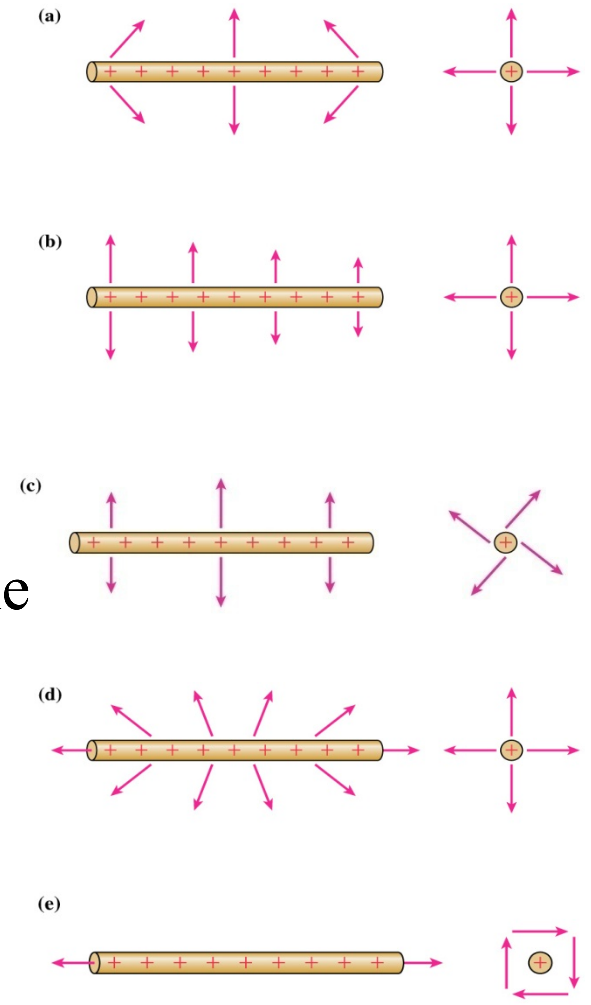
Clicker Session – Gauss' Law

A uniformly charged rod has a *finite* length L. The rod is symmetric under rotations about the axis and under reflection in any plane containing the axis. It is *not* symmetric under translations or under reflections in a plane perpendicular to the axis other than the plane that bisects the rod. Which field shape or shapes match the symmetry of the rod?



A. a and d
B. c and e
C. b only
D. e only
E. none of the above

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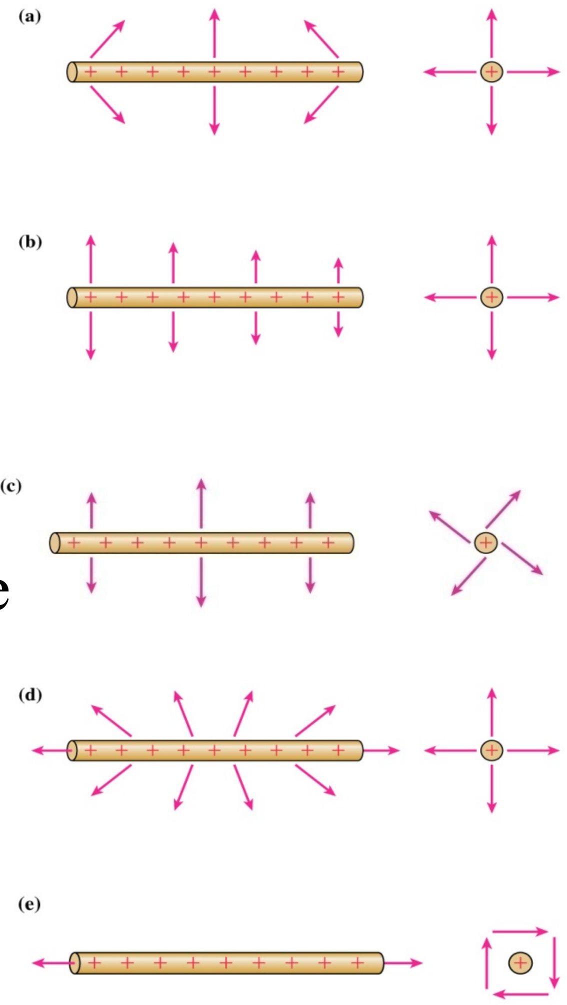


