
(c) The energy stored in the electric field in the region between the plates is $\frac{9Q^2}{8C}$
(d) The force on one plate due to the other plate is $\frac{Q^2}{2\pi\epsilon_0 d^2}$

3. The plates of a parallel plate Condenser are pulled apart with a velocity v. If at any instant mutual distance of separation is d, then the magnitude of the time of rate of change of electrostatic energy of the capacity depends on d as follows-
(a) 1/d (b) $1/d^2$
(c) d^2 (d) d

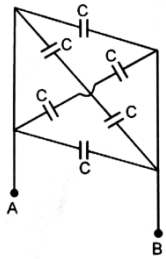
4. Dotted line represents the graph of lnI against t in a charging R-C circuit. If the resistance of the circuit is doubled which of the following best represents graphs of lnI against time in continuous line-



(a) A (b) B
(c) C (d) D

5. A capacitor is charged by connecting a battery across its plates. It stores energy U. Now the battery is disconnected and another identical capacitor is connected across it, then the energy
(a) U (b) $\frac{U}{2}$
(c) 2U (d) $\frac{3}{2}$ U

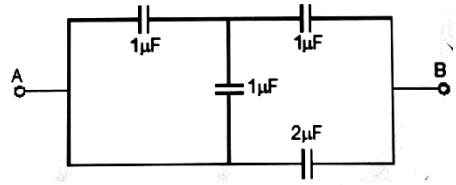
6. The resultant capacity between the points A and B in the adjoining circuit will be -



(a) C (b) 2C
(c) 3C (d) 4C

7. A 3μF capacitor is charged to a potential of 300 V and a 2μF capacitor is charged to 200 V. The capacitors are then connected in parallel with plates of opposite polarity joined together. What amount of charge will flow when the plates are so connected-
(a) 250μC (b) 600μC
(c) 700μC (d) 1300μC

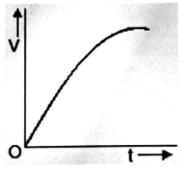
8. The equivalent capacitance of the circuit shown, between points A and B will be-

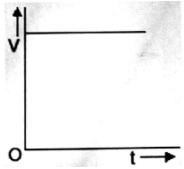


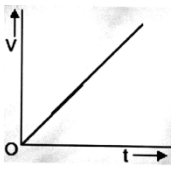
(a) $\frac{2}{3}$ μF (b) $\frac{5}{3}$ μF
(c) $\frac{8}{3}$ μF (d) $\frac{7}{3}$ μF

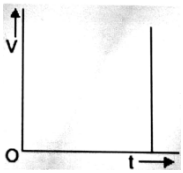
9. Two capacitors when connected in series have a capacitance of 3 μF, and when connected in parallel have a capacitance of 16 μF. Their individual capacities are-
(a) 1 μF, 2 μF (b) 6 μF, 2 μF
(c) 12 μF, 4 μF (d) 3 μF, 16 μF

10. If a current, that charges a capacitor, Is constant, then graph representing the change in voltage across the capacitor with time t is-

(a) 

(b) 

(c) 

(d) 

11. On placing a dielectric slab between the plates of an isolated charged condenser its-

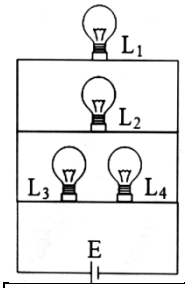
Capacitance	Charge	Potential Difference	Energy stored	Electric field
(1) decreases	Remains unchanged	decreases	increases	increases
(2) increases	Remains unchanged	increases	increases	decreases
(3) increases	Remains unchanged	decreases	decreases	decreases
(4) decreases	Remains unchanged	decreases	increases	Remains unchanged

