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QUESTION 1

Choose the correct answer.

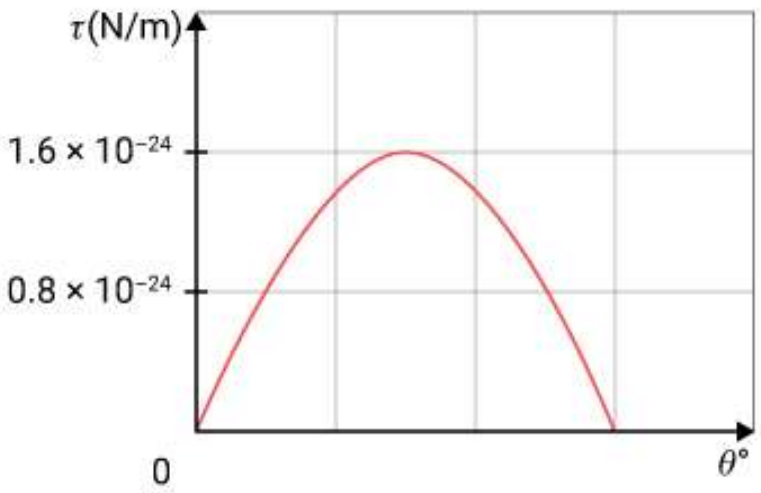
The graph of the given figure shows the variation of the torque acting on an electric dipole in terms of the angle

θ

between the dipole moment and the electric field of magnitude

$1.0 \times 10^{4}\ \mathrm{N/C}$

.



What is the magnitude of the dipole moment?

- $p = 1.6 \times 10^{-28}\ \mathrm{C\ m}$ ✓
- $p = 1.6 \times 10^{28}\ \mathrm{C\ m}$
- $p = 6.0 \times 10^{27}\ \mathrm{C\ m}$
- $p = 6.2 \times 10^{-27}\ \mathrm{C\ m}$

QUESTION 2

Choose the correct answer.

A molecule of a given substance has a dipole of moment ***p*** and charge

$q = 1.6 \times 10^{-18}$ C

. The molecule is placed in a uniform electric field of magnitude

1.5×10^{4} N / C

. A torque with a maximum magnitude of

9.0×10^{-26} N m

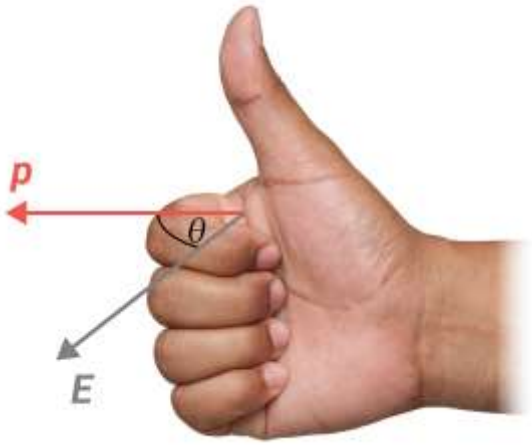
acts on the dipole. Calculate the distance *d* separating the charges of the dipole.

- ○ $d = 2.7 \times 10^{11}$ m
- ✓ $d = 3.7 \times 10^{-12}$ m
- ○ $d = 2.9 \times 10^{-48}$ m
- ○ $d = 8.4 \times 10^{-4}$ m

QUESTION 3

Drag and drop the correct answer to fill in the blank.

Using the right-hand rule, and knowing that ***p*** and ***E*** are in the horizontal plane, the thumb indicates the direction of the torque ✓.



electric field

electric force

electric charge

QUESTION 4

Choose the correct answer.

An electric dipole is placed in an external uniform electric field so that its dipole moment is initially parallel to the lines of the electric field and opposes ***E***.

The dipole performed a half turn around its center to become aligned with the electric field.

Which figure corresponds to the variation of the torque in terms of the angle θ, for this rotation of the dipole?

