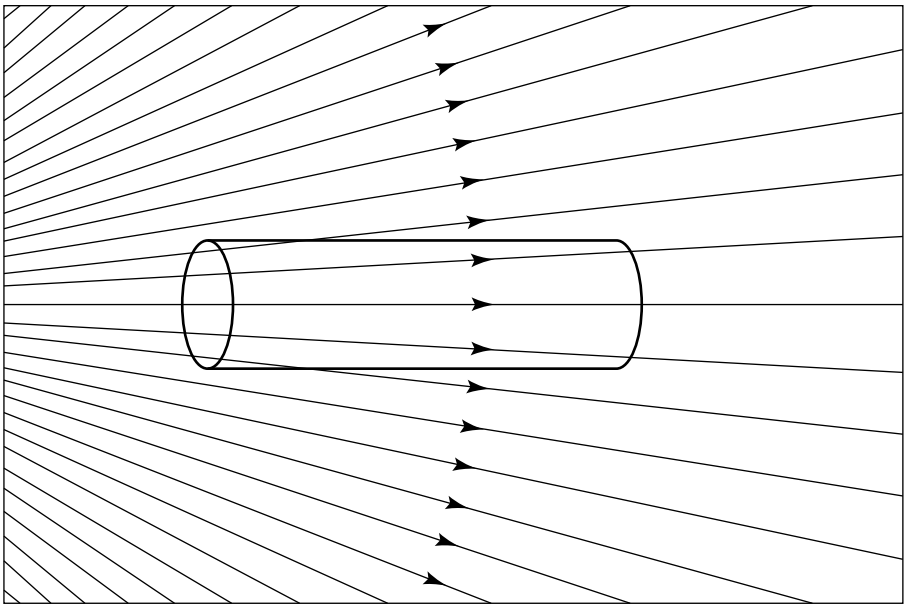
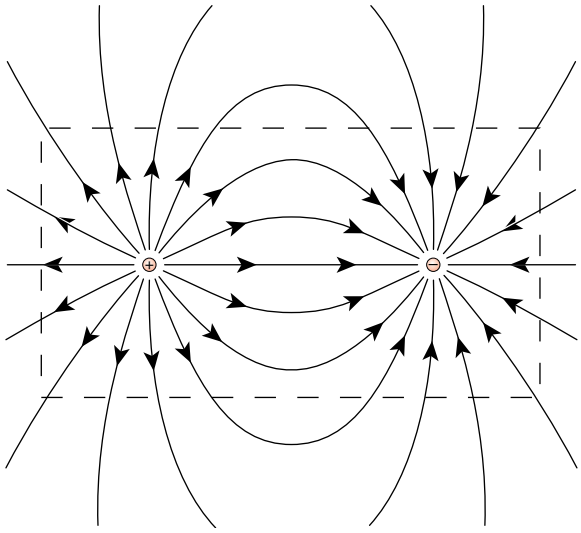
A cylindrical piece of insulating material is placed in an external electric field, as shown. The net electric flux passing through the surface of the cylinder is



1. positive.
2. negative.
3. zero.

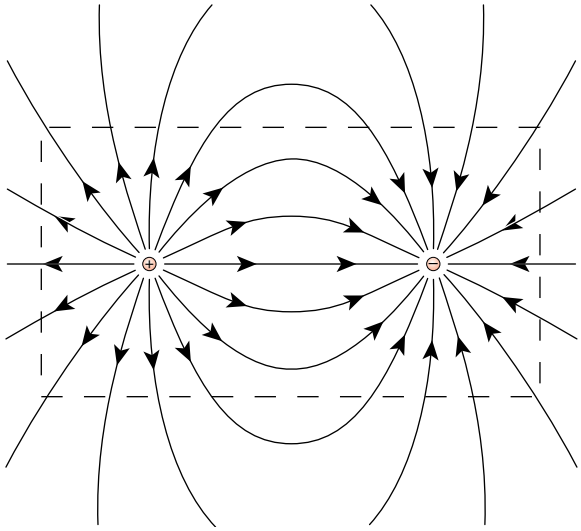
Consider a rectangular Gaussian surface surrounding a dipole that has 16 field lines emanating from its positively charged end.



If you move the Gaussian rectangle around (anywhere in the plane), the field line flux through the rectangle:

1. always remains zero.
2. varies between -32 and +32.
3. varies between -16 and +16.
4. is -16, zero, or 16.
5. Other.

