How many boundary conditions (on the potential V) do you use to find V inside the spherical plastic shell?

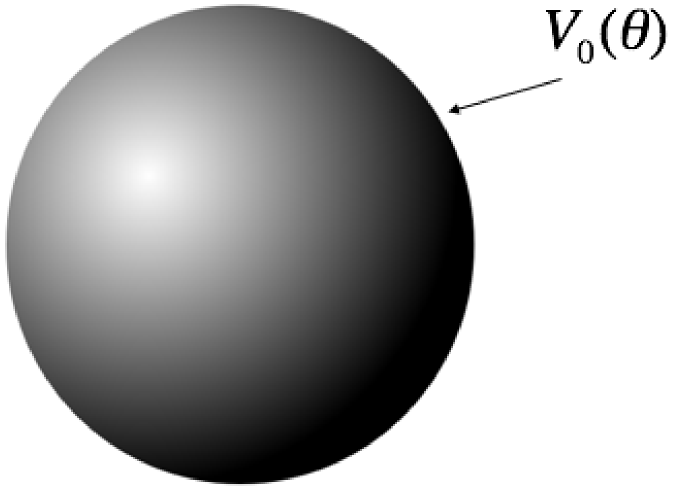
A. 1

B. 2

C. 3

D. 4

E. It depends on $V_0(\theta)$



$$V(r,\theta) = \sum_{l=0}^{\infty} \left(A_l r^l + \frac{B_l}{r^{l+1}} \right) P_l(\cos\theta)$$

Suppose V on a spherical shell is:

$$V(R,\theta) = V_0 \left(1 + \cos^2\theta\right)$$

Which terms do you expect to appear when finding **V(inside)**?

A. Many A_l terms (but no B_l's)
B. Many B_l terms (but no A_l's)
C. Just A_0 and A_2
D. Just B_0 and B_2
E. Something else!

$$V(r,\theta) = \sum_{l=0}^{\infty} \left(A_l r^l + \frac{B_l}{r^{l+1}} \right) P_l(\cos\theta)$$

Suppose V on a spherical shell is:

$$V(R,\theta) = V_0 \left(1 + \cos^2\theta\right)$$

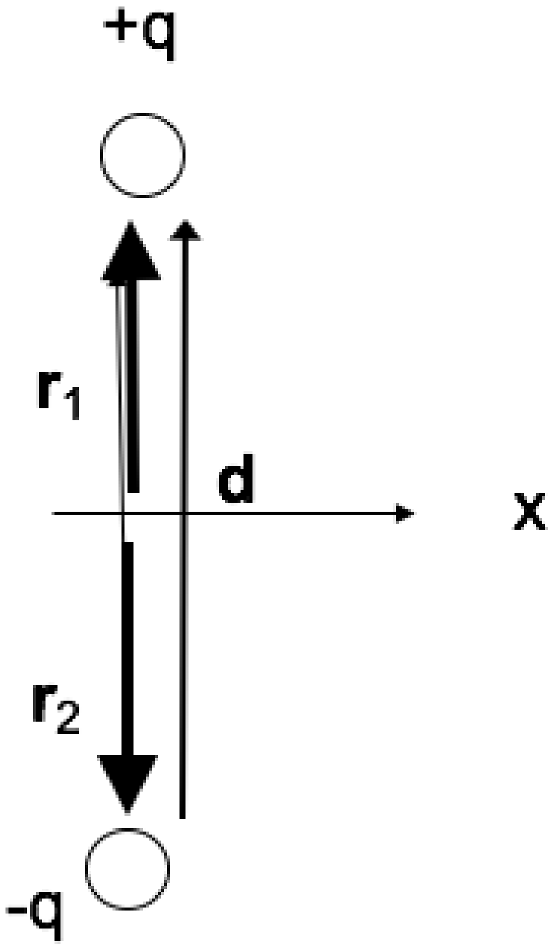
Which terms do you expect to appear when finding **V(outside)**?

