Topic- Electric flux

Assignment-2 **Subject- Physics**

1. The total electric flux emanating from a closed surface enclosing an alpha particle (e = electronic charge) is 1

2. Two charges $-2Q \,\&\, +Q$ are located at points $(a,0)\&(4a,0)$,respectively. What is the electric flux due to these charges through a sphere of radius $3a$ with its center at the origin? 2

3. If the radius of the Gaussian surface enclosing a charge is halved, how does the electric flux through the Gaussian surface change? 2

4. A point charge is placed at the center of a closed Gaussian spherical surface of radius r. Electric flux passing through the surface is ϕ. How is the electric flux ϕ through the surface affected when the following

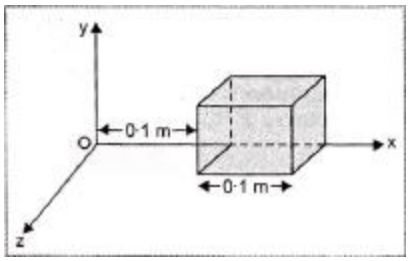
changes are made in turn:

(i) The spherical surface is replaced by a cylindrical surface of the same radius?

(ii) The point charge is replaced by an electric dipole? Justify your answer in each case. 2

5. A surface element $d\vec{s} = 5\hat{i}$ is placed in an electric field $\vec{E} = 4\hat{i} + 4\hat{j} + 4\hat{k}$. What is the electric flux emanating from the surface? 2

6. A uniformly charged conducting sphere of $2.4m$ diameter has a surface charge density of $180.0\mu Cm^{-2}$



(i) Find the charge on the sphere,

(ii) What is the total flux leaving the surface of the sphere? 3

7. The electric field components due to a charge inside the cube of side $0.1m$ are $E_x = \alpha x$, where $\alpha = 500NC^{-1}m^{-1}$, $E_y = E_z = 0$ Calculate the flux through the cube and the charge inside the cube. 3

8. Using Gauss's theorem, derive an expression for electric field intensity at a point due to an infinite plane sheet of charge. 3

9. A wire AB of length L has linear charge density $\lambda = kx$, where x is measured from the end A of the wire. This wire is enclosed by a Gaussian hollow surface. Find the expression for electric flux through the surface. 3

10. Using Gauss's theorem, derive an expression for electric field intensity at a point due to a uniformly charged thin spherical shell. 3

11. An early model for an atom considered it to have a positively charged point nucleus of charge Ze, surrounded by a uniform density of negative charge up to a radius R. The atom as a whole is neutral. For this model, what is the electric field at a distance r from the nucleus? 3

12. Using Gauss's theorem, derive an expression for electric field intensity at a point due to two parallel sheets of charge with charge densities $+\sigma \& -\sigma$. 3

13. A circular plane sheet of radius 10 cm is placed in a uniform electric field of $5\times10^{5}\,NC^{-1}$, making an angle of 60^{0} with the field. Calculate electric flux through the sheet. 3

14. Using Gauss's theorem, derive an expression for electric field intensity at a point due to a line of charge. 3

15. Two long straight parallel wires carry charges $\lambda_1 \& \lambda_2$ per unit length. The distance between them is d. Calculate the magnitude of force exerted on the length of one due to charge on the other. 3

For more questions with solution (NCERT)

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