Physicsaholics

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Q 1. A system has two charges $q_A = 2.5 \times 10^{-7} C$ and $q_B = -2.5 \times 10^{-7} C$ located at points A(0,0,-0.15m) and B(0,0,+0.15) respectively. What is the electric dipole moment of the system?
(a) 7.5×10^{-8} C-m
(b) 2.5×10^{-8} C-m
(c) 0.15×10^{-8} C-m
(d) 7.5×10^{-5} C-m

Q 2. Three charges of +2q, -q, -q are placed at the corners A, B and C of an equilateral triangle of side a as shown in the adjoining figure. Determine the dipole moment of this combination:
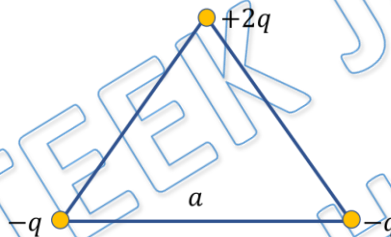
(a) $2\sqrt{3}qa$
(b) $\sqrt{3}qa$
(c) $2qa$
(d) $\sqrt{2}qa$

Q 3. An electric dipole is placed along the x-axis centered at the origin O. A point P at a distance 20cm from the origin such that OP makes an angle $\frac{\pi}{3}$ with the x-axis. if electric field at P makes an angle ϕ with the x-axis, the value of ϕ would be:
(a) $\frac{\pi}{3} + \tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$
(b) $\frac{\pi}{3}$
(c) $\frac{2\pi}{3}$
(d) $\tan^{-1}\left(\frac{\sqrt{3}}{2}\right)$

Q 4. Electric field lines in which an electric dipole P is placed as shown. Which of the following statements is correct?
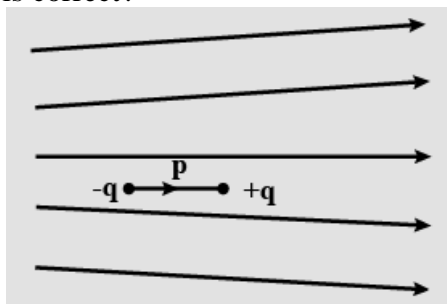
(a) The dipole will not experience any force.
(b) The dipole will experience a force towards right
(c) The dipole will experience a force towards left
(d)The dipole will experience a force upwards

Q 5. A and B are two points on the axis and the perpendicular bisector, respectively, of an electric dipole. A and B are far away from the dipole and at equal distances from it. The fields at A and B are $\vec{E_A}$ and $\vec{E_B}$. Then:

(a) $\vec{E_A} = \vec{E_B}$

(b) $\vec{E_A} = 2\vec{E_B}$

(c) $\vec{E_A} = -2\vec{E_B}$

(d) None of these

Q 6. Two charges +10 μC and -10 μC are held 2 cm apart. Calculate the electric field at a point on the equatorial line at a distance of 50 cm from the centre of the dipole:

(a) $1.44 \times 10^4\ N/C$

(b) $3.44 \times 10^4\ N/C$

(c) $1.88 \times 10^4\ N/C$

(d) $2.44 \times 10^5\ N/C$

Q 7. The electric force on a point charge situated on the axis of a short dipole is F. If the charge is shifted along the axis to double the distance, the electron force acting will be:

(a) 4F

(b) F/2

(c) F/4

(d) F/8

Q 8. What is the electric field intensity at a point at a distance 20 cm on a line making an angle of 45° with the axis of the dipole of moment 10 C-m?

(a) 1.77×10^{13} V/m

(b) 0.177×10^{13} V/m

(c) 17.7×10^{13} V/m

(d) 177×10^{13} V/m

Q 9. An electric dipole with dipole moment 4×10^{-9} C m is aligned at 30° with the direction of a uniform electric field of magnitude 5×10^4 N C^{-1}. Calculate the magnitude of the torque acting on the dipole:

(a) 10^{-4} Nm

(b) 10^4 Nm

(c) 2×10^{-4} Nm

(d) 2×10^4

Q 10. An electric dipole of length 2 cm, when placed with its axis making an angle of 60^0 with a uniform electric field, experiences a torque of $8\sqrt{3}$ Nm. Calculate the potential energy of the dipole, if it has a charge of $\pm 4nC$

(a) -8 joule

(b) 8 joule

(c) -16 joule

(d) 16 joule

Q 11. An electric dipole moment $\vec{P} = (2\hat{\imath} + 3\hat{\jmath})\mu Cm$ is placed in a uniform electric field $\vec{E} = (3\hat{\imath} + 2\hat{k}) \times 10^5\ NC^{-1}$:

(a) The torque that $\vec{E}$ exerts on $\vec{P}$ is $(0.6\hat{\imath} - 0.4\hat{\jmath} - 0.9\hat{k})Nm$

(b) The potential energy of the dipole is -0.6J

(c) Both (a) and (b)

(d) The potential energy of the dipole is 0.9J

Q 12. Two dipoles each of moment 5×10^{-12}C-m form a cross with their axis (- to +) along the coordinate axes. The potential at a point 20cm away in a direction making an angle of 30^0 with x-axis is (if the potential at an infinite distance is taken to be zero):

(a) 1.12 V   (b) 2.12 V   (c) 2.4 V   (d) 1.536 V

Q 13. What is the electric potential at a point distant 100 cm from the centre of an electric dipole of moment 2×10^{-4} C-m on a line making an angle of 60° with the axis of dipole?
(a) 7×10^5 V
(b) 8×10^5 V
(c) 9×10^5 V
(d) 10×10^5 V

Q 14. A short electric dipole has dipole moment of 4×10^{-9} C-m. Determine the electric potential due to the dipole at a point distant 0.3 m from the centre of the dipole situated on
(1) the axial line (V_1),
(2) on equatorial line (V_2)
(a) $V_1 = 400\,V, V_2 = 0\,V$
(b) $V_1 = 400\,V, V_2 = 200\,V$
(c) $V_1 = 400\,V, V_2 = 20\,V$
(d) $V_1 = 400\,V, V_2 = -200\,V$

Q 15. Two short dipoles, each of dipole moment P are placed at a large separation r. The force between them:
(a) is proportional to product of dipole momenta
(b) is inversely proportional to r^4
(c) the force is attractive, if direction of dipole momenta is same, repulsive if opposite
(d) all options are correct

Q 16. An electric dipole consists of two opposite charges of magnitude $1\mu C$ separated by a distance of 2cm. The dipole is placed in an electric field $10^{-5}\,Vm^{-1}$. The maximum torque that the field exerts on the dipole is:
(a) $10^{-3}\,Nm$
(b) $2 \times 10^{-13}\,Nm$
(c) $3 \times 10^{-3}\,Nm$
(d) $4 \times 10^{-3}\,Nm$

Answer Key

Q.1 a	Q.2 b	Q.3 a	Q.4 c	Q.5 c
Q.6 a	Q.7 d	Q.8 a	Q.9 a	Q.10 a
Q.11 c	Q.12 d	Q.13 c	Q.14 a	Q.15 d
Q.16 b				