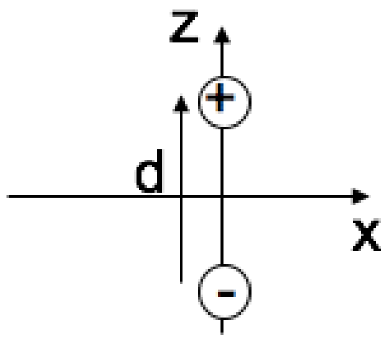
$$\mathbf{E}_{dip}(\mathbf{r}) = \frac{p}{4\pi\varepsilon_0 r^3}\left(2\cos\theta\,\hat{\mathbf{r}} + \sin\theta\,\hat{\theta}\right)$$

For the dipole $\mathbf{p} = q\mathbf{d}$ shown, what does the formula predict for the direction of $\mathbf{E}(\mathbf{r})$ for $\theta = 0$ and $\theta = \pi/2$?



Consider r to be large compared to d.

A. $+z; +x$

B. $-z; +x$

C. $-z; +z$

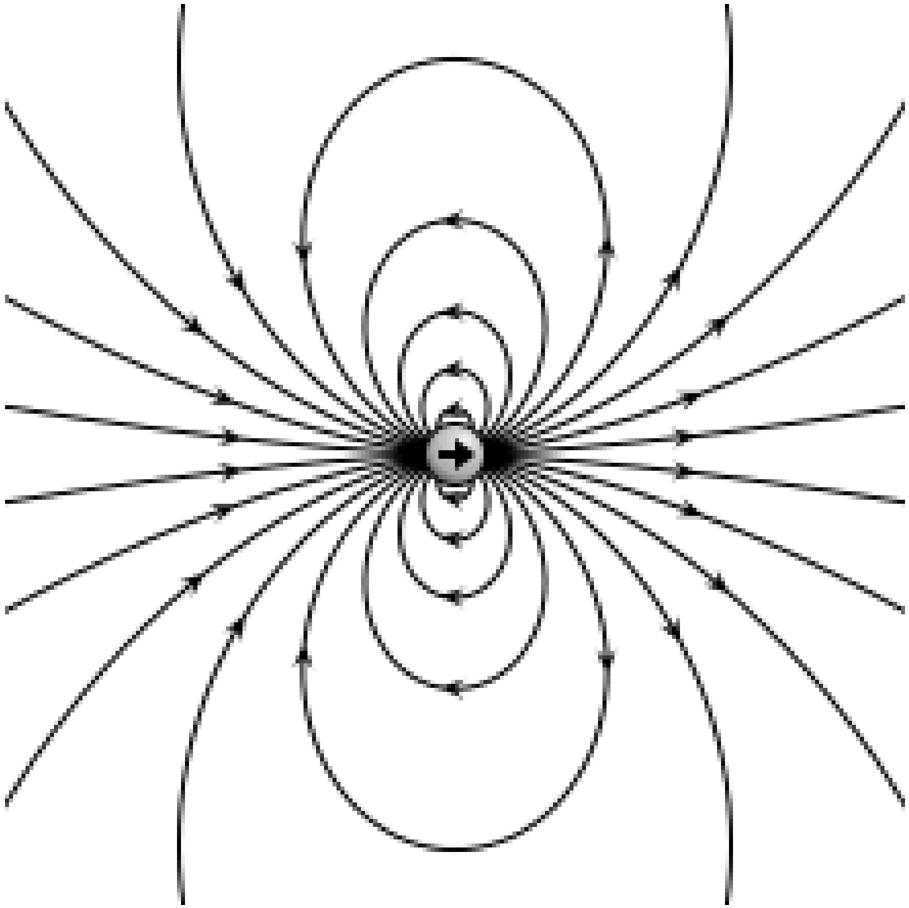
D. $+z; -z$

E. Some other pair of directions

ANNOUNCEMENTS

- Exam 2 is coming up (2 weeks from today)
  - BPS 1415 (this room), 7pm-9pm, Nov 6th
  - Same format as Exam 1
  - Details next week