✔ **A. a and d**

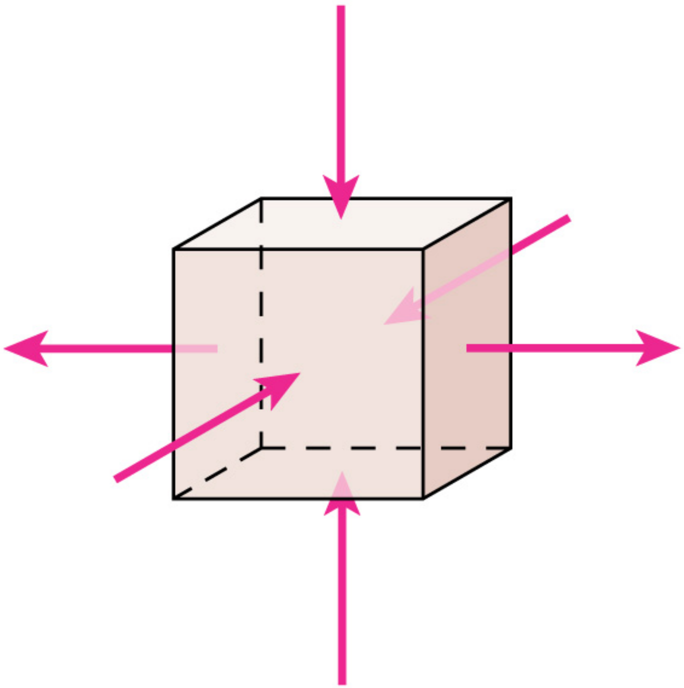
B. c and e

C. b only

D. e only

E. none of the above

This box contains



A. a net positive charge.
B. no net charge.
C. a net negative charge.
D. a positive charge.
E. a negative charge.

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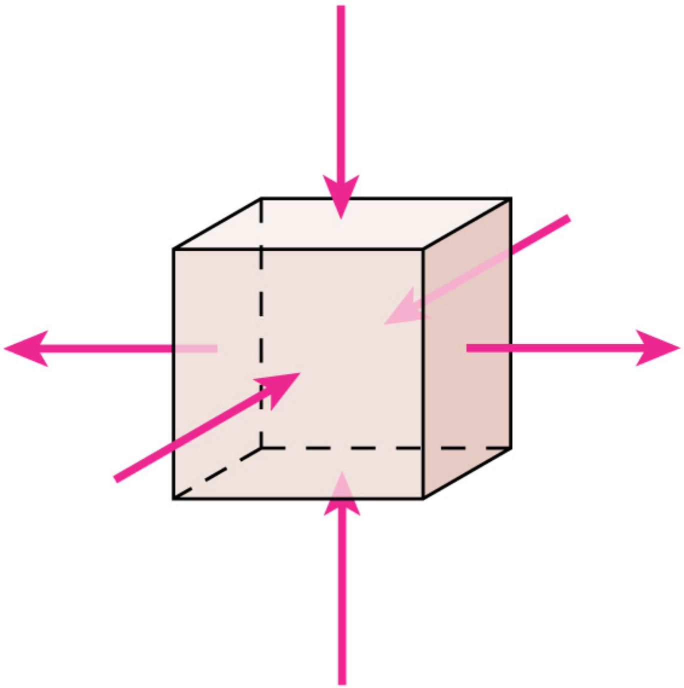

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D. a positive charge.
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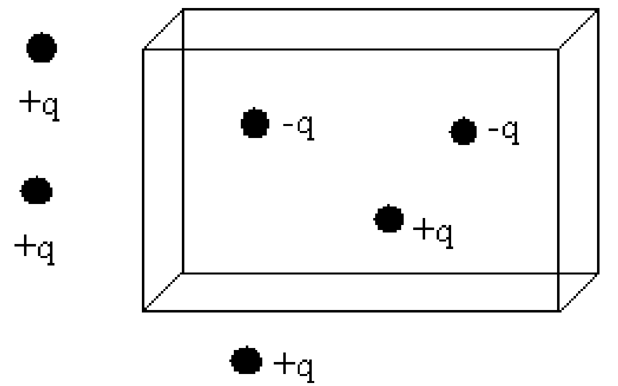
What is the total flux through the rectangular prism surface and charge configuration below?