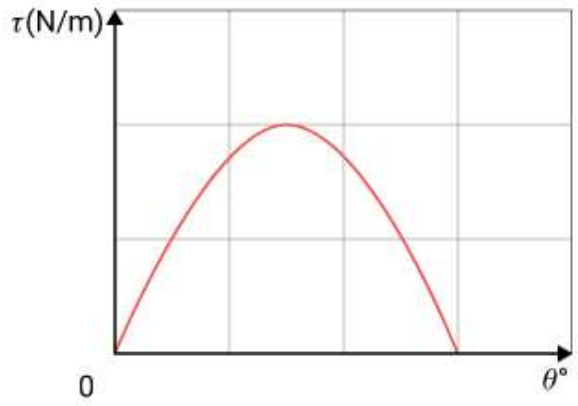


Figure a

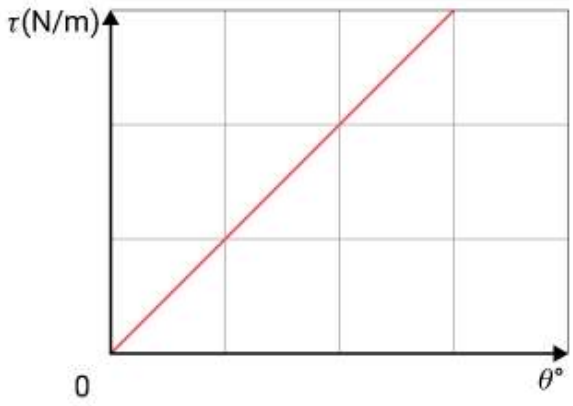


Figure b

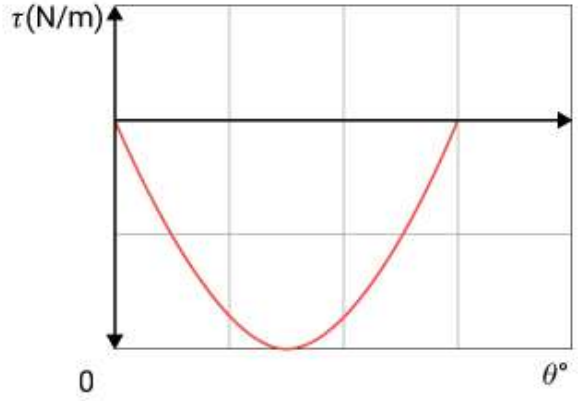


Figure c

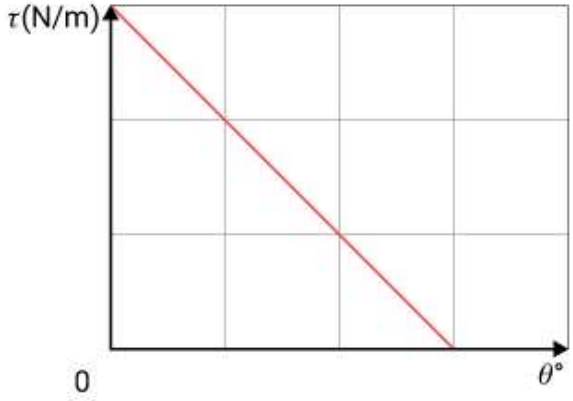


Figure d

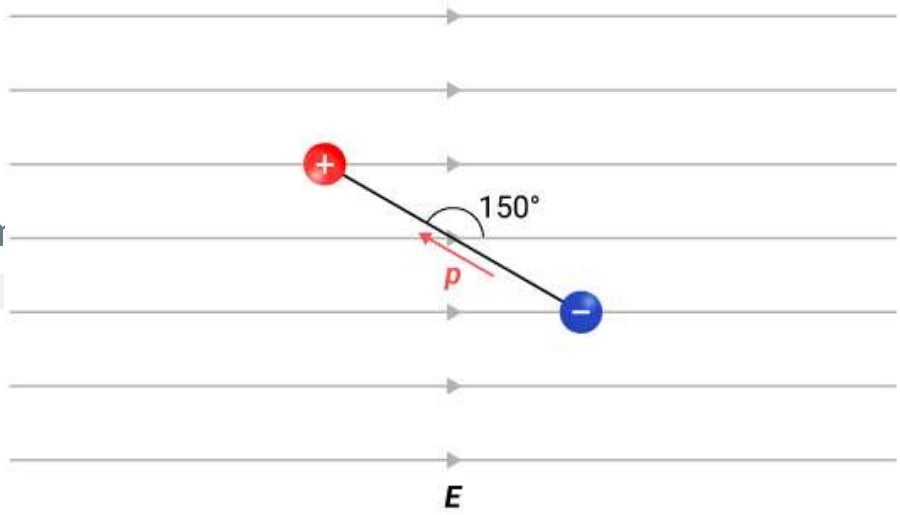
- ○ Figure (c)
- ✓ Figure (a)
- ○ Figure (b)
- ○ Figure (d)

QUESTION 5

Choose the correct answer.

The torque acting on the dipole shown in the given figure has a magnitude $\tau = 8.0 \times 10^{-15}$ N m

.



What are the maximum possible magnitude and the direction of the torque acting on this electric dipole in the same electric field?

