DPP

DAILY PRACTICE PROBLEMS

Class : XIIth **Subject : PHYSICS**
Date : **DPP No. : 1**

Topic :-Electric charges and fields

1. Charge $q_1 = +6.0$ nC is on Y-axis at y=+3 cm and charge q_2 =-6.0 nC is on Y-axis at y=-3 cm calculate force on a test charge $q_0 = 2$nC placed on X-axis at x=4 cm.
   a) $-51.8\,\hat{j}\mu N$ b) $+51.8\,\hat{j}\mu N$ c) $-5.18\,\hat{j}\mu N$ d) $5.18\,\hat{j}\mu N$

2. The electric intensity outside a charged sphere of radius R at a distance $r(r > R)$ is
   a) $\frac{\sigma R^2}{\varepsilon_0 r^2}$ b) $\frac{\sigma r^2}{\varepsilon_0 R^2}$ c) $\frac{\sigma r}{\varepsilon_0 R}$ d) $\frac{\sigma R}{\varepsilon_0 r}$

3. An uniform electric field E exists along positive x-axis. The work done in moving a charge 0.5 C through a distance 2 m along a direction making an angle 60^o with x-axis is 10 J. Then the magnitude of electric field is
   a) 5 Vm^{-1} b) 2 Vm^{-1} c) $\sqrt{5}Vm^{-1}$ d) 20 Vm^{-1}

4. 64 small drops of mercury, each of radius r and charge q coalesce to form a big drop. The ratio of the surface density of charge of each small drop with that of the big drop is
   a) 1 : 64 b) 64 : 1 c) 4 : 1 d) 1 : 4

5. Two point charges 100 μC and 5 μC are placed at points A and B respectively with $AB = 40\ cm$. The work done by external force in displacing the charge 5 μC from B to C, where $BC = 30cm$, angle $ABC = \frac{\pi}{2}$ and $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 Nm^2/C^2$
   a) 9 J
   b) $\frac{81}{20}J$
   c) $\frac{9}{25}J$
   d) $-\frac{9}{4}J$

6. An electric dipole is placed at an angle of 60^0 with an electric field of intensity 10^5 NC^{-1}. It experiences a torque equal to $8\sqrt{3}$ Nm. Calculate the charge on the dipole, if the dipole length is 2 cm.

a) -8×10^3 C b) 8.54×10^{-4} C c) 8×10^{-3} C d) 0.85×10^{-6} C

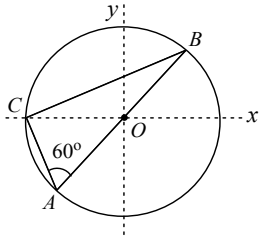
7. A sphere of 4 cm radius is suspended within a hollow sphere of 6 cm radius. The inner sphere is charged to potential 3 $e.s.u.$ and the outer sphere is earthed. The charge on the inner sphere is
a) $54 e.s.u.$
b) $1/4 e.s.u.$
c) $30 e.s.u.$
d) $36 e.s.u.$

8. The angle subtended by a circular disk of diameter 2 cm at a distance 1000 cm from your eye is
a) 0.2^o b) 0.002^o c) 0.11^o d) 0.22^o

9. Given that $q_1 + q_2 = q$. For what ratio q_1/q will the force between q_1 and q_2 be maximum?
a) 0.25 b) 0.5 c) 1 d) 2

10. Two plates are at potentials $-10\ V$ and $+30\ V$. If the separation between the plates be 2 cm. The electric field between them is
a) $2000\ V/m$ b) $1000\ V/m$ c) $500\ V/m$ d) $3000\ V/m$

11. Consider a system of three charges $\frac{q}{3}, \frac{q}{3}$ and $-\frac{2q}{3}$ placed at points A, B and C, respectively, as shown in the figure. Take O to be the centre of the circle of radius R and angle $CAB = 60^o$



a) The electric field at point O is $\frac{q}{8\pi\varepsilon_0 R^2}$ directed along the negative $x-$ axis
b) The Potential energy of the system is zero
c) The magnitude of the force between the charges at C and B is $\frac{q^2}{54\pi\varepsilon_0 R^2}$
d) The potential at point O is $\frac{q}{12\pi\varepsilon_0 R}$

12. There is a uniform electric field of strength $10^3 V/m$ along y-axis. A body of mass $1g$ and charge $10^{-6}C$ is projected into the field from origin along the positive x-axis with a velocity $10m/s$. Its speed in m/s after $10s$ is (Neglect gravitation)

a) 10 b) $5\sqrt{2}$ c) $10\sqrt{2}$ d) 20

13. A cylindrical capacitor has charge Q and length L. If both the charge and length of the capacitor are doubled, by keeping other parameters fixed, the energy stored in the capacitor

a) Remains same b) Increases two times c) Decreases two times d) Increases four times

14. The electrostatic potential inside a charged spherical ball is given by $\phi = ar^2 + b$ where r is the distance from the centre a, b are constants. Then the charge density inside the ball is

a) $-6a\varepsilon_0 r$ b) $-24\pi a\varepsilon_0$ c) $-6a\varepsilon_0$ d) $-24\pi a\varepsilon_0 r$

15. Can a metal be used as a medium for dielectric

a) Yes b) No

c) Depends on its shape d) Depends on dielectric

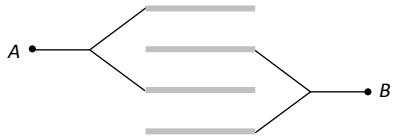
16. The electric potential V is given as a function of distance x(metre) by $V = (5x^2 + 10x - 9) volt$. Value of electric field at $x = 1$ is

a) $-20V/m$ b) $6V/m$ c) $11V/m$ d) $-23V/m$

17. The work done in carrying a charge of $5\mu C$ from a point A to a point B in an electric field is $10mJ$. The potential difference $(V_B - V_A)$ is then

a) $+2kV$ b) $-2\ kV$ c) $+200\ V$ d) $-200\ V$

18. Four plates of the same area of cross-section are joined as shown in the figure. The distance between each plate is d. The equivalent capacity across A and B will be



a) $\frac{2\varepsilon_0 A}{d}$ b) $\frac{3\varepsilon_0 A}{d}$ c) $\frac{3\varepsilon_0 A}{2d}$ d) $\frac{\varepsilon_0 A}{d}$

19. A hollow conducting sphere of radius R has a charge $(+Q)$ on its surface. What is the electric potential within the sphere at a distance $r = R/3$ from its centre

a) Zero b) $\frac{1}{4\pi\varepsilon_0}\frac{Q}{r}$ c) $\frac{1}{4\pi\varepsilon_0}\frac{Q}{R}$ d) $\frac{1}{4\pi\varepsilon_0}\frac{Q}{r^2}$

20. The capacity of a spherical conductor in MKS system is

a) $\frac{R}{4\pi\varepsilon_0}$ b) $\frac{4\pi\varepsilon_0}{R}$ c) $4\pi\varepsilon_0 R$ d) $4\pi\varepsilon_0 R^2$