1. 0
2. $-q/\varepsilon_0$
3. q/ε_0
4. $2q/\varepsilon_0$
5. Not enough symmetry to easily calculate



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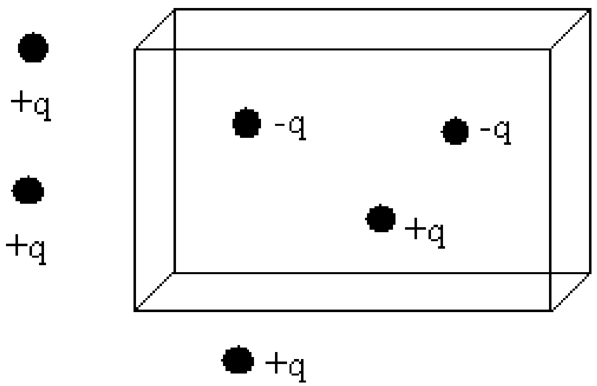
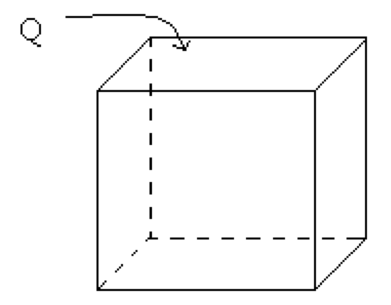


Which Gaussian surface would allow you to use Gauss's law to determine the electric field outside a uniformly charged cube?

A. A sphere whose center coincides with the center of the charged cube.
B. A cube whose center coincides with the center of the charged cube and which has parallel faces.
C. Either A or B.
D. Neither A nor B.



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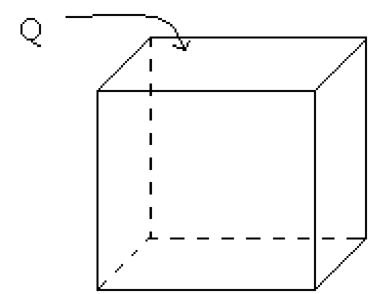
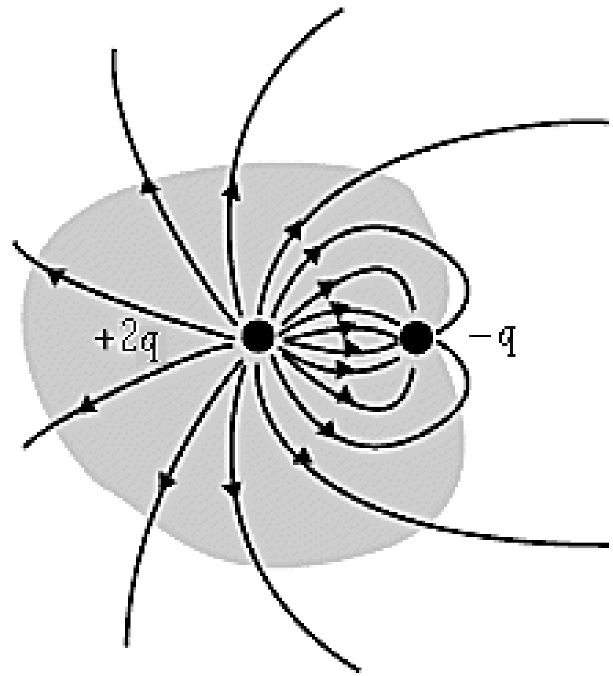


The figure shows a surface enclosing the charges $2q$ and $-q$. The net flux through the surface surrounding the two charges is



A) $q/\in_{0,}$
B) $2q/\in_0$
C) $-q/\in_0$
D) Zero
E) None of these is correct.

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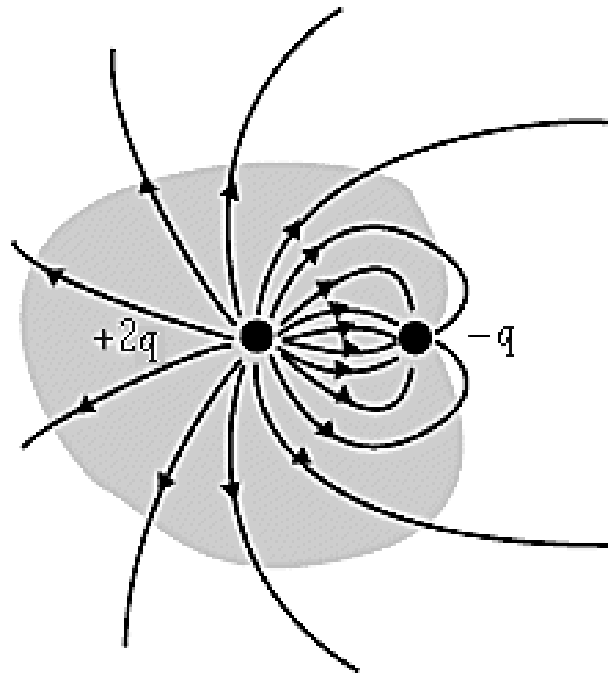
✔ ***A) q/ϵ_0,***

