BRAIN INTERNATIONAL SCHOOL

SUBJECT: PHYSICS **CLASS XII** **JULY, 2024**

CH: 2-ELECTRIC POTENTIAL AND CAPACITANCE

1. A positively charged particle is released from rest in a uniform electric field. The electric potential energy of the charge

   (a) remains a constant because the electric field is uniform.
   (b) increases because the charge moves along the electric field.
   (c) decreases because the charge moves along the electric field.
   (d) decreases because the charge moves opposite to the electric field.

2. Equipotential at a great distance from a collection of charges whose total sum is not zero are approximately

   (a) spheres.
   (b) planes.
   (c) paraboloids
   (d) ellipsoids.

3. If a conductor has a potential $V \neq 0$ and there are no charges anywhere else outside, then

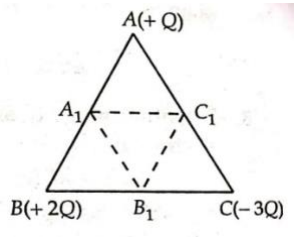
   (a) there must be charges on the surface or inside itself.
   (b) there cannot be any charge in the body of the conductor.
   (c) there must be charges only on the surface.
   (d) there must be charges inside the surface.

4. A capacitor has some dielectric between its plates, and the capacitor is connected to a DC source. The battery is now disconnected and then the dielectric is removed. State whether the capacitance, the energy stored in it, electric field, charge stored and the voltage will increase, decrease or remain constant.

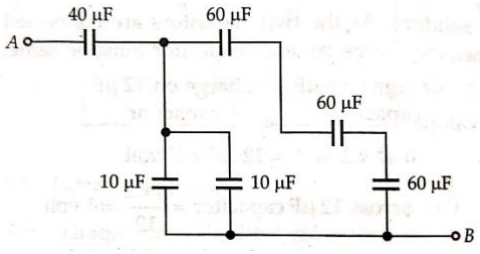
5. Calculate potential on the axis of a ring due to charge Q uniformly distributed along the ring of radius *R*.

6. An electric dipole of length 4 cm, when placed with its axis making an angle of $60°$ with a uniform electric field experiences a torque of $4\sqrt{3}$ Nm. Calculate (i) the magnitude of the electric field, (ii) potential energy of the dipole, if the dipole has charges of ± 8 nC.

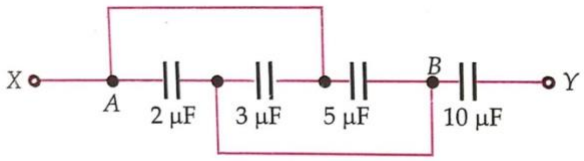
7. Three-point charges, + Q, + 2Q and – 3Q are placed at the vertices of an equilateral triangle ABC of side l. If these charges are displaced to the midpoints A_1, B_1 and C_1 respectively, find the amount of the work done in shifting the charges to the new locations.



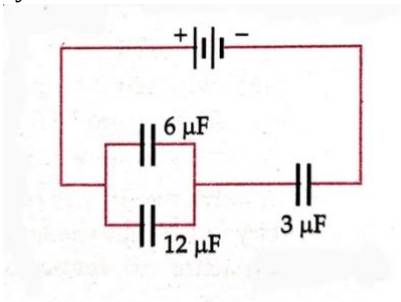
8. An electric field $\vec{E}$ =20 $\hat{\imath}$ + 30 $\hat{\jmath}$ NC^{-1} exists in free space. If the potential at the origin is taken zero, determine the potential at point (2 m, 2 m).
9. Find the equivalent capacitance of the combination of capacitors between the points A and B as shown in figure. Also calculate the total charge that flows in the circuit when a 100 V battery is connected between the points A and B.



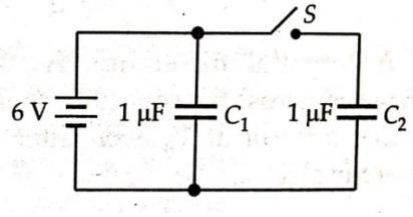
10. Four capacitors are connected as shown in the figure. Calculate the equivalent capacitance between the points X and Y.



