Physicsaholics

DPP – 6 (Electrostatics)

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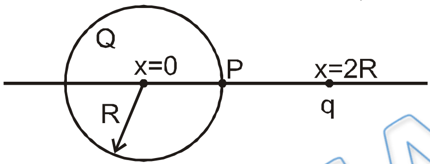
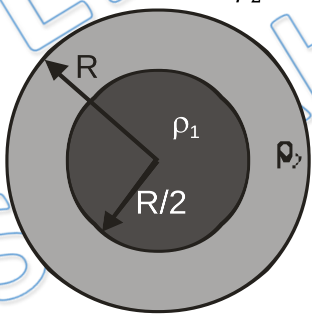
Q 1. A sphere of radius R contains a total charge +Q which is uniformly distributed throughout its volume. At a distance 2R from the centre of sphere, a particle having charge +q is fixed. P is a point on surface of sphere and lying on line joining the centre of sphere and point charge. Distance of point from P where net electric field is zero, is R/2. Then q may be



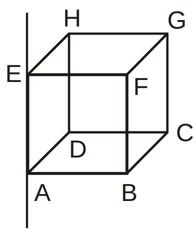
(a) $\frac{9Q}{8}$ (b) Q (c) $\frac{1}{9}$Q (d) 2Q

Q 2. Consider a solid non conducting sphere of radius R. There is uniform volume charge density ρ_1 from r = 0 to r = $\frac{R}{2}$, and from r = $\frac{R}{2}$ and r = R, the volume charge density is ρ_2. If electric field at r =$\frac{R}{2}$ and r =R have same magnitude then $\frac{\rho_1}{\rho_2}$ is :



(a) 4/1 (b) 8/3 (c) 7/3 (d) 5/4

Q 3. An infinite long line charge of charge per unit length l is passing through one the edge of a cube. Length of edge of the cube is l. Total flux linked with



(a) cube is $\frac{\lambda\ell}{2\varepsilon_0}$ (b) cube is $\frac{\lambda\ell}{4\varepsilon_0}$

(c) BCGF is $\frac{\lambda\ell}{8\varepsilon_0}$ (d) ABFE is zero

Q 4. Two point charges 4q and – q are placed at some distance. What fraction of field lines originating from 4q will terminate to q.[Assume absence of any other charge in space]

(a) 1/4 (b)3/4 (c) 1 (d) ½

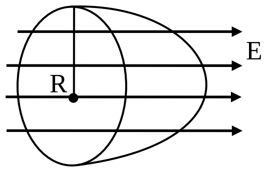
Q 5. Consider a triangular surface whose vertices are three points having co-ordinate A (2a, 0, 0), B(0, a, 0), C(0, 0, a). If there is a uniform electric field $E_0\hat{\imath} + 2E_0\hat{\jmath} + 3E_0\hat{k}$ then flux linked to triangular surface ABC is-

(a) $\frac{7E_0a^2}{2}$ (b) $3E_0a^2$ (c) $\frac{11E_0a^2}{2}$ (d) Zero

Q 6. A cylinder of radius (R) and length (L) is placed in a uniform electrical field (E) parallel to the axis of the cylinder. The total flux for the surface of the cylinder is given by –

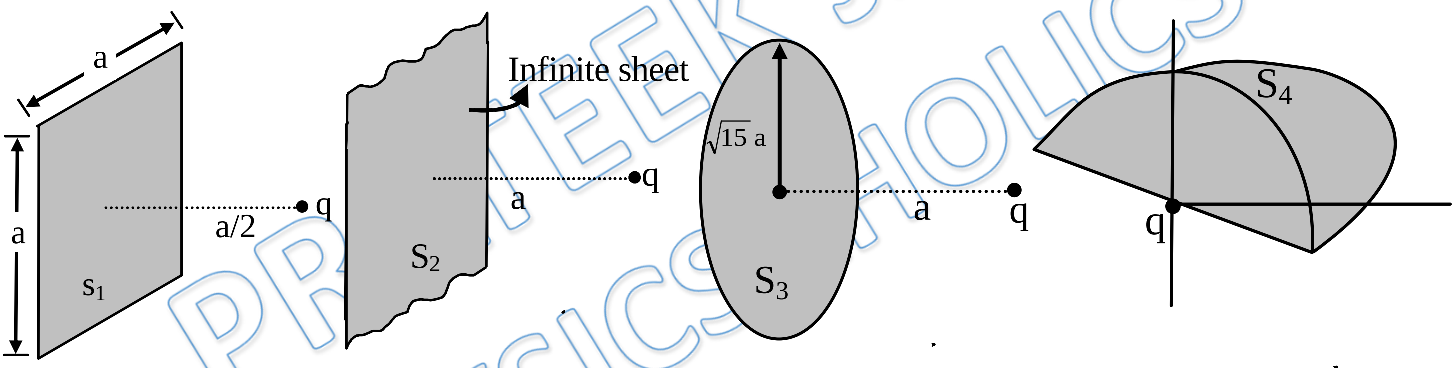
(a) $2\pi R^2E$ (b) πR^2E (c) $\frac{\pi R^2+\pi R^2}{E}$ (d) zero

