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QUESTION 1

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

The electric field strength created by an electric dipole at a point on the axis and at a distance x_1 to the left of the dipole is $E_1 = 1.6 \times 10^{-11}$ N/C. This electric field strength drops to a value of $E_2 = 2.0 \times 10^{-12}$ N/C at a distance x_2. Then $x_2 = 2.0 x_1$ ✓.

$x_2 = 8.0 x_1$ $x_1 = 2.0 x_2$ $x_1 = 8.0 x_2$

QUESTION 2

Choose the correct answer.

An electric dipole has an electric dipole moment of magnitude $p = 1.6 \times 10^{-31}$ C m

. What is the magnitude of the electric field at a point on the dipole's axis 10 cm to the left of its positive charge?

- [x] 2.9×10^{-18} N/C
- [ ] 1.5×10^{-24} N/C
- [ ] 1.5×10^{-18} N/C
- [ ] 2.9×10^{-24} N/C

QUESTION 3

Choose the correct answer.

A lightning sprite is a natural electrical discharge phenomenon that occurs high in Earth's atmosphere above thunderstorms, up to 80.0 km high in the sky.

Scientists theorize that sprites could be due to a vertical electric dipole made of a positive charge on the bottom of a cloud and a negative charge at a given depth below ground, as shown in the given figure.

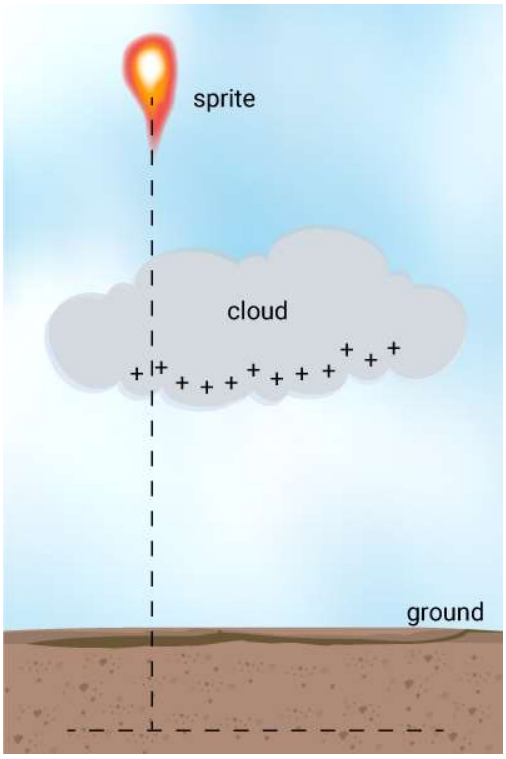
What is the magnitude of the electric field due to such a vertical dipole with a moment of magnitude

$p = 20.0 \times 10^{5}$ C m

, at a height of

40.0 km

above the center of the dipole?



- $E = 14 \times 10^{6}$ N / C
- $E = 22.5 \times 10^{6}$ N / C
- $E = 56.2 \times 10^{10}$ N / C
- $E = 562$ N / C ✓

QUESTION 4

Choose the correct answer.

The resultant electric field due to both dipoles is equal to zero at the point M shown in the given figure. What is the distance *a*, in terms of *x*, between M and the center of the dipole to the right?



- $a = 2x$
- $a = \frac{x}{\sqrt[3]{2}}$
- $a = \sqrt[3]{2}\,x$ ✓
- $a = \sqrt{2}\,x$

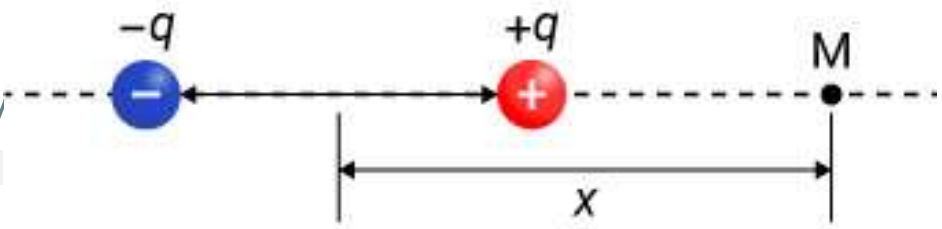
QUESTION 5

Choose the correct answer.