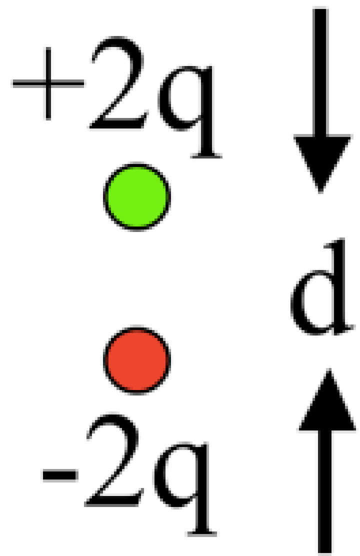
IDEAL VS. REAL DIPOLE



$$\mathbf{p} = \sum_i q_i \mathbf{r}_i$$

What is the magnitude of the dipole moment of this charge distribution?

A. qd
B. 2qd
C. 3qd
D. 4qd
E. It's not determined

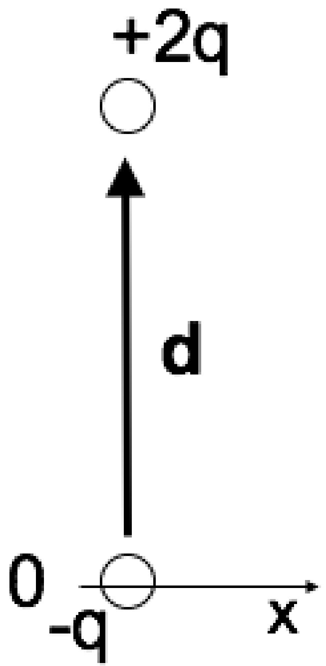


$$\mathbf{p} = \sum_i q_i \mathbf{r}_i$$

What is the dipole moment of this system?

(BTW, it is NOT overall neutral!)

A. $q\mathbf{d}$
B. $2q\mathbf{d}$
C. $\frac{3}{2}q\mathbf{d}$
D. $3q\mathbf{d}$
E. Someting else (or not defined)

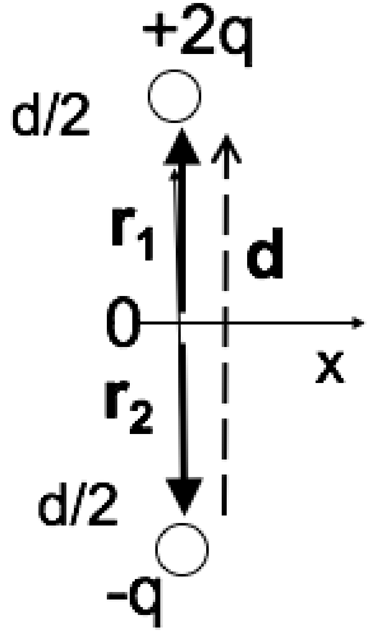


$$\mathbf{p} = \sum_i q_i \mathbf{r}_i$$

What is the dipole moment of this system?

(Same as last question, just shifted in z.)

A. $q\mathbf{d}$
B. $2q\mathbf{d}$
C. $\frac{3}{2}q\mathbf{d}$
D. $3q\mathbf{d}$
E. Someting else (or not defined)



You have a physical dipole, $+q$ and $-q$ a finite distance d apart. When can you use the expression:

$$V(\mathbf{r}) = \frac{1}{4\pi\varepsilon_0}\frac{\mathbf{p}\cdot\hat{\mathbf{r}}}{r^2}$$

A. This is an exact expression everywhere.
B. It's valid for large r
C. It's valid for small r
D. No idea...

You have a physical dipole, $+q$ and $-q$ a finite distance d apart. When can you use the expression:

$$V(\mathbf{r}) = \frac{1}{4\pi\varepsilon_0} \sum_i \frac{q_i}{\mathfrak{R}_i}$$

A. This is an exact expression everywhere.

B. It's valid for large r

C. It's valid for small r

D. No idea...