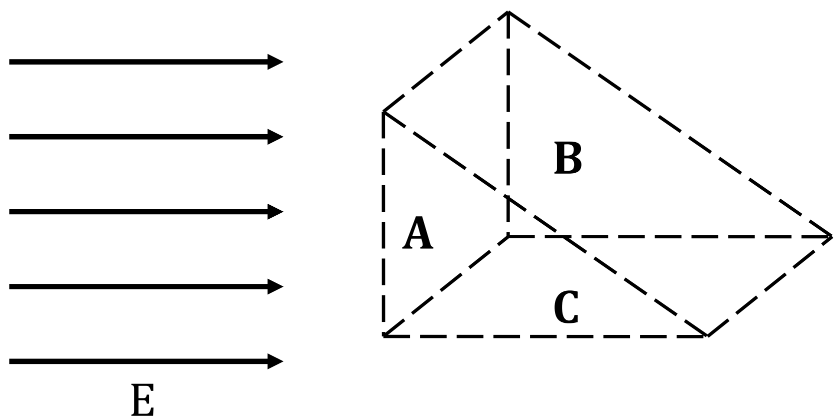
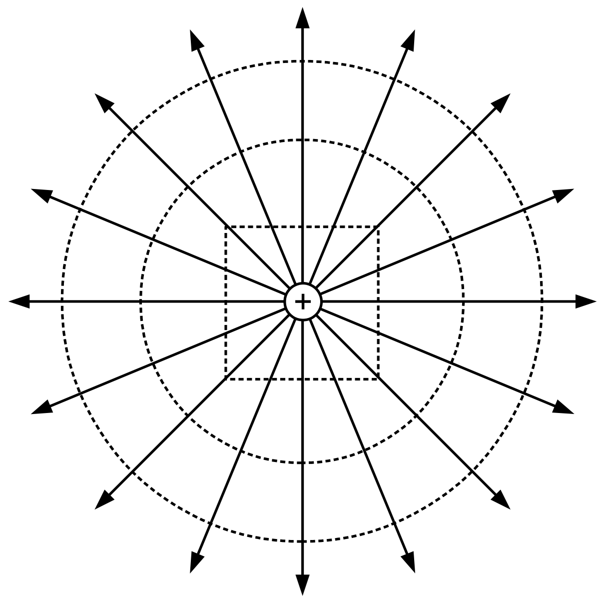
A prism-shaped closed surface is in a constant, uniform electric field E, filling all space, pointing right. The 3 rectangular faces of the prism are labeled **A**, **B**, and **C**. Face **A** is perpendicular to the electric field. The bottom face **C** is parallel to the electric field. Face **B** is the leaning face. (The two triangular side faces are not labeled.)



Which face has the largest magnitude of electric flux through it?

1. A
2. B
3. C
4. A and B have the same flux
5. That all have zero flux
6. They all have the same non-zero flux

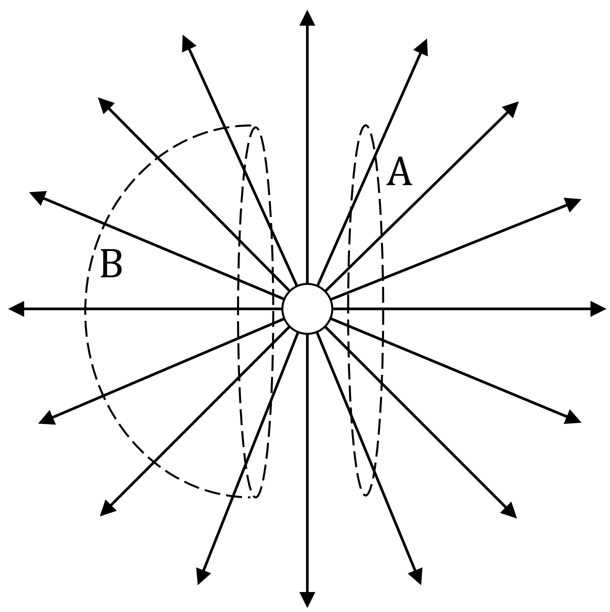
Three closed surfaces enclose a point charge. Which surface has the largest flux through it?



1. Small cube
2. Smaller sphere
3. Larger sphere
4. The spheres are equal, but the cube gets more flux
5. Need more info
6. All three have the same flux.

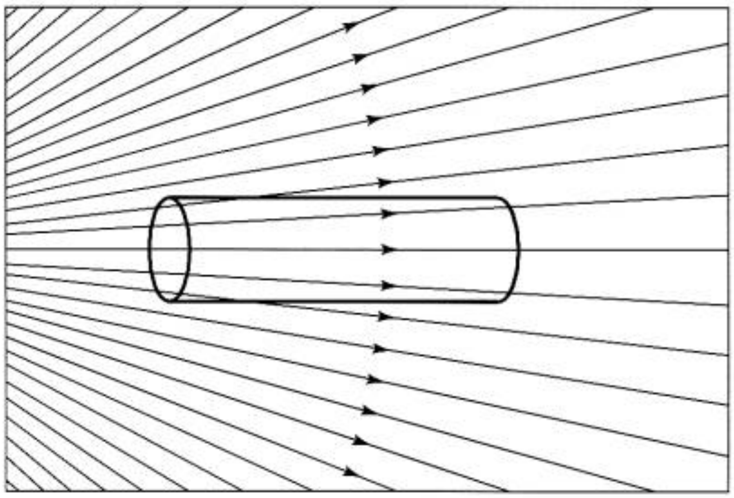
Two open surfaces are in an electric field as shown. The right surface (A) is a flat circular disk of radius *R*, which squarely faces the charge. The left surface (B) is a hollow-cup hemisphere of the same radius *R*. The flat rim of the hemisphere is the same distance from the charge as the rim of the flat disk.