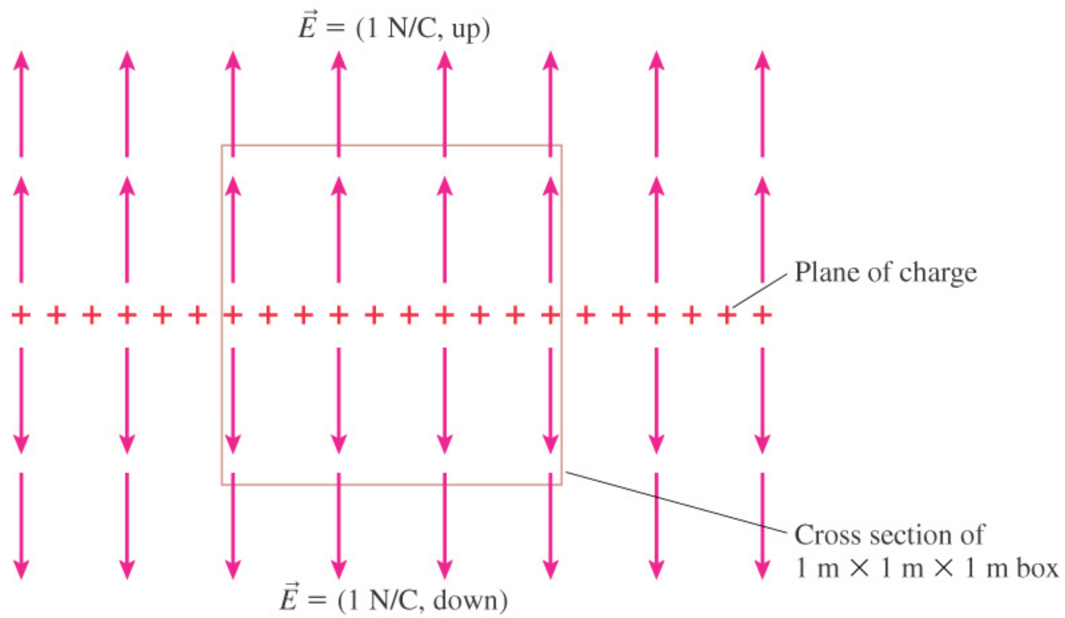
B) $2q/\epsilon_0$

C) $-q/\epsilon_0$

D) Zero

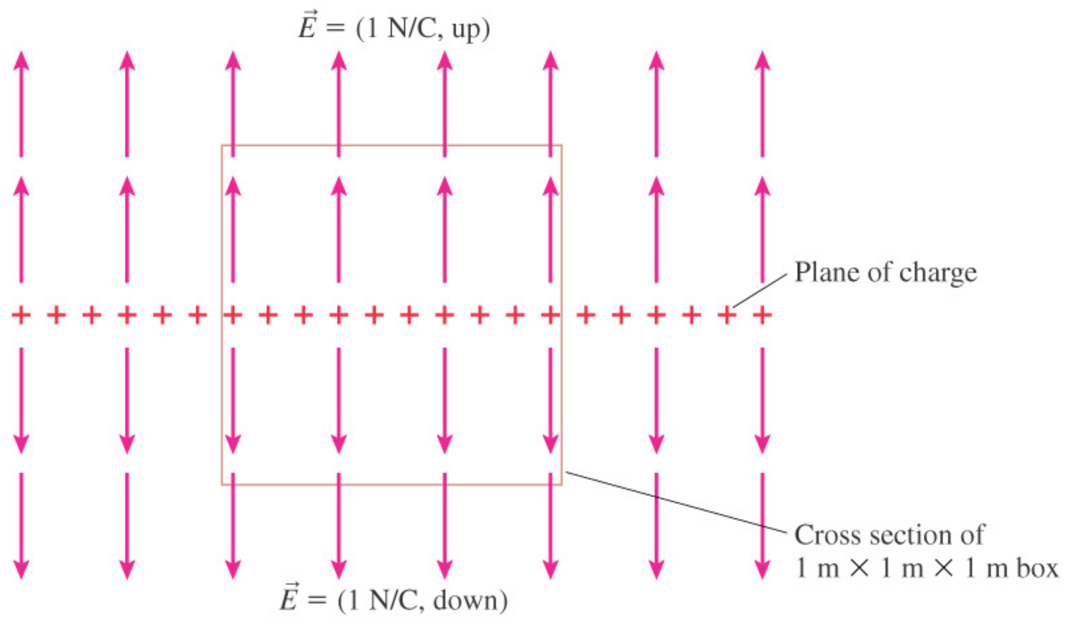
E) None of these is correct.