A. Many A_l terms (but no B_l's)
B. Many B_l terms (but no A_l's)
C. Just A_0 and A_2
D. Just B_0 and B_2
E. Something else!

Consider a solid sphere of charge that has a charge density that varies with $\cos\theta$. What can we say about the terms in the general solution to Laplace's equation outside there sphere?

$$V(r,\theta) = \sum_l \left(A_l\, r^l + \frac{B_l}{r^{(l+1)}} \right) P_l(\cos\theta)$$

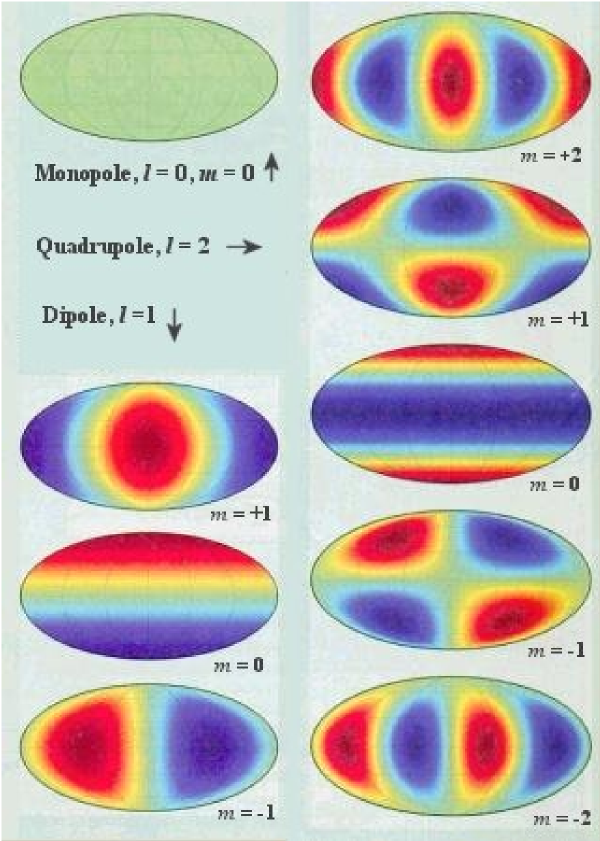
A. All the A_l's are zero
B. All the B_l's are zero
C. Only A_0 should remain
D. Only B_0 should remain
E. Something else



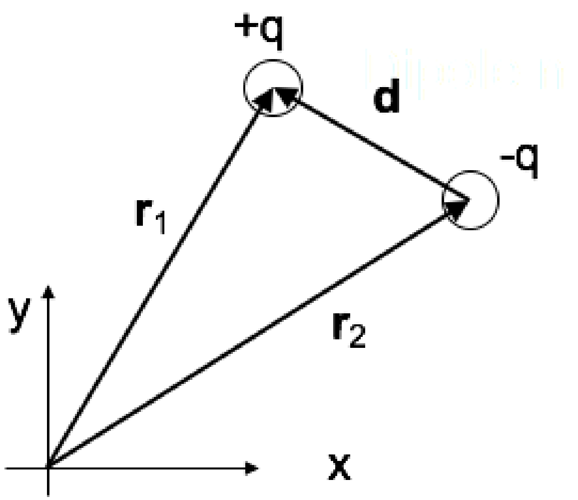
Two charges are positioned as shown to the left. The relative position vector between them is $\mathbf{d}$. What is the value of of the dipole moment? $\sum_i q_i \mathbf{r}_i$

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

MULTIPOLE EXPANSION



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?

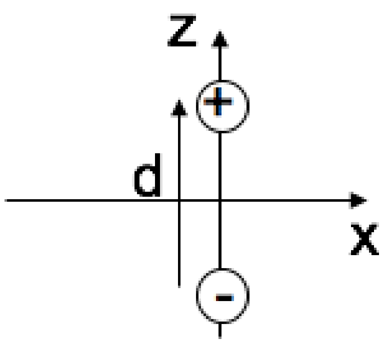
$$\sum_i q_i \mathbf{r}_i$$

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