Q 7. A hemisphere (radius R) is placed in electric field as shown in fig. Total outgoing flux is –



(a) πR^2E (b) $2\pi R^2E$ (c) $4\pi R^2E$ (d) $(\pi R^2E)/2$

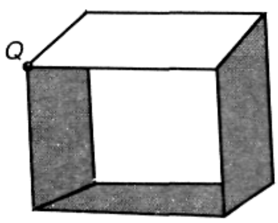
Q 8. Consider the imaginary surfaces S_1, S_2, S_3 and S_4 drawn near a point charge as shown in fig.



Column I give different surfaces and Column II corresponding electric flux. Match the entries of Column I to Column II.

Column I	**Column II**
(A) S_1	(P) $\frac{3q}{8\varepsilon_0}$
(B) S_2	(Q) $\frac{q}{2\varepsilon_0}$
(C) S_3	(R) $\frac{q}{6\varepsilon_0}$
(D) S_4	(S) $\frac{q}{4\varepsilon_0}$

Q 9. If a point charge is placed at vertex of cube then flux linked to surface shaded in figure



(a) $\frac{q}{8\varepsilon_0}$ (b) $\frac{q}{3\varepsilon_0}$ (c) $\frac{q}{12\varepsilon_0}$ (d) Zero

Q 10. In a region of space, the electric field is in the x-direction and proportional to x, i.e., $\vec{E} = E_0 x\hat{i}$. Consider an imaginary cubical volume of edge a, with its edges parallel to the axes of coordinates. The charge inside this volume is

(a) zero (b) $\varepsilon_0 E_0 a^3$ (c) $\frac{1}{\varepsilon_0} E_0 a^3$ (d) $\frac{1}{6}\varepsilon_0 E_0 a^2$

Q 11. Charges Q_1 and Q_2 are inside and outside respectively of a closed surface *S*. Let *E* be the field at any point on *S* and ϕ be the flux of *E* over *S*. Then choose the correct statements

(a) if Q_1 changes both and *E* and ϕ will change

(b) if Q_2 changes, *E* will change but ϕ will not change

(c) if $Q_1 = 0$ and $Q_2 = 0$, then $E \neq 0$ but $\phi = 0$

(d) if $Q_1 = 0$ and $Q_2 = 0$, then $E = 0$ and $\phi = 0$

Q 12. In a spherical volume of radius R , volume charge density $\rho = r^3$ (where r is distance from centre). Electric Field at distance r (r < R) from centre is

(a) $\frac{r^4}{5\varepsilon_0}$ (b) $\frac{r^4}{4\varepsilon_0}$ (c) $\frac{r^4}{6\varepsilon_0}$ (d) $\frac{r^4}{3\varepsilon_0}$

Q 13. In a nonuniformly charged solid sphere of radius R electric field at distance r from centre is E $= r^2$ in radially outward direction. Charge density at distance r from centre (r < R) is

(a) $\varepsilon_0 r$ (b) $4\varepsilon_0 r$ (c) $2\varepsilon_0$ (d) $\varepsilon_0 r^2$

Answer Key

Q.1 a, c	**Q.2 c**	**Q.3 b, c, d**	**Q.4 a**	**Q.5 c**
Q.6 d	**Q.7 a**	**Q.9 c**	**Q.10 b**	**Q.11 a, b, d**
Q.12 c	**Q.13 b**			

Q.8 A → R; B → Q; C → P; D → S