- $\tau = 8.0 \times 10^{-15}$ N m
  $\boldsymbol{\tau}$
  points is horizontal to the right

- ✓ $\tau = 1.6 \times 10^{-14}$ N m
  $\boldsymbol{\tau}$
  points into the plane of the screen

- $\tau = 4.0 \times 10^{-15}$ N m
  $\boldsymbol{\tau}$
  points is horizontal to the left

- $\tau = 4.0 \times 10^{-15}$ N m
  $\boldsymbol{\tau}$
  points is out of the plane of the screen

QUESTION 6

Choose the correct answer.

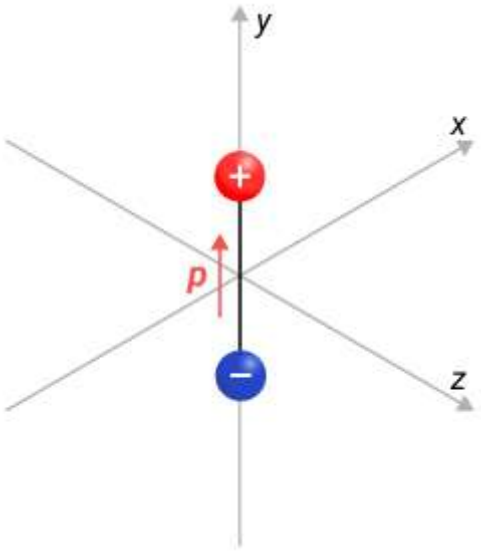
The dipole of moment

$p = 1.0 \times 10^{-15}$ C m

shown in the given figure is placed in a uniform electric field

$E = 2.0 \times 10^{3} \hat{z}$

.



Determine

τ

.

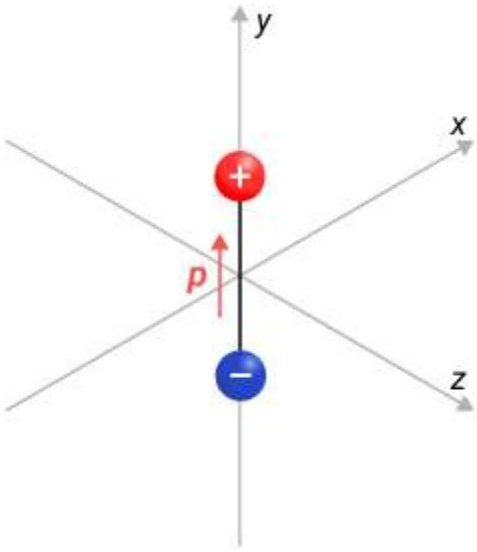
- ○ $\tau = -2.0 \times 10^{-12} \hat{x}$
- ○ $\tau = 0.5 \times 10^{-12} \hat{y}$
- ✓ $\tau = 2.0 \times 10^{-12} \hat{x}$
- ○ $\tau = 0.5 \times 10^{12} \hat{z}$

QUESTION 7

Choose the correct answer.

The dipole shown in the given figure is in equilibrium in an external uniform electric field.

What are the direction of the electric field and the value of the torque acting on this dipole?



- ○ *E* is horizontal along the positive *z*-direction.
  $\tau = 0$ N m
- ○ *E* is horizontal along the positive *x*-direction.
  $\tau = 1$ N m
- ✓ *E* is vertical upward along the positive *y*-direction.
  $\tau = 0$ N m
- ○ *E* is vertical downward along the negative *y*-direction.
  $\tau = -1$ N m

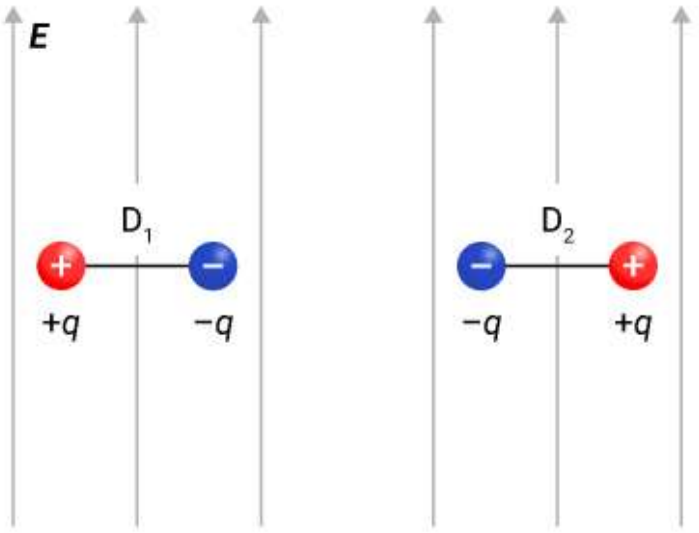
QUESTION 8

QUESTION 8

Choose the correct answer.

