JEEt Lo 2021

PHYSICS

GRADE - 12

• LIVE

ELECTRIC DIPOLE

(Moment +Torque+ Energy)

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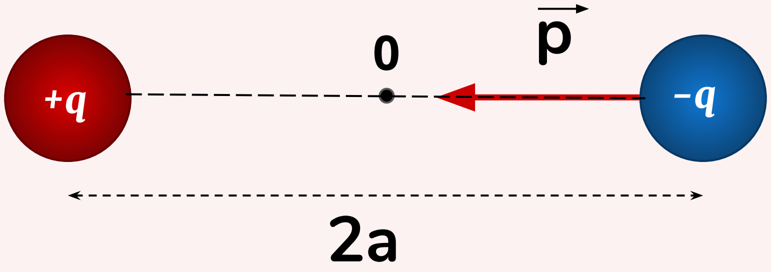
Electric dipole
(moment + torque + energy)

Lesson plan

- ➔ Dipole moment
- ➔ Torque
- ➔ Potential energy

Electric dipole

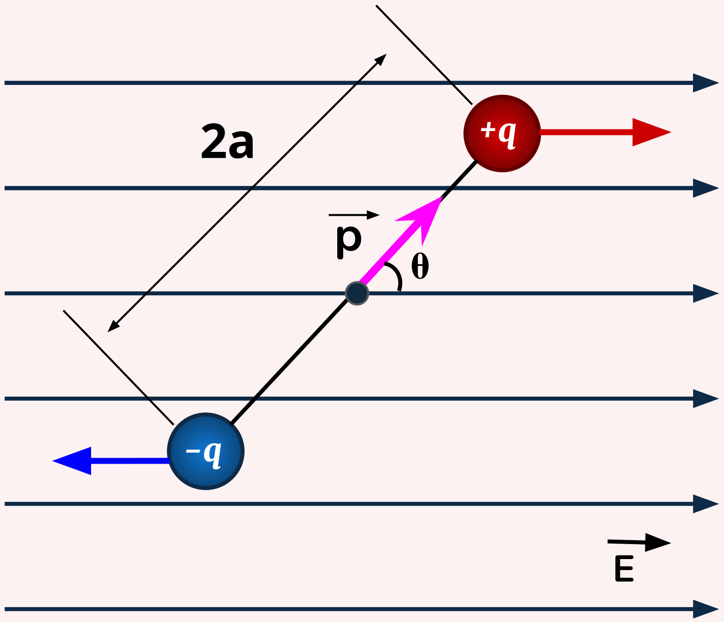
Two equal and opposite charges separated by a small distance is called electric dipole



Dipole moment:

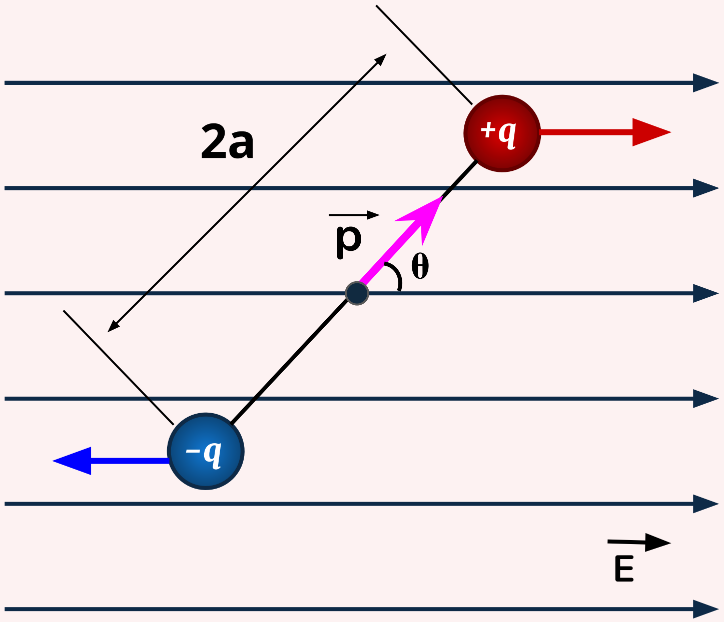
$$p = q\,(2a)$$

Electric dipole in a uniform field



Torque

Electric dipole in a uniform field



Potential energy

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An electric dipole is kept in non-uniform electric field. It experiences

A. A force and a torque

B. A force but not a torque

C. A torque but not a force

D. Neither a force nor a torque

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, -0.15 m) and B; (0, 0, +0.15 m), respectively. What is the net charge and electric dipole moment of the system?

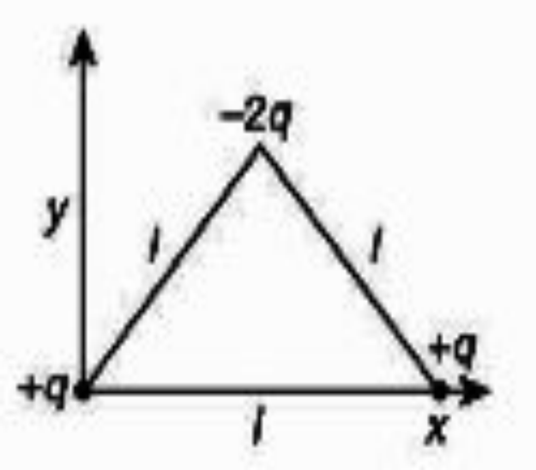
Determine the electric dipole moment of the system of three charges, placed on the vertices of an equilateral triangle, as shown in the figure
(jee 2019)

A $\sqrt{3}gl\frac{\hat{j}-\hat{i}}{\sqrt{2}}$

B $(ql)\frac{\hat{i}+\hat{j}}{\sqrt{2}}$

C $2ql\hat{j}$

D $-\sqrt{3}ql\hat{j}$



An electric dipole consisting of two opposite charges of 2×10^{-6} C each separated by a distance of 3 cm is placed in an electric field of 2×10^{5} N/C. The maximum torque on the dipole will be

A. 12×10^{-1} Nm

B. 12×10^{-3} Nm

C. 24×10^{-1} Nm

D. 24×10^{-3} Nm

For a dipole q = 2 x 10^{-6} C and d =0.01m. Calculate the maximum torque for this dipole if E = 5 x 10^{5} N/C

A 1 x 10^{-3} Nm^{-1}

B 10 x 10^{-3} Nm^{-1}

C 10 x 10^{-3} Nm

D 1 x 10^{2} Nm^{2}

An electric dipole of moment $\vec{p}$ is placed normal to the lines of force of electric intensity $\vec{E}$, then the work done in deflecting it through an angle of 180^0 is

A pE

B +2pE

C -2pE

D Zero

An electric dipole of length 1 cm is placed with the axis making an angle of 30^0 to an electric field of strength 10^4 NC^{-1}. If it experiences a torque of $10\sqrt{2}$ Nm, the potential energy of the dipole is:

A. 0.245 J

B. 0.0245 J

C. 245.0 J

D. 24.5 J

Q. Two charges $+3.2 \times 10^{-19}$ C and -3.2×10^{-19} C kept 2.4 m apart forms a dipole. If it kept in uniform electric field of intensity 4×10^{-5} volt/m then what will be its electrical energy in equilibrium

(Homework Question)

A $+3 \times 10^{-23}$ J

B -3×10^{-23} J

C -6×10^{-23} J

D -2×10^{-23} J

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