Multiple Choice Questions

Chapter 1. Electric Charges and Fields

1. A rectangular frame of area 10 m^2 is placed in a uniform electric field of 20 NC^{-1}, with normal drawn on the surface of the frame making 60° angle with the direction of field. The electric flux through the frame is :

   (a) 100 Vm (b) 200 Vm (c) $50\sqrt{3}$ Vm (d) $100\sqrt{3}$ Vm

2. A charge Q is enclosed by a Gaussian spherical surface of radius R. If the radius is doubled then the outward electric flux will :

   (a) be doubled (b) increase four times

   (c) be reduced half (d) remains the same

3. The work done in taking a charge q one round a circle of radius r having a charge Q at the centre is :

   (a) $\frac{qQ}{4\pi\varepsilon_0 r}$ (b) $\frac{qQ}{4\pi\varepsilon_0 r^2}$ (c) $\frac{qQ}{4\pi\varepsilon_0}(2\pi r)$ (d) Zero.

4. A charge placed at a distance from an electric dipole in the end-on position experiences a force F. If the distance be doubled, the force will become :

   (a) 2 F (b) F/2 (c) F/4 (d) F/8

5. Two point charges $(+e)$ and $(-e)$ are kept inside a large metallic cube without touching its sides. Electric flux emerging out of the cube is :

   (a) $\frac{e}{\varepsilon_0}$ (b) $\frac{-e}{\varepsilon_0}$ (c) Zero (d) $\frac{2e}{\varepsilon_0}$

6. A soap bubble is given a negative charge. Then its radius :

   (a) decreases (b) increases (c) remains unchanged (d) None of the above

7. Relative permittivity of water is 81. If ε_w and ε_0 are permittivities of water and vacuum respectively, then :

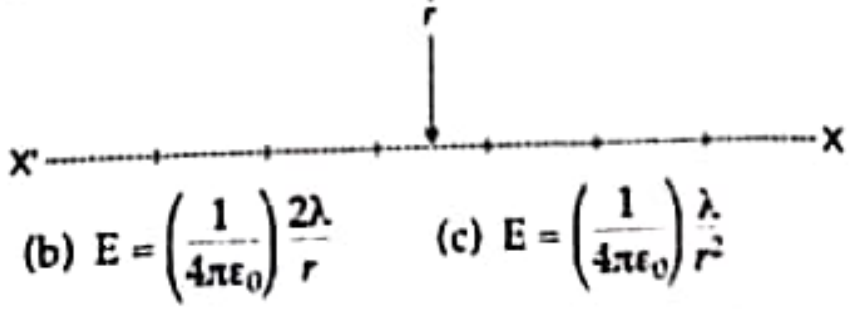
   (a) $\varepsilon_0 = 9\varepsilon_w$ (b) $\varepsilon_0 = 81\varepsilon_w$ (c) $\varepsilon_w = 9\varepsilon_0$ (d) $\varepsilon_w = 81\varepsilon_0$

8. A body has a positive charge of 8×10^{-19} C. It has :

   (a) an excess of 5 electrons (b) a deficiency of 5 electrons

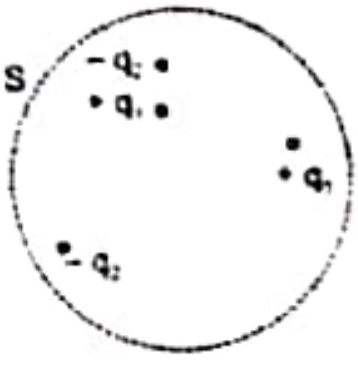
   (c) an excess of 8 electrons (d) a deficiency of 8 electrons

9. Electric field intensity, 'E' at a point P (Figure) at a perpendicular distance 'r' from an infinitely long line X'X having linear charge density λ is given by :



   (a) $E = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{2\lambda}{r^2}$ (b) $E = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{2\lambda}{r}$ (c) $E = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{\lambda}{r^2}$ (d) $E = \left(\frac{1}{4\pi\varepsilon_0}\right)\frac{\lambda}{r}$

10. Electric charges q_1, $-q_1$, $+q_2$ and $-q_2$ are placed in free space and S is a spherical Gaussian surface. The electric flux passing over the surface S is :



   (a) due to $+q_2$ only

   (b) due to all charges

   (c) zero

   (d) due to positive charge only

11. What is the locus of an electron projected perpendicular to a uniform electric field ?
(a) Circle (b) Parabola (c) Ellipse (d) Hyperbola

12. Gauss's theorem states that :
(a) Electric flux $= \frac{q}{\varepsilon_0}$ (b) Electric potential $= \varepsilon p$
(c) Electric field intensity $= \varepsilon_0 q$ (d) None of these

13. When 10^{14} electrons are removed from a neutral metal sphere, the charge on the sphere becomes :
(a) 16 μC (b) 32 μC (c) – 32 μC (d) – 16 μC

14. Two positive point charges are 3 m apart and their combined charge is 20 μC. If the force between them is 0.075 N, then the charges are :
(a) 10 μC, 10 μC (b) 15 μC, 5 μC (c) 12 μC, 8 μC (d) 14 μC, 6μC

15. If an electron has an initial velocity in a direction different from that of an electric field, the path of the electron is :
(a) a straight line (b) a circle (c) an ellipse (d) a parabola

16. If a dipole of dipole moment $\vec{p}$ is placed in a uniform electric field $\vec{E}$, then forque acting on it is given by :
(a) $\vec{\tau} = \vec{p}\,\vec{E}$ (b) $\vec{\tau} = \vec{p} + \vec{E}$ (c) $\vec{\tau} = \vec{p} \times \vec{E}$ (d) $\vec{\tau} = \vec{p} - \vec{E}$

17. The angle between the dipole moment and electric field at any point on the equatorial plane is :
(a) 180° (b) 0° (c) 45° (d) 90°

18. The surface considered for Gauss's law is called :
(a) Closed surface (b) Spherical surface (c) Gaussion surface (d) Plane surface

19. Debye is the unit of :
(a) Electric flux (b) Torque
(c) Electric dipole moment (d) None of these

20. If the charge on an object is halved then electric field becomes :
(a) half (b) double (c) unchanged (d) thrice