Which surface has the greater flux through it?



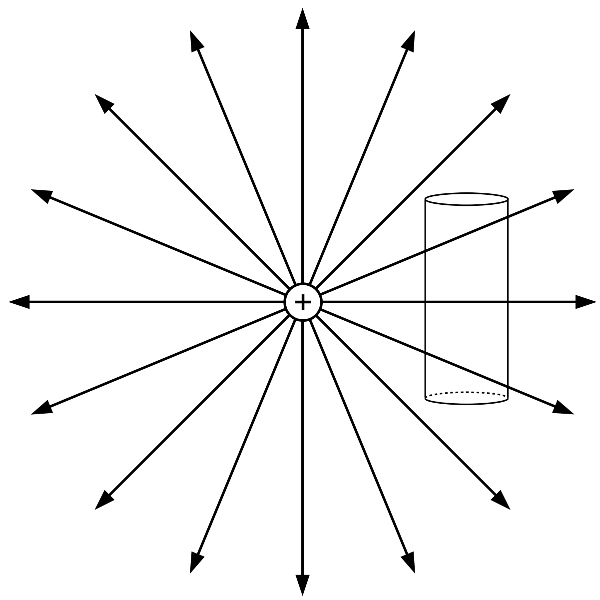
1. A
2. B
3. They are equal
4. It is impossible to know without integration

The net electric flux flowing through the closed cylindrical surface shown is:



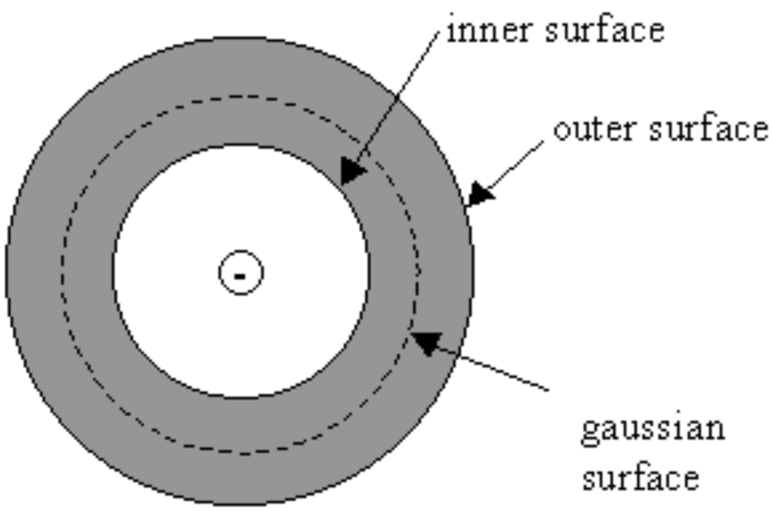
1. Zero
2. Positive
3. Negative

A circular cylinder of radius R and length L is placed near a point charge as shown in the figure. What is the sign of the net flux through its curved side?



1. Positive (net outward flux)
2. Zero
3. Negative (net inward flux)
4. Need more info

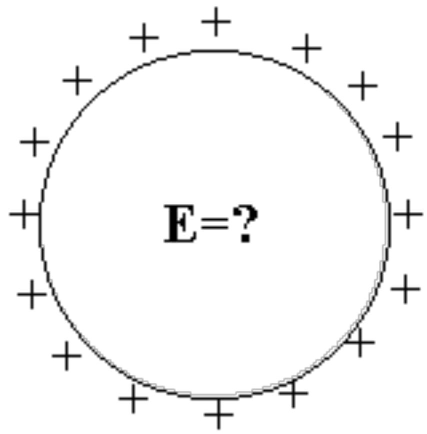
A negative point charge with charge -Q sits in the interior of a thick spherical metal shell. The conducting metal shell has zero net charge. What is the total charge on the inner surface of the shell? Hint: consider the indicated Gaussian surface.



1. – Q
2. + Q
3. – 2Q
4. + 2Q
5. zero
6. Some other answer.