The given figure shows two dipoles D_1 and D_2 placed in an external uniform electric field E.

Which direction does each dipole rotate under the action of the torque?

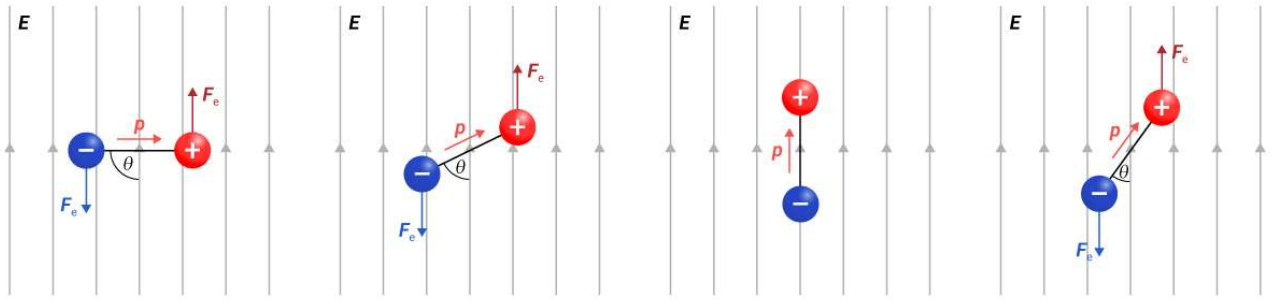


- Both D_1 and D_2 rotate anticlockwise.
- D_1 rotates clockwise while D_2 rotates anticlockwise. ✓
- D_1 rotates anticlockwise while D_2 rotates clockwise.
- Both D_1 and D_2 rotate clockwise.

QUESTION 9

Choose the correct answer.

Which of the following choices arranges the figures in decreasing order for the magnitude of the torque acting on the same dipole placed in the same external uniform electric field?



- [x] a, b, d, c
- [ ] c, a, b, d
- [ ] b, a, c, d
- [ ] d, a, c, b

QUESTION 10

Choose the correct answer.

An electric dipole is made of two electric charges, each with $q = 5.6 \times 10^{-19}$ C, separated at a distant 1.0×10^{2} pm, is placed in a uniform external electric field with a magnitude of $E = 1.0 \times 10^{4}$ N/C. What is the magnitude of the torque acting on the dipole at the instant it is placed in the electric field? Note that the dipole rotates by an angle of

30°

to reach equilibrium.

- ○ 4.8×10^{-25} N m
- ✓ 2.8×10^{-25} N m
- ○ 2.8×10^{-20} N m
- ○ 1.4×10^{-25} N m

QUESTION 11

Drag and drop the correct answer to fill in the blank.

The torque of an electric dipole in an external uniform electric field can be described in terms of *E* and ***p*** ✓.

q d θ

QUESTION 12

Drag and drop the correct answer to fill in the blank.

The net torque acting on an electric dipole is given by: $\tau_{net} = Fd\sin(\theta)$ ✓ where ***F*** is the force acting on each charge.

$\tau_{net} = Fd\sin^2(\theta)$

$\tau_{net} = Fq\sin(\theta)$

$\tau_{net} = \frac{F}{2}d\sin(\theta)$

QUESTION 13

Drag and drop the correct answer to fill in the blank.

The force acting on each charge of the electric dipole placed in a uniform electric field produces a torque ✓ capable to rotate the dipole to align ✓ itself with the electric field.

decline

charge

field

stretch

QUESTION 14

Drag and drop the correct answer to fill in the blank.

When an electric dipole is placed in an external electric field, the electric force which acts on the positive charge of the dipole always has the same direction ✓ as the electric field.

opposite magnitude | same magnitude | opposite direction

QUESTION 15

Choose the correct answer.

A dipole of dipole moment p placed in a uniform electric field

$E_1 = 2.0 \times 10^4 \text{ N/ C}$

undergoes a maximum torque of magnitude

$1.8 \times 10^{-26} \text{ N m}$

. The distance between the charges of this dipole is halved and then placed in another uniform electric field of magnitude E_2, where the maximum torque is also halved. What is the value of E_2?

- ○ $E_2 = 2.5 \times 10^3 \text{ N/ C}$

$E_2 = 4.0 \times 10^4$ N/ C

$E_2 = 2.0 \times 10^4$ N/ C ✓

$E_2 = 1.0 \times 10^4$ N/ C