An electric dipole of moment of magnitude

$p = 3.2 \times 10^{-19}$ C m

produces an electric field of magnitude $E = 9.0 \times 10^{-5}$ N/



at a point M distant x from the center of the dipole. What is the value of x?

(Take $\varepsilon_0 = 8.85 \times 10^{-12}\ C^2/N\ m^2$)

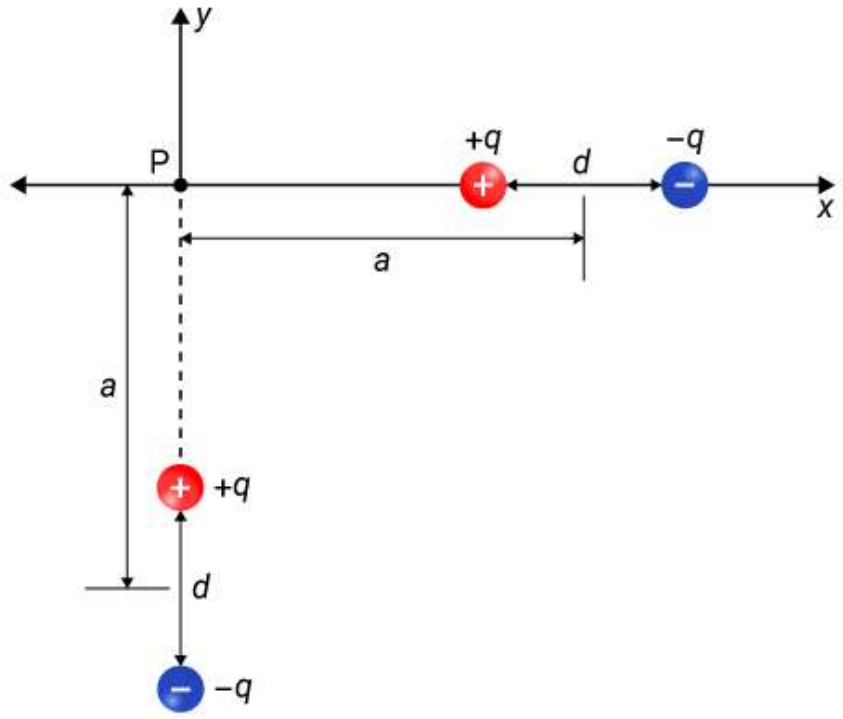
- $x = 4.0$ m
- $x = 6.4 \times 10^{-3}$ m
- $x = 6.4 \times 10^{-3}$ cm
- $x = 4.0 \times 10^{-2}$ m ✓

QUESTION 6

Choose the correct answer.

Two identical electric dipoles are placed as shown in the given figure.

What is the magnitude and direction of the electric field at point P created by both dipoles?



$E_P = \left(\frac{2qd}{2\pi\varepsilon_0 a^3}\right)$

E_P

makes an angle of

45°

above the negative *x*-direction

$E_P = \sqrt{2}\left(\frac{qd}{2\pi\varepsilon_0 a^3}\right)$

E_P

makes an angle of

45°

above the negative *x*-direction

$E_P = 2\left(\frac{qd}{\pi\varepsilon_0 a^3}\right)$

E_P

makes an angle of

45°

below the positive *x*-direction

$E_P = 4(\frac{qd}{2\pi\varepsilon_0 a^3})$

E_P

makes an angle of

45°

above the negative *x*-direction

QUESTION 7

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

The graph of the given figure shows the variation of the magnitude of the electric field *E* in terms of