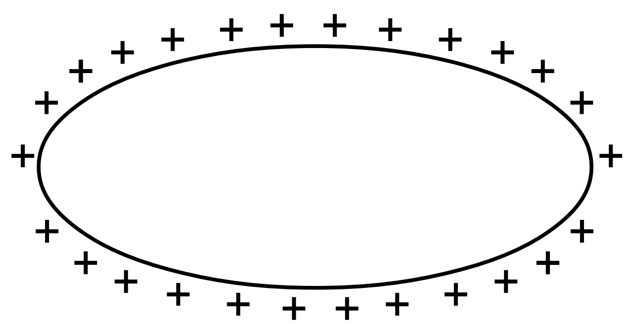
What is the total charge on the exterior surface of the shell?

A spherical body has a uniform positive charge density on its surface. There are no other charges around. What can be known about the electric field inside the sphere?



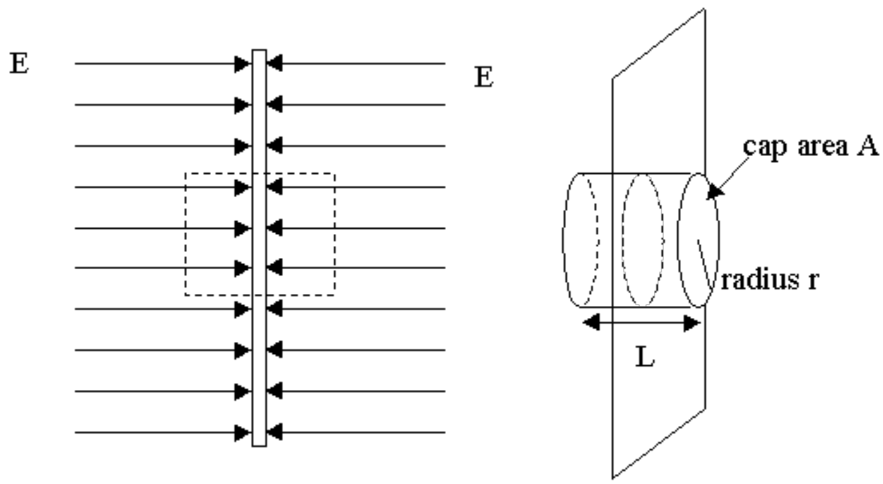
1. E = 0 everywhere inside
2. E = 0 only at the very center, but E can be non-zero elsewhere inside the sphere.
3. E is non-zero everywhere inside the sphere
4. Not enough info given

An oblong body has a uniform positive charge density on its surface. There are no other charges around. What can be known about the electric field inside the oblong body?



1. E = 0 everywhere inside
2. E = 0 only at the very center, but E can be non-zero elsewhere inside the sphere.
3. E is non-zero everywhere inside the sphere
4. Not enough info given

A uniform, infinite plane of negative charge creates a uniform electric field of magnitude E perpendicular to the plane and pointing toward the plane as shown. An imaginary gaussian surface in the shape of a right cylinder is shown. (This shape is sometimes called a "pillbox".)



The magnitude of the flux through surface equals the electric field times

1. the area of pillbox top A
2. twice the area of pillbox top $2A$
3. the surface area of cylinder sides $L\pi\, r^2$
4. the total gaussian surface area $2A + L\pi\, r^2$
5. None of these

1. A prism-shaped closed surface is in a constant electric field. Face A is perpendicular to the field, C is parallel to the field, and face B is the leaning face. Which of these faces has the largest magnitude of electric flux through it?

Answer: 4 The electric field is continuous and invariant all the flux that passes through surface A will pass through surface B. No flux passes through surface C because it is parallel to the field

2. A charged particle is enclosed by three surfaces. The inner most one is a cube, then a sphere, and the outer most surface is a sphere.

Answer: 6 Any flux that passes through the inner cube will pass through all the other shapes. Since flux is conserved it is the same through all surfaces.

3. A disk and a hemisphere both have a radius of R and are centered some distance from a charged particle so that their rims are the same distance from the charged particle. Which surface has the greatest flux through it.

Answer: 3 The rims of the disk and hemisphere are situated identically relative to the charge particle. This means that one could imagine shifting the disk over to cap the hemisphere, thereby enclosing a fixed, finite volume. The net flux through that volume's surface must be zero because there is no electrical charge contained within. Hence, the flux through the hemisphere and the disk must be equal and opposite.

4. What is the net flux of a cylinder in an electric field containing no charged particles?

Answer: 1 Any flux that enters the cylinder must also leave because no flux is created inside the cylinder every bit of flux that enters corresponds to some that leaves so the net flux is zero.

5. A cylinder is placed so that its curved face is perpendicular to a horizontal field line from a charged particle. What is the sign of the net flux through the surface?

Answer: 3 The net flux through the cylinder must be zero since there is no charge contained within. It is obvious that the flux through the caps is outward for both of them. This means that the curved surface must have a net inward flux.

6. A negative charge sits inside of a thick metal spherical shell. What is the total charge on the inner surface of the shell?

Answer: 2 Within a conductor, the electric field is zero. Establish a gaussian surface within the material that encloses the cavity. The electric field on every point of that surface is zero, so the electrical flux through it is zero. By Gauss's law, the net charge contained within is zero, and that gaussian surface can be situated anywhere within the material outside of the cavity itself. Therefore, a quantity of charge equal and opposite to the original charge must exist on the surface of the cavity.