The total electric flux through this box is

A. 0 Nm^2/C.
B. 1 Nm^2/C.
C. 2 Nm^2/C.
D. 4 Nm^2/C.
E. 6 Nm^2/C.



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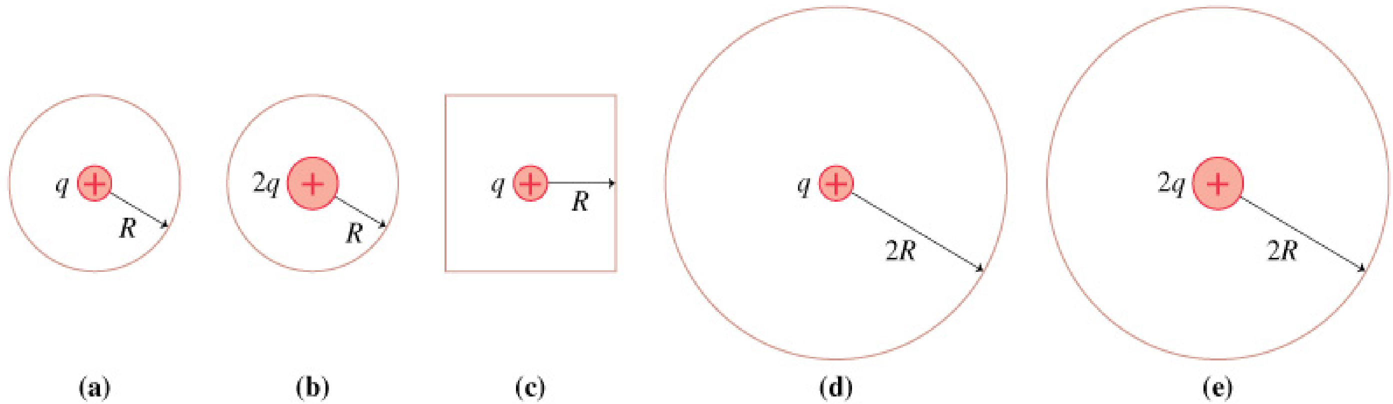
These are two-dimensional cross sections through three-dimensional closed spheres and a cube. Rank order, from largest to smallest, the electric fluxes Φ_a to Φ_e through surfaces a to e.



A. $\Phi_a > \Phi_c > \Phi_b > \Phi_d > \Phi_e$
B. $\Phi_b = \Phi_e > \Phi_a = \Phi_c = \Phi_d$
C. $\Phi_e > \Phi_d > \Phi_b > \Phi_c > \Phi_a$
D. $\Phi_b > \Phi_a > \Phi_c > \Phi_e > \Phi_d$
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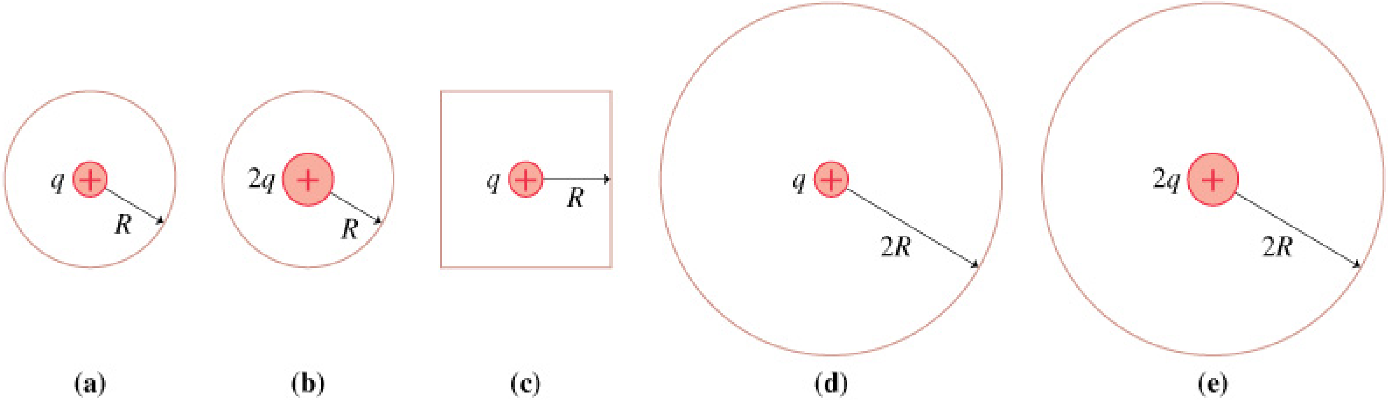

