

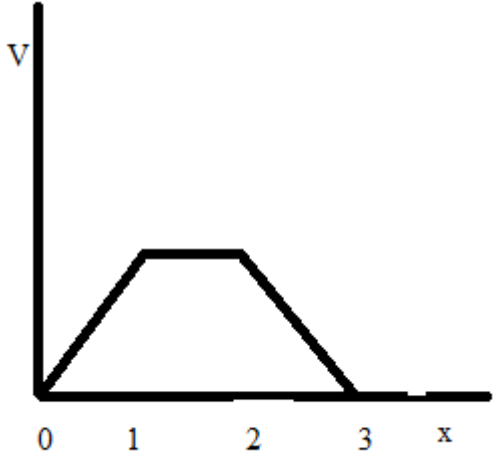


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	<p>revolving around the wire as its centre with constant velocity in a circular plane perpendicular to the wire. Deduce the expression for its kinetic energy.</p> <p>(b) Plot a graph of kinetic energy as a function of charge density λ.</p>	
14.	<p>(a) An electrostatic field line is a continuous curve. That is, a field line cannot have sudden breaks. Why is it so?</p> <p>(b) Explain why two field lines never cross each other.</p>	3
15.	<p>Two uniformly large parallel thin plates having charge densities $+\sigma$ and $-\sigma$ are kept in the X Y plane at a distance d apart. Sketch an equipotential surface due to electric field between the plates. If a particle of mass m and charge $-q$ remains stationary between the plates, what is the magnitude and direction of this field?</p>	3
16.	<p>A parallel plate is charged by a battery. When the battery remains connected, a dielectric slab is inserted in the space between the plates. Explain what changes if any occur in the values of</p> <p>(a) potential difference between plates</p> <p>(b) electric field strength between plates</p> <p>(c) capacitance</p> <p>(d) charge on the plates</p> <p>(e) energy stored in the capacitor.</p>	3
17.	<p>A capacitor of unknown capacitance is connected across a battery of v volts. The charge stored in it is $360 \mu\text{C}$. When capacitance across the capacitor is reduced by 120V, the charge stored in it becomes $120\mu\text{C}$. Calculate</p> <p>(a) The potential V and unknown capacitance C</p> <p>(b) What will be the charge stored in the capacitor, if the voltage applied has increased by 120V?</p>	3
18.	<p>Four point charges Q, q, Q and q are placed at the corners of a square of side 'a'.</p> <div style="text-align: center;"> </div> <p>Find the</p> <p>(a) Resultant electric force on charge Q</p> <p>(b) Potential energy of this system.</p> <p>(2018 CBSE question paper)</p>	3
19.	<p>(a) Three point charges $q, -4q$ and $2q$ are placed at the vertices of an equilateral triangle ABC of side 'l'. Obtain the expression for the magnitude of the resultant electric force acting on the charge q.</p> <p>(b) Find out the amount of work done to separate the charges at infinite distance.</p> <p>(2018 CBSE question paper)</p>	3
20.	<p>Define electric flux. Is it a scalar or vector quantity?</p> <p>(a) A point charge q is at a distance of $d/2$ directly above the centre of a square of side d, as shown in the figure. Use Gauss's law to obtain the expression for electric flux through the square.</p> <p>(b) If the point charge is now moved to a distance d from the centre of the square and the side of the square is doubled, explain how the electric flux will be affected?</p> <p>(2018 CBSE question paper)</p>	5
21.	<p>(a) When a parallel plate capacitor is connected across a dc battery, explain briefly how the capacitor gets charged.</p> <p>(b) A parallel plate capacitor of capacitance 'c' is charged to V volt by a battery. After sometime the battery is disconnected and the distance between the plates is doubled. Now a slab of dielectric constant $1 < k < 2$ is introduced to fill the space between the plates. How will the following be affected?</p> <p>(i) The electric field between the plates of the capacitor.</p> <p>(ii) The energy stored in the capacitor.</p> <p>(c) The electric potential as a function of distance 'x' is shown in the figure. Draw a graph of</p>	5

