DPP

DAILY PRACTICE PROBLEMS

Class : XIIth **Subject : PHYSICS**
Date : **DPP No. : 10**

Topic :-Electric charges and fields

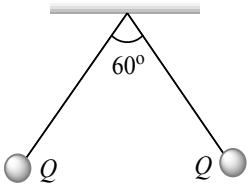
1. Two pint charges + 8q and -2q are located at $x = 0$ and $x = L$ respectively. The location of a point on the x- axis at which the net electric field due to these two point charges is zero is

   a) 2L b) L/4 c) 8L d) 4L

2. Two long conductors, separated by a distance d carry currents I_1 and I_2 in the same direction. They exert a force F on each other. Now the current in one of them is increased to two times and its direction is reversed. The distance is also increased to $3d$. The new value of the force between them is

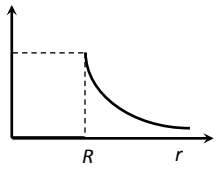
   a) $-2F$ b) $F/3$ c) $-2F/3$ d) $-F/3$

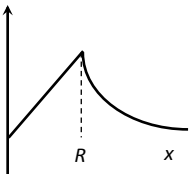
3. Two small spherical balls each carrying a charge $Q = 10\mu C$ ($10\ micro - coulomb$) are suspended by two insulating threads of equal lengths $1m$ each, from a point fixed in the ceiling. It is found that in equilibrium threads are separated by an angle 60^o between them, as shown in the figure. What is the tension in the threads (Given :$\frac{1}{(4\pi\varepsilon_0)} = 9 \times 10^9 Nm/C^2$)

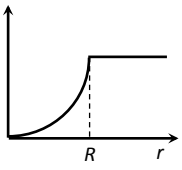


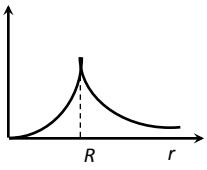
   a) 18 N b) 1.8 N c) 0.18 N d) None of the above

4. Which of the following graphs shows the variation of electric field E due to a hollow spherical conductor of radius R as a function of distance from the centre of the sphere

a) 

b) 

c) 

d) 

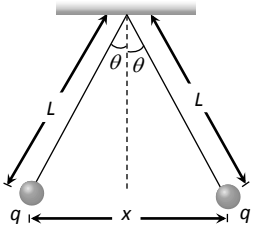
5. In infinite parallel plane sheet of a metal is charged to charge density σ coulomb per square metre in a medium of dielectric constant$K$. Intensity of electric field near the metallic surface will be

a) $E = \frac{\sigma}{\varepsilon_0 K}$ b) $E = \frac{K}{3\varepsilon_0}$ c) $E = \frac{\sigma}{2\varepsilon_0 K}$ d) $E = \frac{K}{2\varepsilon_0}$

6. A negatively charged plate has charge density of $2 \times 10^{-6} C/m^2$. The initial distance of an electron which is moving towards the plate, cannot strike the plate, if it is having energy of $200eV$

a) 1.77 mm b) 3.51 mm c) 1.77 cm d) 3.51 cm

7. In the given figure two tiny conducting balls of identical mass m and identical charge q hang from non-conducting threads of equal length L. Assume that θ is so small that $\tan\theta \approx \sin\theta$, then for equilibrium x is equal to



a) $\left(\frac{q^2 L}{2\pi\varepsilon_0 mg}\right)^{\frac{1}{3}}$ b) $\left(\frac{qL^2}{2\pi\varepsilon_0 mg}\right)^{\frac{1}{3}}$ c) $\left(\frac{q^2 L^2}{4\pi\varepsilon_0 mg}\right)^{\frac{1}{3}}$ d) $\left(\frac{q^2 L}{4\pi\varepsilon_0 mg}\right)^{\frac{1}{3}}$

8. An electric dipole in a uniform electric field experiences (When it is placed at an angle θ with the field)

a) Force and torque both b) Force but no torque
c) Torque but no force d) No force and no torque