A. $\Phi_a > \Phi_c > \Phi_b > \Phi_d > \Phi_e$

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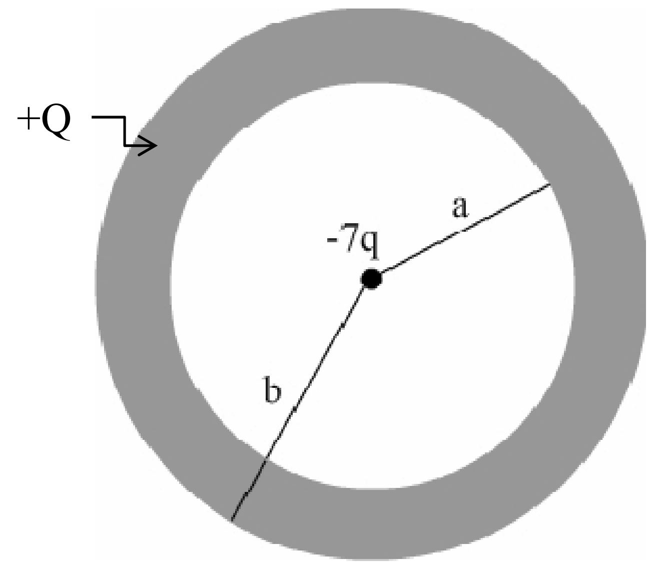
D. $\Phi_b > \Phi_a > \Phi_c > \Phi_e > \Phi_d$

E. $\Phi_d = \Phi_e > \Phi_c > \Phi_a = \Phi_b$

A net charge of +q is transferred to a spherical ***conducting shell of*** inner radius a and outer radius b. A charge (–7q) is placed in the center of the shell. What is the charge on the inside of the conducting shell?

1. -7q
2. -Q
3. 7q
4. Q
5. Q - 7q
6. Q + 7q
7. 7q – Q



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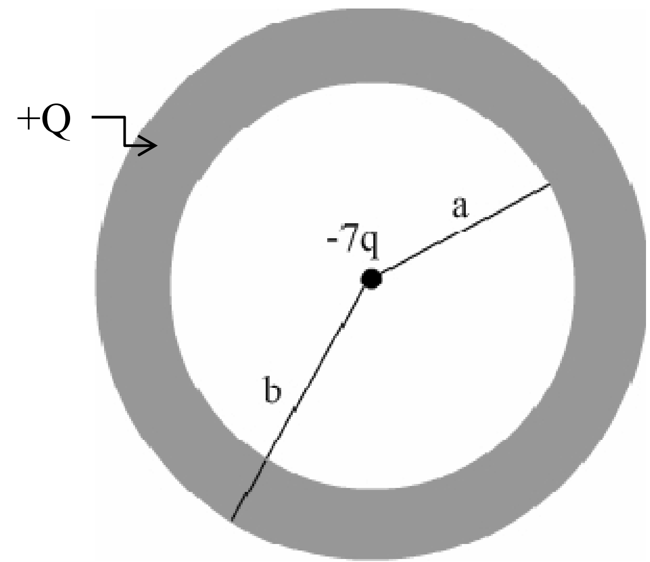
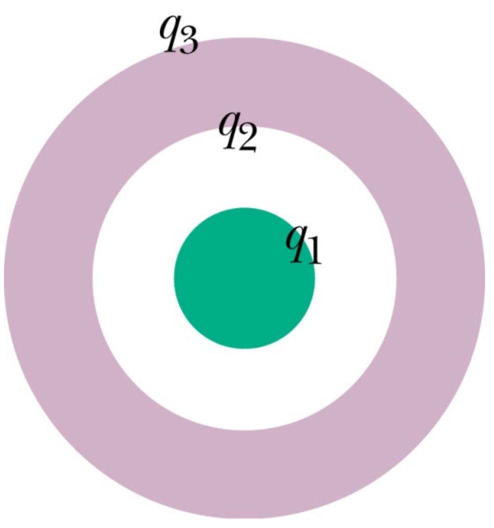