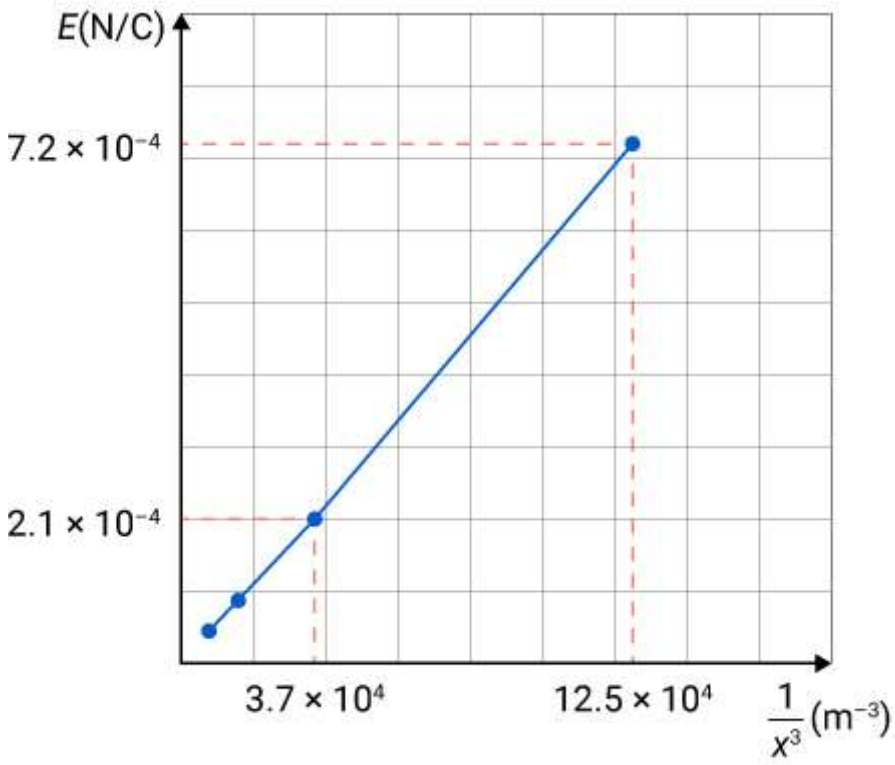
$\frac{1}{x^3}$

, where *x* is the distance from the center of the electric dipole of moment ***p***, along the dipole axis. Then $p = 3.2 \times 10^{-19}$ C m ✓.

$p = 3.2 \times 10^{-}$

$p = 5.8 \times 10^{-}$

$p = 9.2 \times 10^{-}$



QUESTION 8

Choose the correct answer.

Which of the following patterns corresponds to an electric dipole?

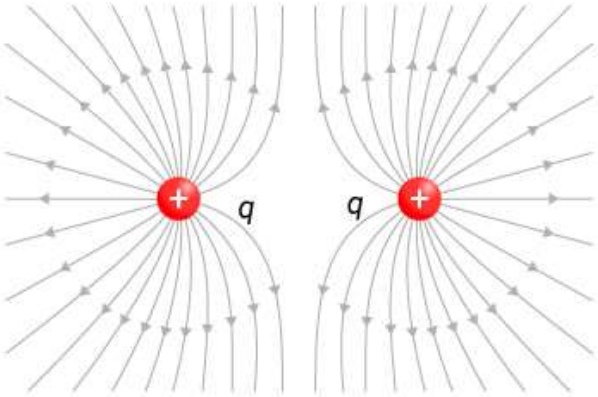


Figure (a)

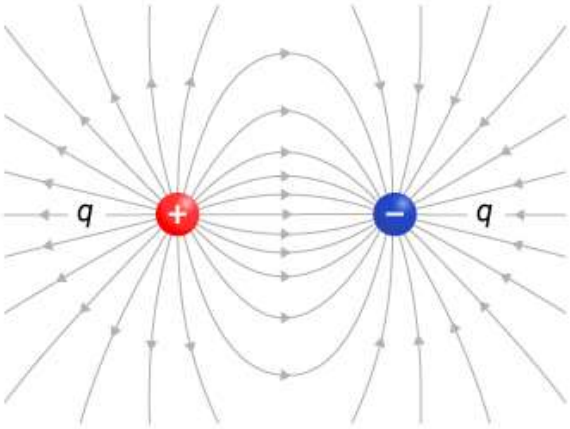


Figure (b)

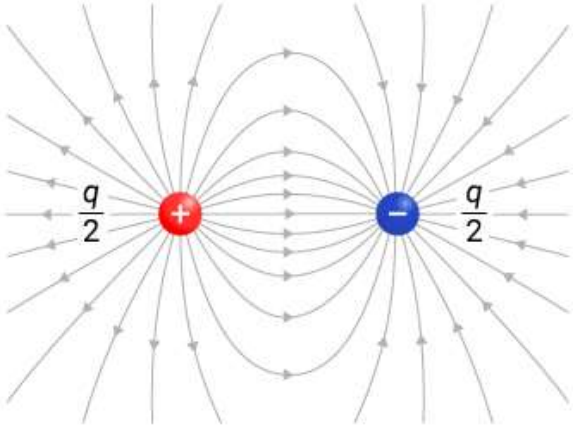


Figure (c)