(a) 1 (b) 2
(c) 3 (d) 4

12. **Statement-1:** If temperature is increased, the dielectric constant of a polar dielectric decreases whereas that of a non-polar dielectric does not change significantly.
Statement-2: The magnitude of dipole moment of individual polar molecule decreases significantly with increase in temperature.
(a) Both Statement-1 and Statement-2 are false
(b) Statement-1 is false and Statement-2 is true
(c) Statement-1 is true and Statement-2 is false
(d) Both Statement-1 and Statement-2 are true

13. While a capacitor remains connected to a battery, a dielectric slab is slipped between the plates-
(a) The electric field between the plates increases
(b) The energy stored in the capacitor decreases
(c) The potential difference between the plates is changed
(d) Charges flow from the battery to the capacitor

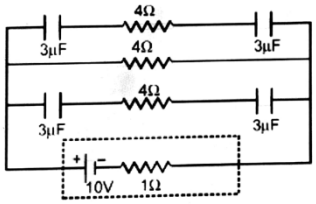
14. In the shown circuit diagram, all the electric bulbs are identical. Then, match the entries of column I with the entries of column II



Column -I	Column-II
(A) Current drawn by Li is	(P) maximum
(B) Intensity of L_1 and L_2 is	(Q) minimum
(C) Intensity of L_3 and L_4 is	(R) same
(D) Intensity of L_1 and L_4 is	(S) different

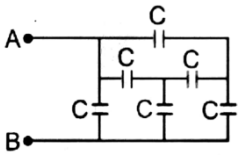
(a) A-P; B-P,R; C-Q, R; D-S
(b) A-R; B-Q,R; C-P,S; D-R
(c) A-P,R; B-R; C-Q; D-S
(d) A-Q; B-R, S; C-R; D- S

15. In the circuit given, charge (in μC) on each capacitor in steady state will be



(a) 12 (b) 10
(c) 8 (d) 6

16. In the given figure, the capacitance of .each capacitor is C, then the effective capacitance between A and B will be

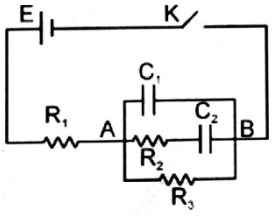


(a) C/2 (b) C
(c) 2C (d) 6C

17. Three capacitors of same capacitance are connected in parallel. When they are connected to a cell of 2 volt, total charge of 1.8μC is accumulated on them. Now they are connected in series and then charged by the same cell. The total charge stored in them will be
(a) 1.8 μC (b) 0.9 μC
(c) 0.6 μC (d) 0.2 μC

18. A capacitor of capacitance 500μF i charged at the rate of 100μC/s . The time in which the potential difference will become 20 V, is
(a) 100 s (b) 50 s
(c) 20 s (d) 10 s

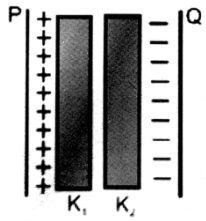
19. A network of uncharged capacitors and resistances is shown

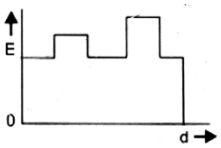


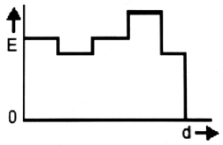
Current through the battery immediately after key K is closed and after a long time interval is :
(a) $\frac{E}{R_1}, \frac{E}{R_1+R_3}$ (b) $\frac{E}{R_1+R_3}, \frac{E}{R_1+\frac{R_2R_3}{R_2+R_3}}$

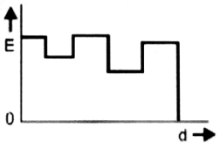
(c) zero, $\frac{E}{R_1}$ (d) $\frac{E}{R_1+\frac{R_2R_3}{R_2+R_3}}, \frac{E}{R_1}$

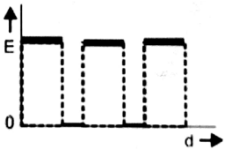
20. Two thin dielectric slabs of dielectric constants K_1 and K_2 ($K_1 < K_2$) are inserted between plates of a parallel plate capacitor, as shown in the figure. The variation of electric field 'E' between the plates with distance 'd' as measured from plate P is correctly shown by:



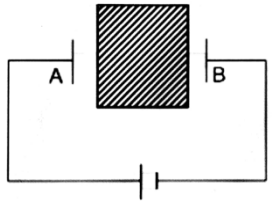
(a) 

(b) 

(c) 

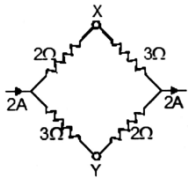
(d) 

21. An insulator plate is passed between the plates of a capacitor. Then current



(a) first flows from A to B and then from B to A
(b) first flows from B to A and then from A to B
(c) always flows from B to A
(d) always flows from A to B

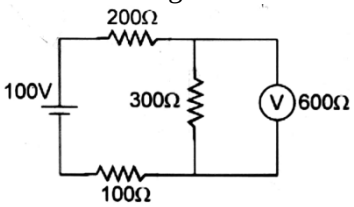
22. Find the potential difference between points X and Y.



(a) 1 (b) –1
(c) 2 (d) –2

23. 12 cells each having the same emf are connected in series and are kept in a closed box. Some of the cells are wrongly connected. This battery is connected in series with an ammeter and two cells identical with each other and also identical with the previous cells. The current is 3 A when the external cells aid this battery and is 2 A when the cells oppose the battery. How many cells in the battery are wrongly connected?
(a) one (b) two
(c) three (d) none

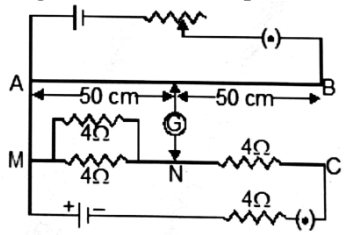
24. The reading of voltmeter is



(a) 50 V (b) 60 V
(c) 40 V (d) 80 V

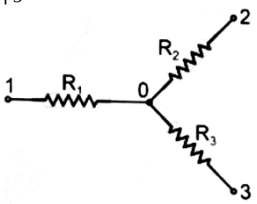
25. The sensitivity of a potentiometer is increased by
(a) increasing the emf of the cell
(b) increasing the length of potentiometer wire
(c) decreasing the length of potentiometer wire
(d) None of the above

26. In the following figure, the p.d. between the points M and N is balanced at 50 cm length. The balancing length in cm, for the p.d. between points N and C will be



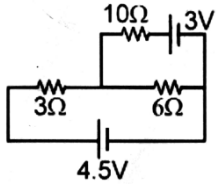
(a) 40 (b) 100
(c) 75 (d) 25

27. Find the current flowing through the resistance R_1 of the circuit shown in figure if the resistances are equal to $R_1 = 10\ \Omega$, $R_2 = 20\ \Omega$, and $R_3 = 30\ \Omega$, and the potentials of points 1, 2 and 3 are equal to $\phi_1 = 10$ V, $\phi_2 = 6$ V, and $\phi_3 = 5$ V.



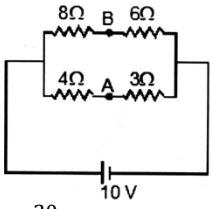
(a) 0.1 A (b) 0.2 A
(c) 0.3 A (d) 0.4 A

28. Find the current through the 10 Ω resistor shown in figure



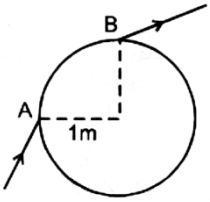
(a) zero (b) 1 A
(c) 2 A (d) 5 A

29. The potential difference between point A and B is



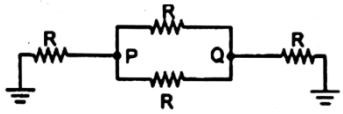
(a) $\frac{20}{7}$ V (b) $\frac{40}{7}$ V
(c) $\frac{10}{7}$ V (d) 0

30. The wire used in the arrangement shown in figure has a resistance of r ohm per meter. The equivalent resistance between points A and B is