A conducting spherical shell (below) is concentric with a solid conducting sphere. Initially, each conductor carries zero net charge. A charge of $+2Q$ is placed on the inner surface of the spherical shell. After equilibrium is achieved, the charges on the surface of the solid sphere, q_1, the inner surface of the spherical shell, q_2, and the outer surface of the spherical shell, q_3, are

a) $q_1 = -Q$, $q_2 = +Q$, $q_3 = +Q$
b) $q_1 = 0$, $q_2 = 0$, $q_3 = +2Q$
c) $q_1 = 0$, $q_2 = +2Q$, $q_3 = 0$
d) $q_1 = +Q$, $q_2 = -Q$, $q_3 = +3Q$



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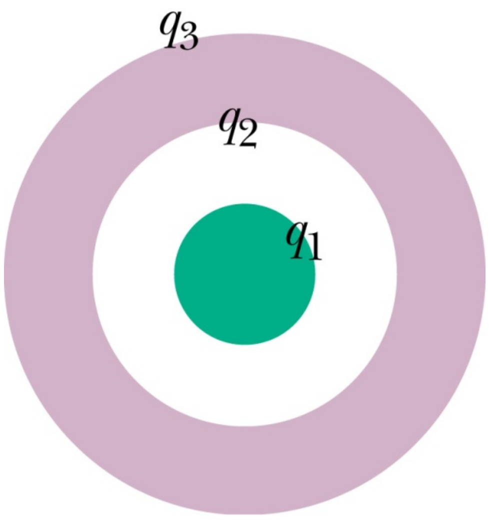

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b) $\mathbf{q_1 = 0, q_2 = 0, q_3 = +2Q}$
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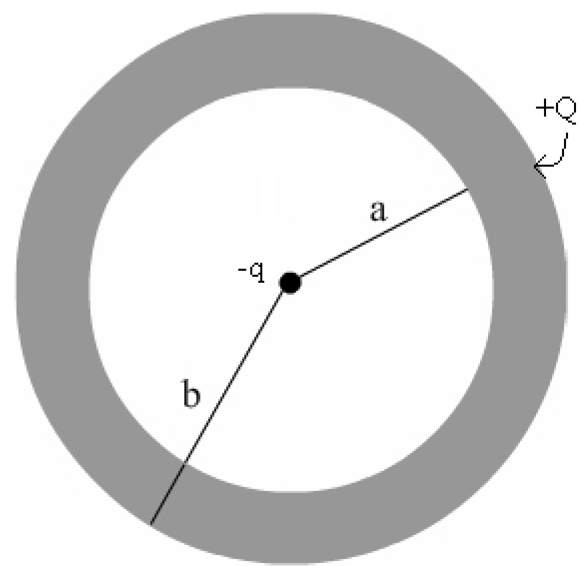
d) $q_1 = +Q$, $q_2 = -Q$, $q_3 = +3Q$

A net charge of +Q is transferred to a spherical conducting shell of inner radius a and outer radius b. A point charge –q is placed in the center of the shell. What is the charge density on the outside of the conducting shell?

1. -q/4πb2
2. -Q/4πb2
3. q/4πb2
4. Q/4πb2
5. (Q - q)/4πb2
6. (Q + q)/4πb2
7. (q – Q)/4πb2



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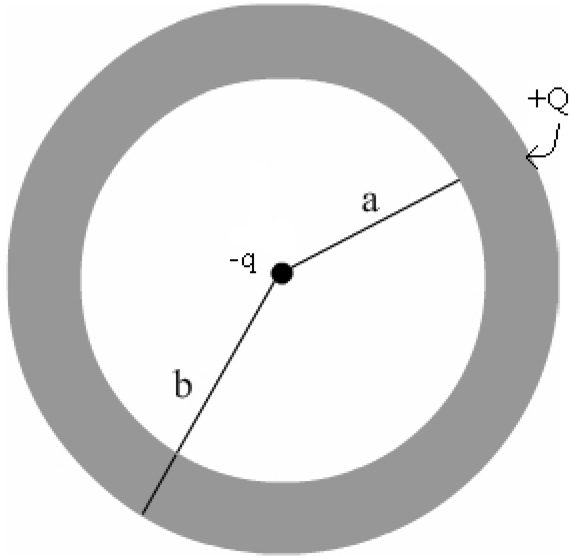

A long cylindrical conducting wire surrounded by a coaxial cylindrical conducting shell of the same length is referred to as a coaxial cable. A total charge of $+Q$ is placed on the central wire and zero net charge on the outer shell, and the electric field, $\mathbf{E}_1$, at a point P inside the cable, far from the ends, as measured. If the coaxial cable is then placed into a uniform external electric field (of the same magnitude $\mathbf{E}_1$), as shown on the right, the electric field you now will measure at point P will be a) zero, b) less than $\mathbf{E}_1$ but not zero, c) $\mathbf{E}_1$, or d) greater than $\mathbf{E}_1$.