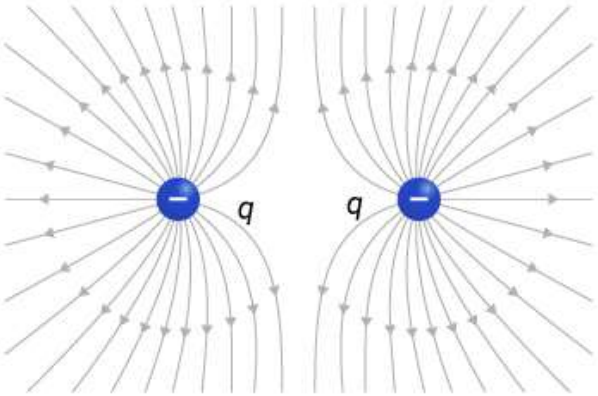


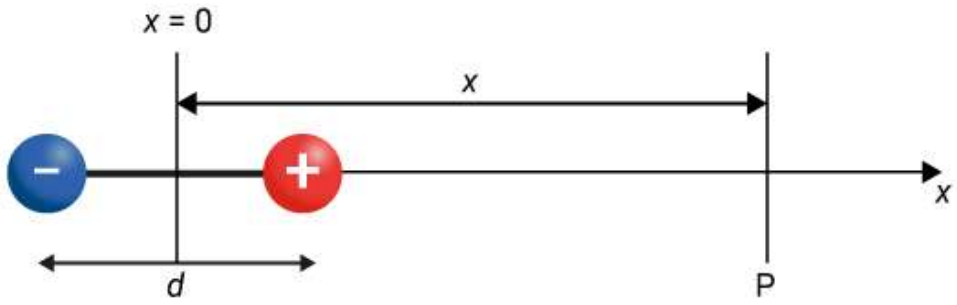
Figure (d)

- [x] patterns in figures (b) and (c)
- [ ] the pattern in figure (d)
- [ ] patterns in figures (a) and (d)
- [ ] pattern in figure (a)

QUESTION 9

Choose the correct answer.

Point P is a distant x from the center of a dipole and aligned with the dipole, as shown in the given figure.



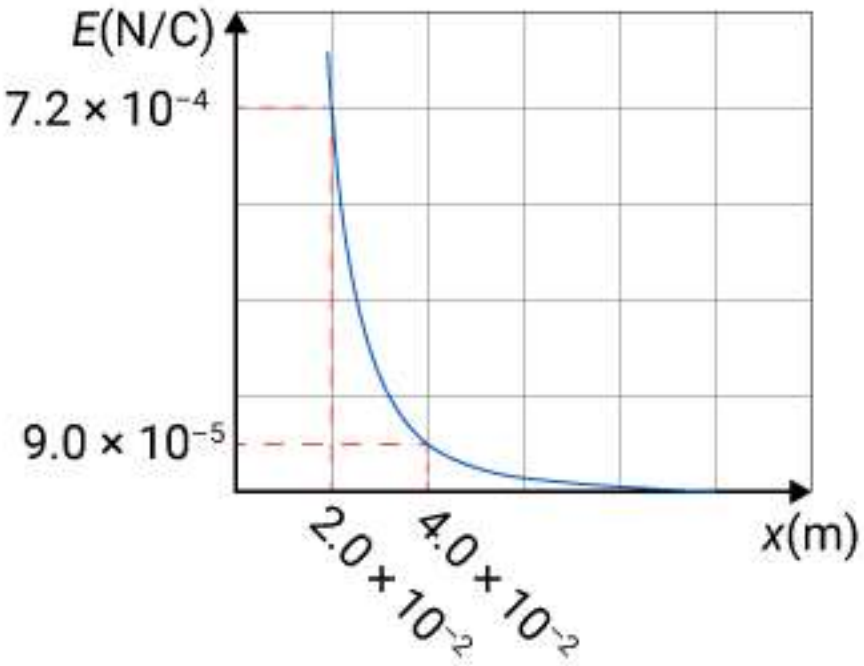
Which expression describes the electric field at point P?