(a) $\left(\frac{6}{11}\right)$r (b) $\frac{2\pi r}{(\pi+1)}$
(c) $\frac{6\pi r}{(16+3\pi)}$ (d) $\frac{3\pi r}{(10+3\pi)}$

31. The net resistance between points P and Q in the circuit shown in fig. is



(a) R/2 (b) 2R/5
(c) 3R/5 (d) R/3

32. Two wires of same dimension but resistivities ρ_1 and ρ_2 are connected in series. The equivalent resistivity of the combination is

(a) $\rho_1 + \rho_2$ (b) $\left(\frac{\rho_1+\rho_2}{2}\right)$
(c) $\sqrt{\rho_1\rho_2}$ (d) $2(\rho_1 + \rho_2)$

33. Two bulbs 25W, 220V and 100W, 220V are given. Which has higher resistance?
(a) 25W bulb
(b) 100 W bulb
(c) Both bulbs will have equal resistance
(d) Resistance of bulbs cannot be compared

34. Si and Cu are cooled to a temperature of 300K, then resistivity :
(a) For Si increases and for Cu decreases
(b) For Cu increases and for Si decreases
(c) Decreases for both Si and Cu
(d) Increases for both Si and Cu

35. For a cell the terminal potential difference is 2.2V when circuit is open and reduces to 1.8V when cell is connected to a resistance R = 5Ω, the internal resistance (r) of cell is:
(a) $\frac{10}{9}\Omega$ (b) $\frac{9}{10}\Omega$
(c) $\frac{11}{9}\Omega$ (d) $\frac{5}{9}\Omega$

36. An electric kettle has two heating coils. When one of the coils is connected to an AC source, the water in the kettle boils in 10 min. When the other coil is used the water boils in 40 min. If both the coils are connected in parallel, the time taken by the same quantity of water to boil will be:
(a) 25 min (b) 15 min
(c) 8 min (d) 4 min

37. Fuse wire is a wire of:
(a) Low resistance and low melting point
(b) Low resistance and high melting point
(c) High resistance and high melting point
(d) High resistance and low melting point

38. In a metre bridge experiment, null point is obtained at 20 cm from one end of the wire when resistance X is balanced against another resistance Y. If X < Y, then where will be the new position of the null point from the same end, if one decides to balance a resistance of 4X against Y?
(a) 50 cm (b) 40 cm
(c) 70 cm (d) 80 cm

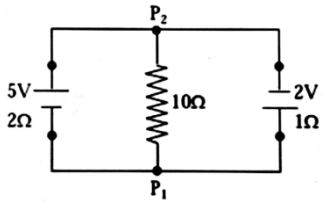
39. A heater coil is cut into two equal parts and only one part is now used in the heater. The heat generated will now be:
(a) doubled (b) four times
(c) one-fourth (d) half

40. A moving coil galvanometer has 150 equal divisions. Its current sensitivity is 10 divisions per milli ampere and voltage sensitivity is 2 divisions per millivolt. In order that each division reads 1 volt, the resistance in ohms needed to be connected in series with the coil will be :
(a) 10^3 (b) 10^5
(c) 99995 (d) 9995

41. In a Wheat stone's bridge, three resistances P, Q and R are connected in the three arms and the fourth arm is formed by two resistances S_1 and S_2 connected in parallel. The condition for the bridge to be balanced will be
(a) $\frac{P}{Q} = \frac{R(S_1+S_2)}{2S_1S_2}$ (b) $\frac{P}{Q} = \frac{R}{(S_1+S_2)}$
(c) $\frac{P}{Q} = \frac{2R}{(S_1+S_2)}$ (d) $\frac{P}{Q} = \frac{R(S_1+S_2)}{S_1S_2}$

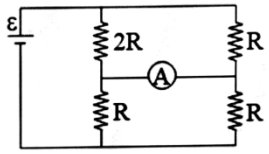
42. The resistance of a wire is 5 ohm at 50° C and 6 ohm at 100°C. The resistance of the wire at 0°C will be
(a) 2 ohm (b) 1 ohm
(c) 4 ohm (d) 3 ohm

43. A 5 V battery with internal resistance 2 Ω and a 2V battery with internal resistance 1 Ω are connected to a 10 Ω resistor as shown in the figure.



