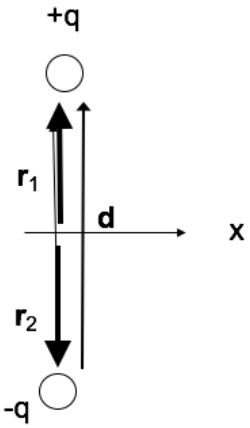
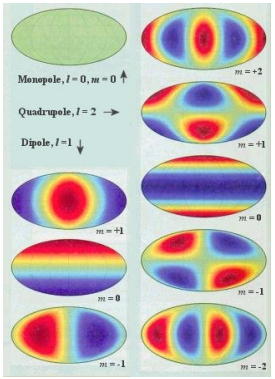
MULTIPOLE EXPANSION

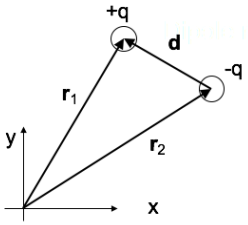


Two charges are positioned as shown to the left. The relative position vector between them is $\mathbf{d}$. What is the value of of the dipole moment? $\sum_i q_i \mathbf{r}_i$

A. $+q\mathbf{d}$
B. $-q\mathbf{d}$
C. Zero
D. None of these



Multipole Expansion of the Power Spectrum of CMBR



Two charges are positioned as shown to the left. The relative position vector between them is $\mathbf{d}$. What is the dipole moment of this configuration?

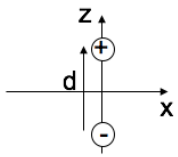
$$\sum_i q_i \mathbf{r}_i$$

A. $+q\mathbf{d}$
B. $-q\mathbf{d}$
C. Zero
D. None of these; it's more complicated than before!

For a dipole at the origin pointing in the z-direction, we have derived:

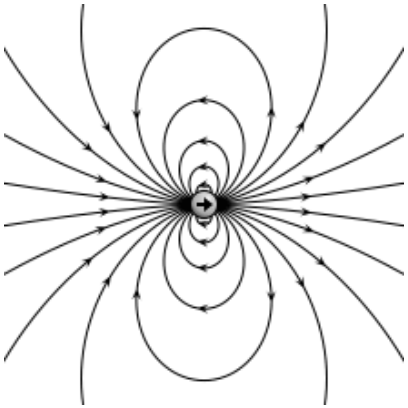
$$\mathbf{E}_{dip}(\mathbf{r}) = \frac{p}{4\pi\varepsilon_0 r^3}\left(2\cos\theta\ \hat{\mathbf{r}} + \sin\theta\ \hat{\theta}\right)$$

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



A. Down
B. Up
C. Some other direction
D. The formula doesn't apply

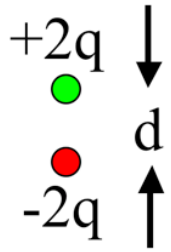
IDEAL VS. REAL DIPOLE



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

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)