9. In a parallel plate capacitor the separation between the plates is 3 mm with air between them. Now a $1mm$ thick layer of a material of dielectric constant 2 is introduced between the plates due to which the capacity increases. In order to bring its capacity to the original value the separation between the plates must be made

a) 1.5 mm b) 2.5 mm c) 3.5 mm d) 4.5 mm

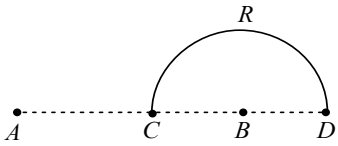
10. Two point charges $+9e$ and $+e$ are at 16 cm away from each other. Where should another charge q be placed between them so that the system remains in equilibrium

a) 24 cm from $+9e$
b) 12 cm from $+9e$
c) 24 cm from $+e$
d) 12 cm from $+e$

11. A cylinder of radius r and length l is placed in an uniform electric field E parallel to the axis of the cylinder. The total flux for the surface of the cylinder is given by

a) Zero b) $2\pi r^2 E$ c) $\pi r^2 E$ d) $(\pi r^2 + \pi l^2)E$

12. Charges $+q$ and $-q$ are placed at point A and B respectively which are a distance $2L$ apart, C is the midpoint between A and B. The work done in moving a charge $+Q$ along the semicircle CRD is



a) $\frac{qQ}{4\pi \in_0 L}$ b) $\frac{qQ}{2\pi \in_0 L}$ c) $\frac{qQ}{6\pi \in_0 L}$ d) $-\frac{qQ}{6\pi \in_0 L}$

13. The energy required to charge a parallel plate condenser of plate separation d and plate area of cross-section A such that the uniform electric field between the plates is E, is

a) $\in_0 E^2 Ad$ b) $\frac{1}{2} \in_0 E^2 Ad$ c) $\frac{1}{2} \in_0 E^2/A.d$ d) $\in_0 E^2/Ad$

14. Two capacitors each of $1\mu F$ capacitance are connected in parallel and are then charged by 200 $volts$ $d.c.$ supply. The total energy of their charges (in joules) is

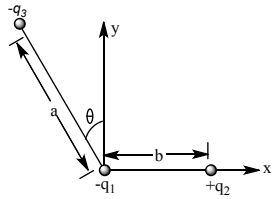
a) 0.01 b) 0.02 c) 0.04 d) 0.06

15. The electric field near a conducting surface having a uniform surface charge density σ is given by

a) $\frac{\sigma}{\varepsilon_0}$ and is parallel to the surface b) $\frac{2\sigma}{\varepsilon_0}$ and is parallel to the surface

c) $\frac{\sigma}{\varepsilon_0}$ and is normal to the surface d) $\frac{2\sigma}{\varepsilon_0}$ and is normal to the surface

16. Three charges $-q_1 + q_2$ and $-q_3$ are placed as shown in the figure. The $x-$component of the force on $-q_1$ is proportional to



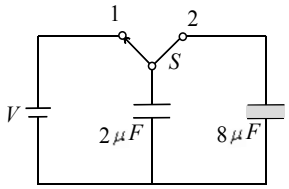
a) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\cos\theta$ b) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\sin\theta$ c) $\frac{q_2}{b^2} + \frac{q_3}{a^2}\cos\theta$ d) $\frac{q_2}{b^2} - \frac{q_3}{a^2}\sin\theta$

17. Top of the stratosphere has an electric field E (in units of V/m) nearly equal to

a) 0 b) 10 c) 100 d) 1000

18. A $2\mu F$ capacitor is charged as shown in figure. The percentage of its stored energy dissipated

after the switch S is turned to position 2 is



a) 0% b) 20% c) 75% d) 80%

19. Electric field strength due to a point charge of 5 μC at a distance of 80 cm from the charge is
a) $8 \times 10^4 N/C$ b) $7 \times 10^4 N/C$ c) $5 \times 10^4 N/C$ d) $4 \times 10^4 N/C$

20. A given charge situated at a certain distance from an electric dipole in the end on opposition, experiences a force F. If the distance of charge is doubled, the force acting on the charge will be
a) 2 F b) $F/2$ c) $F/4$ d) $F/8$