The current in the 10 Ω resistor is -
(a) 0.03 A P_1 to P_2 (b) 0.03 A P_2 to P_1
(c) 0.27 A P_1 to P_2 (d) 0.27 A P_2 to P_1

44. If ammeter has zero resistance then -



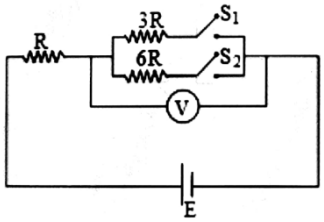
(a) Reading of ammeter is $\frac{\varepsilon}{6R}$
(b) Reading of ammeter is $\frac{\varepsilon}{7R}$
(c) Reading of ammeter is $\frac{\varepsilon}{8R}$
(d) Reading of ammeter is $\frac{\varepsilon}{9R}$

45. A parallel plate capacitor is charged up to a potential of 300 volts. Area of the plates is 100 cm^2 and spacing between them is 2 cm. If the plates are moved apart to a distance of 5 cm without disconnecting the power source, then electric field inside the capacitor is ($\varepsilon_0 = 9 \times 10^{-12}\ C^2\ N^{-1}\ m^{-2}$):
(a) 15×10^2 V/m (b) 3×10^3 V/m
(c) 12×10^3 V/m (d) 6×10^3 V/m

46. To get maximum current through a resistance of 2.5 Ω, one can use m rows of cells, each row having n cells. The internal resistance of each cell is 0.5 Ω. What are the values of n and m if the total number of cells is 45?
(a) m = 3, n = 15 (b) m = 5, n = 9
(c) m = 9, n = 5 (d) m = 15, n = 3

47. A 4μF condenser is connected in parallel to another condenser of 8μF. Both the condensers are then connected in series with a 12μF condenser and charged to 20 volts. The charge on the plate of 4μF condenser is-
(a) 3.3 μC (b) 40 μC
(c) 80 μC (d) 240 μC

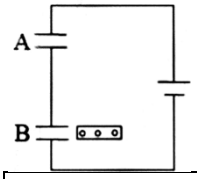
48. In the circuit shown in the figure, reading of voltmeter is V_1 when S_1 is closed, reading of voltmeter is V_2 when only S_2 is closed and reading of voltmeter is V_3 when both S_1 and S_2 are closed. Then-



(a) $V_3>V_2>V_1$ (b) $V_2>V_1>V_3$
(c) $V_3>V_1>V_2$ (d) $V_1>V_2>V_3$

49. Two cells of emf E_1 and E_2 ($E_2 > E_1$) are connected in series in a secondary circuit of a potentiometer experiment for determination of emf. The balancing length is found to be 825 cm. Now when the terminals of cell of emf E_1 are reversed, then the balancing length is found to be 225 cm. The ratio of E_1 and E_2 is, then-
(a) 2:3 (b) 4:7
(c) 7:4 (d) none of these

50. Two identical capacitors A and B connected to a battery of emf E as shown in figure. Now a dielectric slab is inserted between the plates of capacitor B while battery remains connected. Due to this inserting some physical quantities may change which are mentioned in Column-I and the effect is mentioned in Column-II. Match the Column I with Column-II



Column-I	Column-II
(a) Charge on A	(p) Increases
(b) Charge on B	(q) Decreases
(c) Potential difference across A	(r) Remains constant
(d) Potential difference across B	(s) Will change

(a) a-r; b-p; c-s; d-q (b) a-p,s; b-p,s; c-p,s; d-q,s
(c) a-r; b-p; c-q; d-q (d) a-r; b-q; c-s; d-q