

Question 1

A sphere of radius R contains total charge Q that is uniformly distributed.

Which of the following is the volume charge density?

1. $\rho = \frac{Q}{\pi R^2}$

2. $\rho = \frac{Q}{4\pi R^2}$

3. $\rho = \frac{Q}{\pi R^3}$

4. $\rho = \frac{3Q}{4\pi R^3}$

5. $\rho = \frac{4Q}{3\pi R^3}$

Question 2

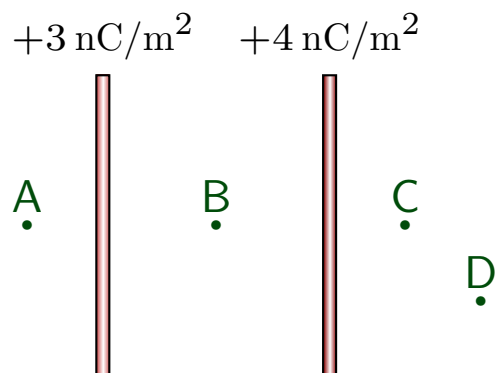
A *hollow* sphere has shell with radius R and contains total charge Q that is uniformly distributed on the surface of the sphere.

Which of the following is true about the electric field inside the sphere?

1. $\vec{E} = 0$ everywhere inside.
2. $\vec{E} = 0$ at the center but elsewhere inside $\vec{E} \neq 0$.
3. $\vec{E} \neq 0$ everywhere inside.

Question 3

Two uniformly charged infinite plates are as illustrated. Charge densities are given for each plate.

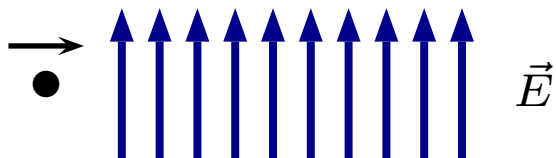


Which of the following best represents the rank of the *magnitudes* of the electric fields at the illustrated locations?

1. $E_A = E_C = E_D > E_B$
2. $E_A = E_C > E_D > E_B$
3. $E_B > E_A = E_C > E_D$
4. $E_B = E_A = E_C = E_D$

Question 4

A proton enters a region of constant electric field as illustrated.



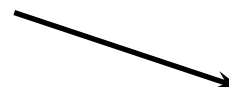
Which of the following best represents the trajectory of the proton while it is in the field?



Case 1



Case 2



Case 3



Case 4



Case 5