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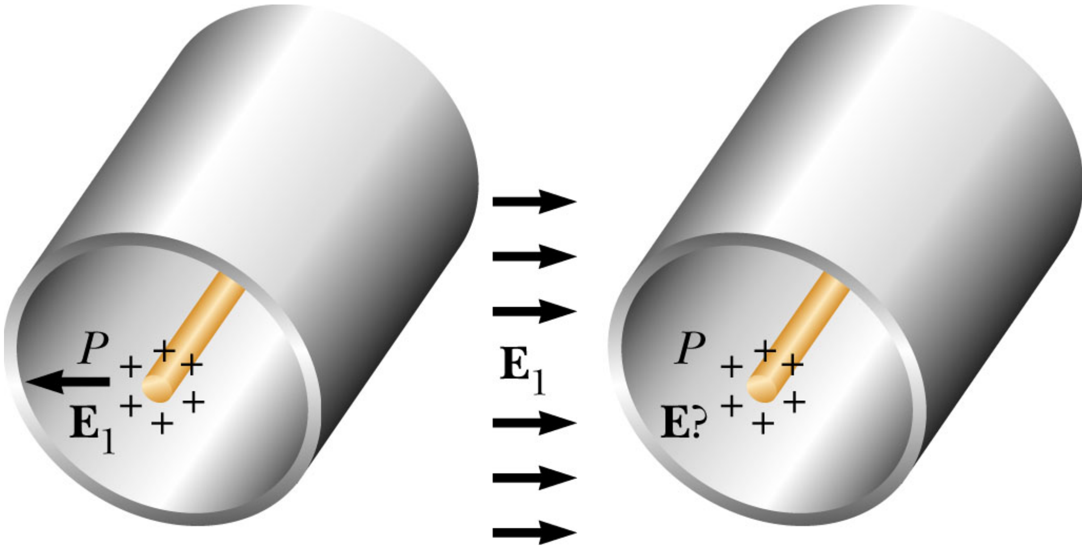

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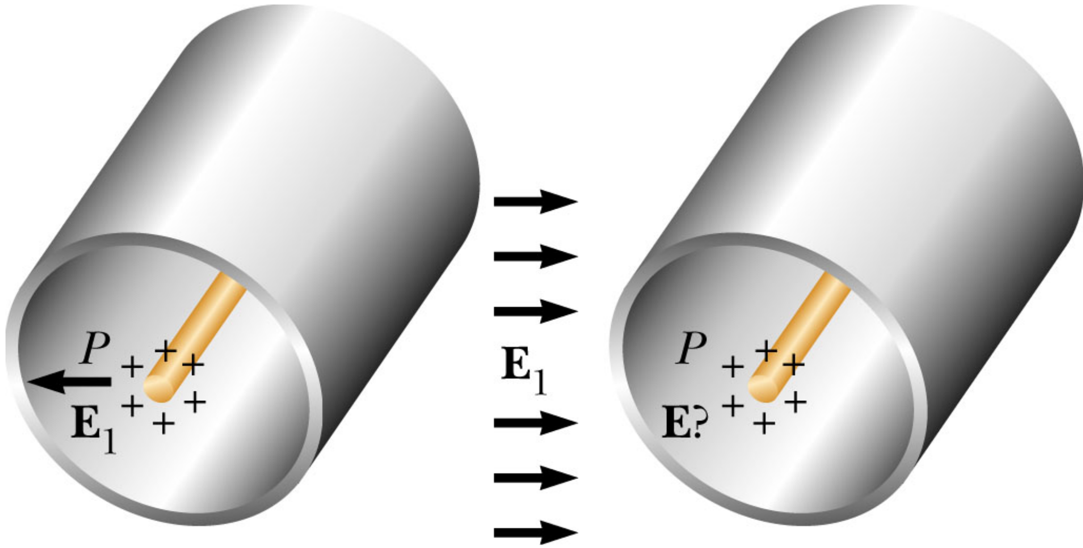

A solid circle and hemisphere have the same radius and are situated in a uniform Electric field. What is the relationship between the flux associated with the circle, φ_1, and the flux associated with the hemisphere, φ_2?

1. $\varphi_1 > \varphi_2$
2. $\varphi_1 < \varphi_2$
3. $\varphi_1 = \varphi_2$
4. Can’t say from the information provided.

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