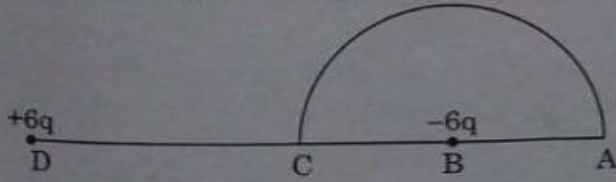


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	 <p>the electric field E as a function of x.</p> <p>(2019 CBSE question paper)</p>	
22.	<p>(a) Derive an expression for the potential energy of an electric dipole in a uniform electric field. Explain conditions for stable and unstable equilibrium.</p> <p>(b) Is the electrostatic potential necessarily zero at a point where the electric is zero? Give an example to support your answer.</p> <p>(2019 CBSE question paper)</p>	5
23.	<p>(a) An electric dipole of dipole moment \mathbf{P} is placed in a uniform electric field E at an angle θ with it. Derive the expression for torque acting on it. Find the orientation of the dipole, relative to the electric field for which torque on it is (i) maximum, and (ii) half of maximum</p> <p>(b) Two point charges $q_1 = 1\mu\text{C}$ and $q_2 = 4\mu\text{C}$ are placed 2m apart in air. At what distance from q_1 along the line joining the two charges, will the net electric field be zero?</p> <p>(2020 CBSE Question paper)</p>	5
24.	<p>Derive an expression for the energy stored in a parallel plate capacitor of capacitance C when charged up to voltage V. How is this energy stored in the capacitor?</p> <p>A capacitor $1\mu\text{F}$ is charged by connecting a battery of negligible internal resistance and emf 10V across it. Calculate the amount of charge supplied by the battery in charging the capacitor fully.</p> <p>(2020 CBSE Question paper)</p>	5
25.	<p>A particle of charge $2\mu\text{C}$ and mass 1.6g is moving with a velocity $4\hat{i}\text{ ms}^{-1}$. At $t = 0$ the particles enters in a region having an electric field E (in N C^{-1}) $= 80\hat{i} + 60\hat{j}$. Find the velocity of particle at $t = 5\text{s}$. (CBSE 2020)</p>	3
26.	<p>(a) Four point charges of $1\mu\text{C}$, $-2\mu\text{C}$, $1\mu\text{C}$ and $-2\mu\text{C}$ are placed at the corners A, B, C and D respectively, of a square of side 30 cm. Find the net force acting on a charge of $4\mu\text{C}$ placed at the centre of the square.</p> <p style="text-align: center;">OR</p> <p>(b) Three point charges, 1pC each, are kept at the vertices of an equilateral triangle of side 10 cm. Find the net electric field at the centroid of triangle.</p> <p>(CBSE – 2024)</p>	2



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27.	<p>(a) Define the term 'electric flux' and write its dimensions.</p> <p>(b) A plane surface, in shape of a square of side 1 cm is placed in an electric field $\vec{E} = \left(100 \frac{\text{N}}{\text{C}}\right) \hat{i}$ such that the unit vector normal to the surface is given by $\hat{n} = 0.8\hat{i} + 0.6\hat{k}$. Find the electric flux through the surface.</p> <p>(CBSE 2024)</p>	3
28.	<p>(i) Two point charges $5 \mu\text{C}$ and $-1 \mu\text{C}$ are placed at points $(-3 \text{ cm}, 0, 0)$ and $(3 \text{ cm}, 0, 0)$ respectively. An external electric field $\vec{E} = \frac{A}{r^2} \hat{r}$ where $A = 3 \times 10^5 \text{ Vm}$ is switched on in the region. Calculate the change in electrostatic energy of the system due to the electric field. $(3 \times 10^8 \text{ C/m})$</p> <p>(ii) A system of two conductors is placed in air and they have net charge of $+80 \mu\text{C}$ and $-80 \mu\text{C}$ which causes a potential difference of 16 V between them.</p> <ol style="list-style-type: none">Find the capacitance of the system.If the air between the capacitor is replaced by a dielectric medium of dielectric constant 3, what will be the potential difference between the two conductors ?If the charges on two conductors are changed to $+160 \mu\text{C}$ and $-160 \mu\text{C}$, will the capacitance of the system change ? Give reason for your answer. <p>CBSE 2025</p>	5
29.	<p>(i) Consider three metal spherical shells A, B and C, each of radius R. Each shell is having a concentric metal ball of radius $R/10$. The spherical shells A, B and C are given charges $+6q$, $-4q$, and $14q$ respectively. Their inner metal balls are also given charges $-2q$, $+8q$ and $-10q$ respectively. Compare the magnitude of the electric fields due to shells A, B and C at a distance $3R$ from their centres.</p> <p>(ii) A charge $-6 \mu\text{C}$ is placed at the centre B of a semicircle of radius 5 cm, as shown in the figure. An equal and opposite charge is placed at point D at a distance of 10 cm from B. A charge $+5 \mu\text{C}$ is moved from point 'C' to point 'A' along the circumference. Calculate the work done on the charge.</p> 	5

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