- $E(x) = \frac{q^2 d}{2\pi\varepsilon_0 x^3}$
- $E(x) = \frac{qd}{4\pi\varepsilon_0 x^3}$
- $E(x) = \frac{qd}{2\pi\varepsilon_0 x^2}$
- $E(x) = \frac{qd}{2\pi\varepsilon_0 x^3}$ ✓

QUESTION 10

Choose the correct answer.

The graph in the given figure shows the variation of the magnitude of the electric field created by an electric dipole in terms of *x,* where *x* is the distance from the center of the dipole and along its axis.



Determine the charge q knowing that

$d = 2.0$ cm

.

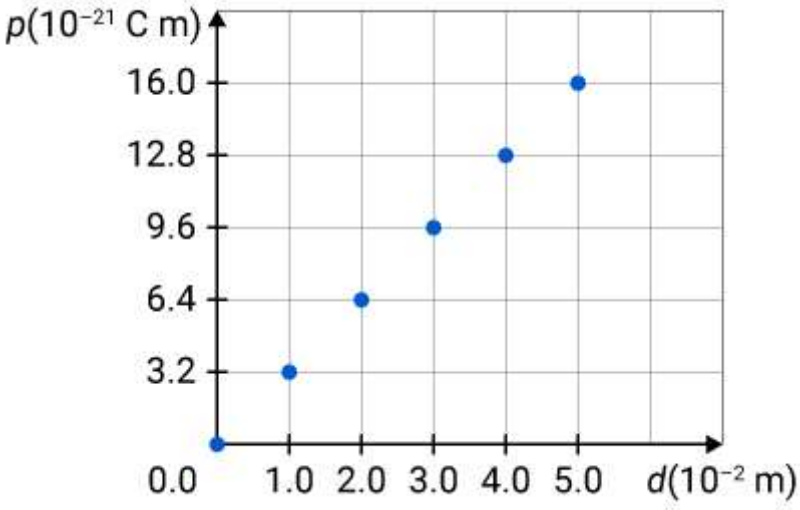
- $q = 2.0 \times 10^{-14}$ C
- $q = 1.0 \times 10^{-29}$ C
- $q = 1.6 \times 10^{-19}$ C
- $q = 1.6 \times 10^{-17}$ C ✓

QUESTION 11

Choose the correct answer.

The graph in the given figure shows the variation of the electric dipole moment in terms of the distance d between the charges of the dipole.

Use the graph to determine the value of q.



- $q = 3.2 \times 10^{21}$ C
- $q = 3.0 \times 10^{18}$ C
- ✓ $q = 3.2 \times 10^{-19}$ C
- $q = 3.0 \times 10^{-16}$ C

QUESTION 12

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

The direction ✓ of the electric dipole moment can be used to specify the orientation of a dipole.

charge | magnitude | force

QUESTION 13

Choose the correct answer.

What is the expression of the electric field at a distance x from the center of an electric dipole along the dipole's axis?

- $E(x) = \frac{d}{2\pi\varepsilon_0 x^3}$
- $E(x) = \frac{p}{2\pi\varepsilon_0 x^3}$ ✓
- $E(x) = \frac{p}{4\pi\varepsilon_0 x^3}$
- $E(x) = \frac{p}{}$

$2\pi\varepsilon_0 x^2$

QUESTION 14

Choose the correct answer.

Which of the following statements is correct about the electric field created by an electric dipole?

- The electric field created by a dipole can have a zero magnitude only at the points located to the right of the positive charge of the dipole.
- The electric field created by a dipole is equal to zero at the midpoint of the dipole.
- The electric field created by a dipole can have a zero magnitude only at the points that belong to the perpendicular bisector of the dipole.
- ✓ The electric field created by a dipole can never have a zero magnitude at any point in the area surrounding the dipole.

QUESTION 15

Drag and drop the correct answers to fill in the blanks.

As the distance of a point from a single point charge is halved, the electric field increases by a factor of 4. If the distance of a point from a dipole is halved, the electric field increases by a factor of 8 ✓, which indicates that the electric field due to a dipole varies more rapidly ✓ than due to a single point charge.

increases by 2 folds more | 2 | varies more slowly | 6