# Physics

| Board – CBSE | Class – 12th | Chapter – Electrostatic Potential & Capacitance |
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**Q.1.** A point charge Q is placed at point O as shown in the figure. Is the potential difference $V_A - V_B$ positive, negative or zero, if Q is


(i) positive

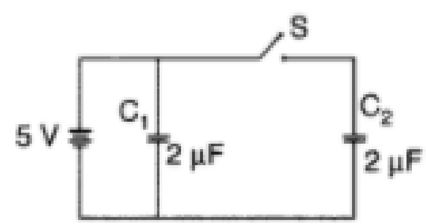
(ii) negative?

**Q.2.** Distinguish between dielectric and a conductor.

**Q.3.** (i) Can two equipotential surfaces intersect each other? Give reasons.
(ii) Two charges -q and + q are located at points A (0, 0, – a) and B (0, 0, +a) respectively. How much work is done in moving a test charge from point P (7, 0, 0) to Q (-3, 0, 0)

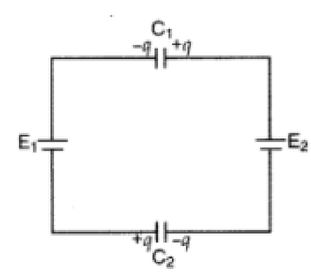
**Q.4.** Draw 3 equipotential surfaces corresponding to a field that uniformly increases in magnitude but remains constant along Z-direction. How are these surfaces different from that of a constant electric field along Z-direction?

**Q.5.** Figure shows two identical capacitors $C_1$ and $C_2$, each of 2 μF capacitance, connected to a battery of 5 V. Initially switch 'S' is left open and dielectric slabs of dielectric constant K = 5 are inserted to fill completely the space between the plates of the two capacitors. How will the charge and potential difference between the plates of the capacitors be affected after the slabs are inserted?




**Q.6.** Net capacitance of three identical capacitors in series is 1pF. What will be their net capacitance if connected in parallel? Find the ratio of energy stored in the two configurations if they are both connected to the same source.

**Q.7.** Determine the potential difference across the plates of the capacitor '$C_1$' of the network shown in the figure. [Assume $E_2 > E_1$]



**Q.8.** Why does current in a steady state not flow in a capacitor connected across a battery? However momentary current does flow during charging or discharging of the capacitor. Explain.

**Q.9.** The figure shows the field lines of a positive charge. Is the work done by the field is moving a small positive charge from Q to P positive or negative?

**Q.10.** Two charges 2μC and −2μC are placed at points A and B, 5 cm apart. Depict an equipotential surface of the system.

**Q.11.** Two-point charges 3μC and −3μC are placed at points A and B, 5 cm apart.

(i) Draw the equipotential surfaces of the system.

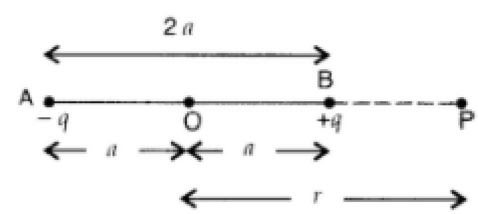
(ii) Why do equipotential surfaces get close to each other near the point charge?

**Q.12.** Find out the expression for the potential energy of a system of three charges $q_1, q_2$ and $g_3$ located at q, $r_2$ and $r_3$ with respect to the common origin 0.

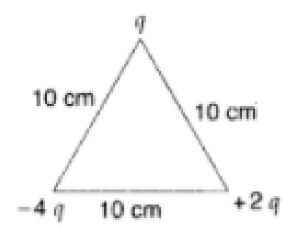
**Q.13.** (i)Can two equipotential surfaces intersect each other? Give reasons,

(ii) Two charges – q and + q are located at points **A**(0,0, −a) and B{0,0, +a ) respectively. How much work is done in moving a test charge from point P{7, 0, 0) to Q(−3, 0, 0)?

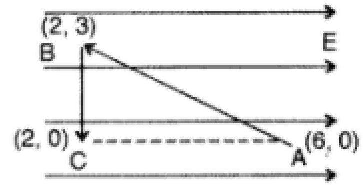
**Q.14.** Derive the expression for the electric potential at any point along the axial line of an electric dipole




**Q.15.** Calculate the work done to dissociate the system of three charges placed on the vertices of a triangle as shown.



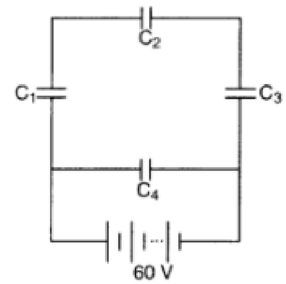
**Q.16.** A test charge 'q' is moved without acceleration from A to C along the path from A to B and then from B to C in electric field E as shown in the figure.




(i) Calculate the potential difference between A and C.

(ii) At which point (of the two) is the electric potential more and why?

**Q.17.** A network of four capacitors, each of capacitance 30 pF, is connected across a battery of 60 V as shown in the figure.
Find the net capacitance and the energy stored in each capacitor.




**Q.18.** A parallel plate capacitor of capacitance C is charged to a potential V. It is then connected to another uncharged capacitor having the same capacitance. Find out the ratio of the energy stored in the combined system to that stored initially in the single capacitor.

**Q.19.** The equivalent capacitance of the combination between A and B in the given figure is 4 μF.


(i) Calculate capacitance of the capacitor C.

(ii) Calculate charge on each capacitor if a 12 V battery is connected across terminals A and B.

(iii) What will be the potential drop across each capacitor?

**Q.20.** Two parallel plate X and Y capacitors, X and Y, have the same area of plates and same separation between them. X has air between the plates while Y contains a dielectric medium of $\varepsilon_r = 4$.

(i) Calculate capacitance of each capacitor if equivalent capacitance of the combination is 4μF.

(ii) Calculate the potential difference between the plates of X and Y.

(iii) What is the ratio of electrostatic energy stored in X and Y?

**Q.21.** A parallel plate capacitor is charged by a battery. After some time, the battery is disconnected and a dielectric slab of dielectric constant K is inserted between the plates. How would

(i) the capacitance,

(ii) the electric field between the plates and

(iii) The energy stored in the capacitor, be affected? Justify your answer.

**Q.22.** (a) Depict the equipotential surfaces for a system of two identical positive point charges placed a distance' d ' apart.

(b) Deduce the expression for the potential energy of a system of two-point charges $q_1$ and $q_2$ brought from infinity to the points $\vec{r_1}$ and $\vec{r_2}$ respectively in the presence of external electric field $\vec{\mathbf{E}}$.

**Q.23.** A parallel plate capacitor is charged to a potential difference V by a d.c. source. The capacitor is then disconnected from the source. If the distance between the plates is doubled, state with reason how the following will change;

(i) electric field between the plates,

(ii) capacitance, and

(iii) energy stored in the capacitor.

**Q.24.** Derive the expression for the capacitance of a parallel plate capacitor having plate area A and plate separation d.

**Q.25.** A network of four capacitors each of 12μF capacitance is connected to a 500 V supply as shown in the figure. Determine

(a) equivalent capacitance of the network and

(b) charge on each capacitor.