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

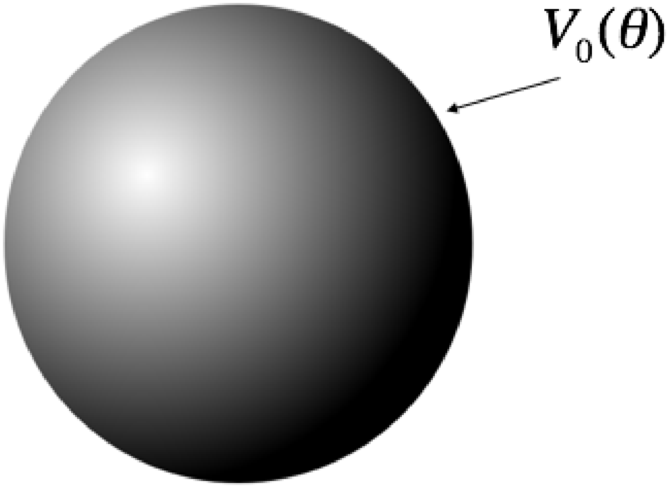
A. 1

B. 2

C. 3

D. 4

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



Physics GRE Study Sessions

- **Friday, October 19**
- **3-4 pm BPS 1400**
- Physics graduate students will explain the contents of the exam, provide study and test taking strategies, go over practice problems, and answer any specific questions you may have.
- In particular, we will go over problems from this practice exam: https://tinyurl.com/y99dbgbm
- Next session
  - Tuesday 10/23 3-4 pm BPS 1400
- Contact Alison Peisker with any questions (peiskera@msu.edu)

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

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!

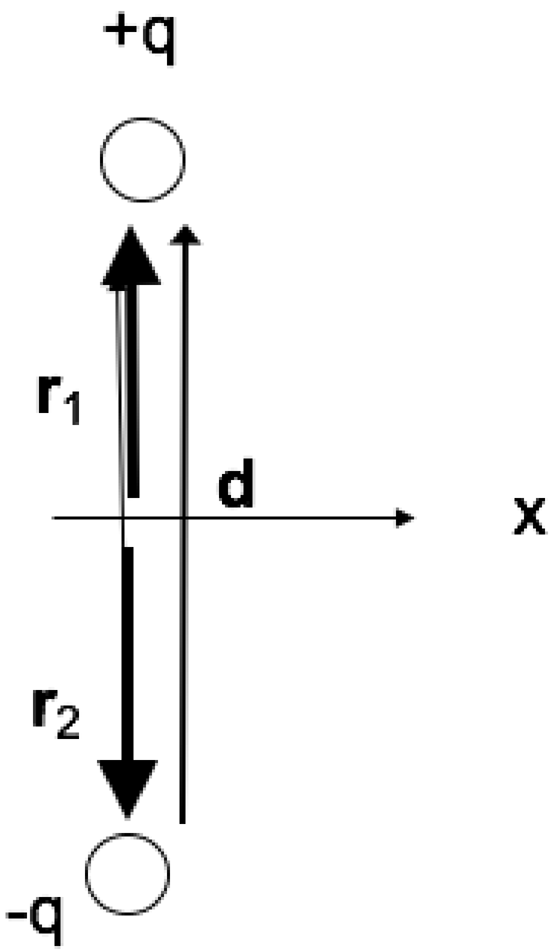
$$V(r,\theta) = \sum_{l=0}^{\infty} \left(A_l r^l + \frac{B_l}{r^{l+1}} \right) P_l(\cos\theta)$$

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)**?

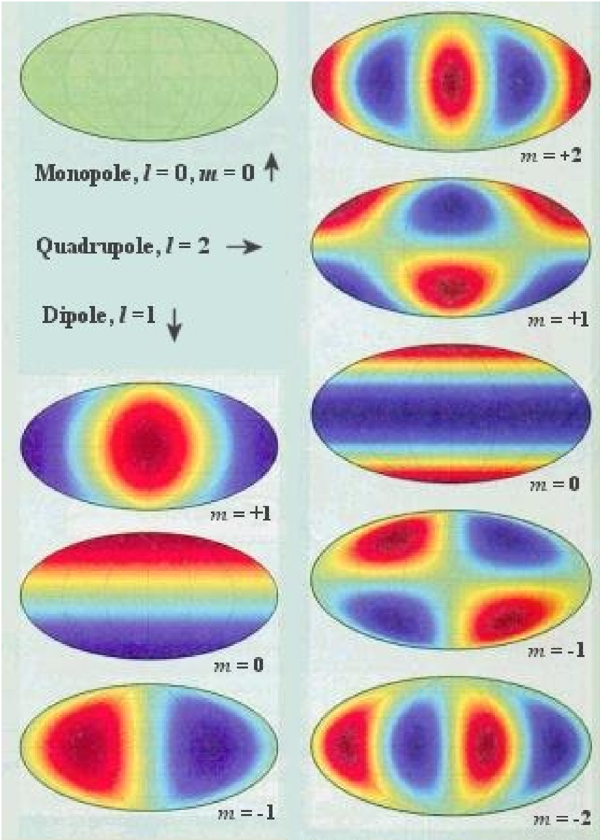
A. Many A_l terms (but no B_l's)
B. Many B_l terms (but no A_l's)
C. Just A_0 and A_2
D. Just B_0 and B_2
E. Something else!



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

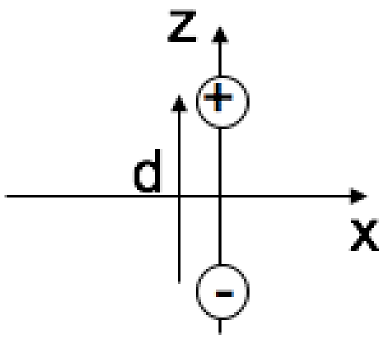


Multipole Expansion of the Power Spectrum of CMBR

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