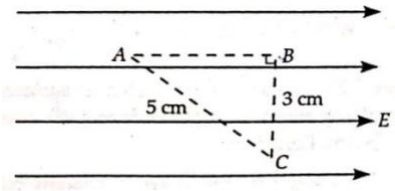
11. In the following arrangement of capacitors, the energy stored in the 6 μF capacitor is E. Find the value of the following:
    (i) Energy stored in 12 μF capacitor.
    (ii)Energy stored in 3 μF capacitor.
    (iii) Total energy drawn from the battery.



12. Figure shows two identical capacitors, C_1 and C_2, each of 1μF capacitance connected to a battery of 6V . Initially switch 'S' is closed. After some time 'S' is left open and dielectric slabs of dielectric constant κ = 3 are inserted to fill completely the space between the plates of the two capacitors. How will the (i) charge and (ii) potential difference between the plates of the capacitors be affected after the slabs are inserted?



13. Three points A, B and C lie in a uniform electric field (E) of $5 \times 10^3\ NC^{-1}$as shown in the figure.Find the potential difference between A and C.



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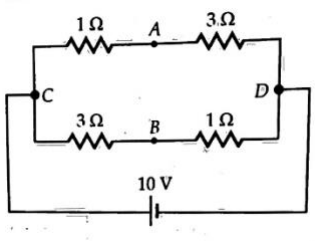
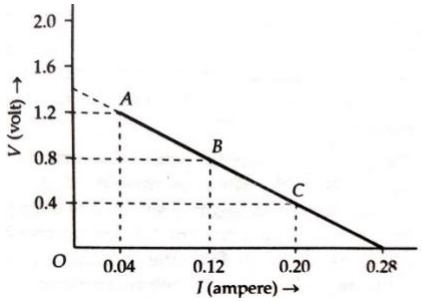
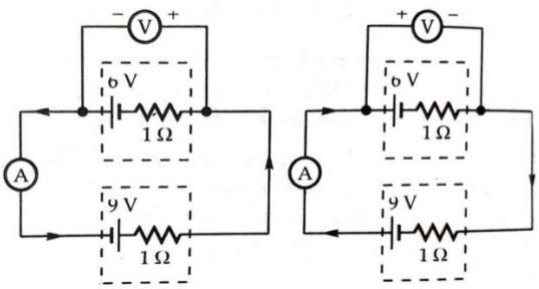
14. A battery of emf 10 V is connected to resistances as shown in figure. Find the potential difference between the points A and B.



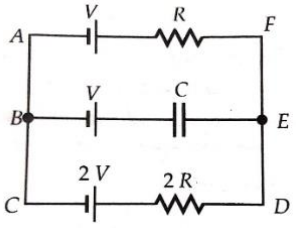
15. Potential differences across the terminals of a cell were measured (in volt) against different currents (in ampere) flowing for the cell. A graph was drawn which was a straight-line ABC as shown in figure. Determine from the graph
    a. emf of the cell
    b. maximum current obtained from the cell and
    c. internal resistance of the cell.



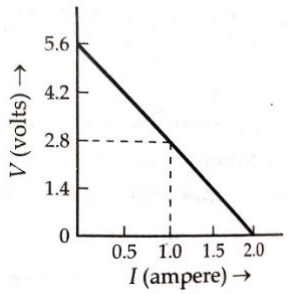
16. In the two electric circuits shown in figure, determine the readings of ideal ammeter (A) and ideal voltmeter(V).



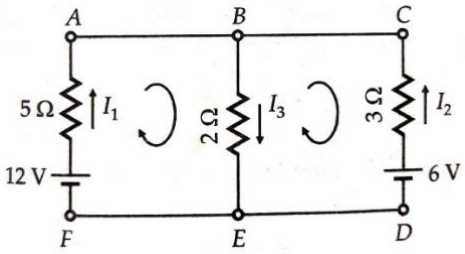
17. In the given circuit in the steady state, obtain the expression for
    d. the potential drop
    e. the charge and
    f. the energy stored in the capacitor,C.



18. 4 cells of identical emf $\boldsymbol{\varepsilon}$, internal resistance r, are connected in series to a variable resistor. The following graph shows the variation of terminal voltage of the combination with the current output.
    g. What is the emf of each cell used?
    h. For what current from the cells, does maximum power dissipation occur in the circuit?
    i. Calculate the internal resistance of a cell.



19. Using Kirchhoff's laws in the electrical network shown in figure, calculate the values of I_1, I_2 and I_3.



20. Find the potential difference across each cell and the rate of energy dissipation in R.