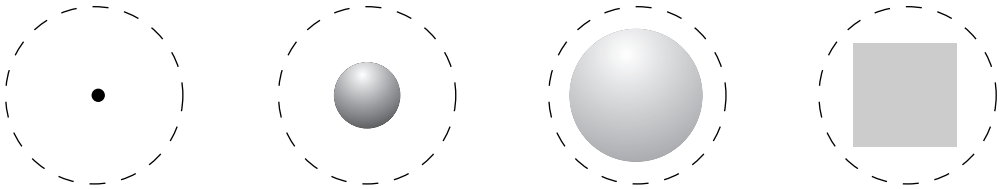
Consider a rectangular Gaussian surface surrounding a dipole as shown below.



If the negative charge is replaced by a positive charge of equal magnitude, the flux through the rectangular surface

1. doubles.
2. becomes zero.
3. becomes nonzero.
4. cannot be determined without knowing more about the charges outside the rectangle.
5. Other.

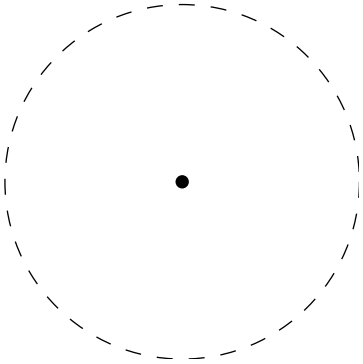
Consider a particle, a metal sphere, a large metal shell, and a plastic cube, all carrying an identical charge $+Q$. Each is surrounded by an identical spherical Gaussian surface.



The field line flux through the Gaussian surface

1. is the same for all four.
2. is largest for the shell.
3. is largest for the cube.
4. depends on how the charge is distributed on the plastic cube.
5. Other.

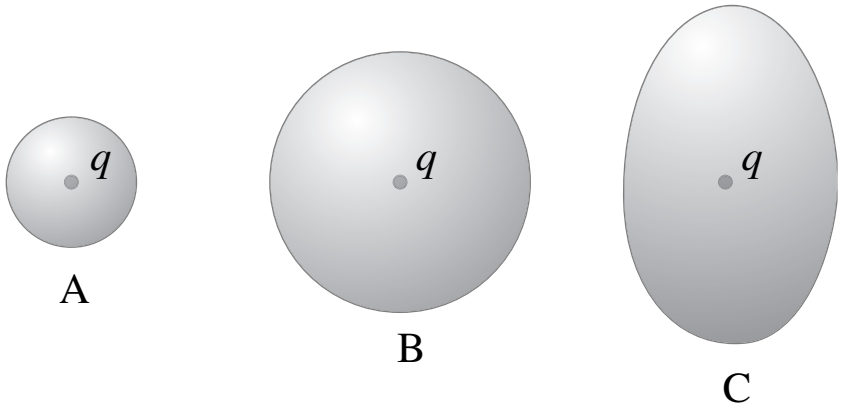
Consider a charged particle at the center of a spherical Gaussian surface.



If the charged particle is moved away from the center of the Gaussian surface, which of the following change?

1. The electric field at the surface and the flux through the surface.
2. Only the electric field at the surface.
3. Only the flux through the surface.
4. Neither one changes.

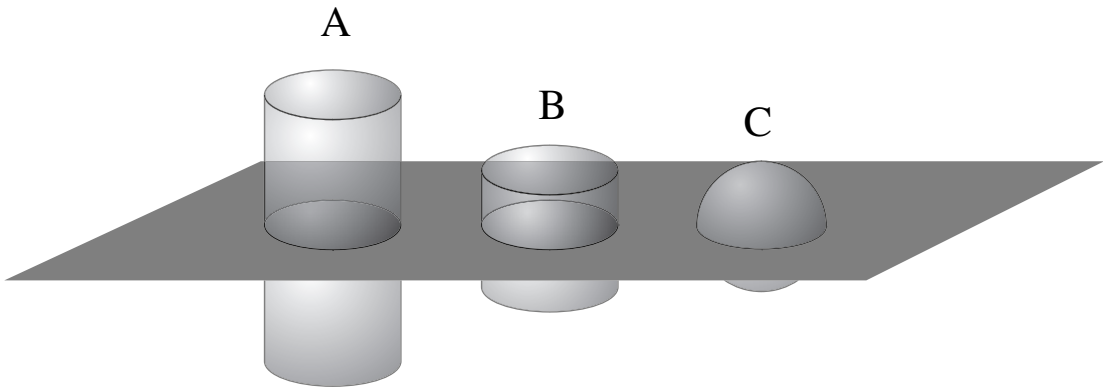
Consider three Gaussian surfaces enclosing a particle carrying a charge q. Spherical surface B has twice the radius of surface A; surface C has the same surface area as surface B.



Rank the three surface in order of increasing electric flux through them.

1. A < B = C
2. A = B = C
3. A > B = C
4. Can't tell without carrying out the integration over C

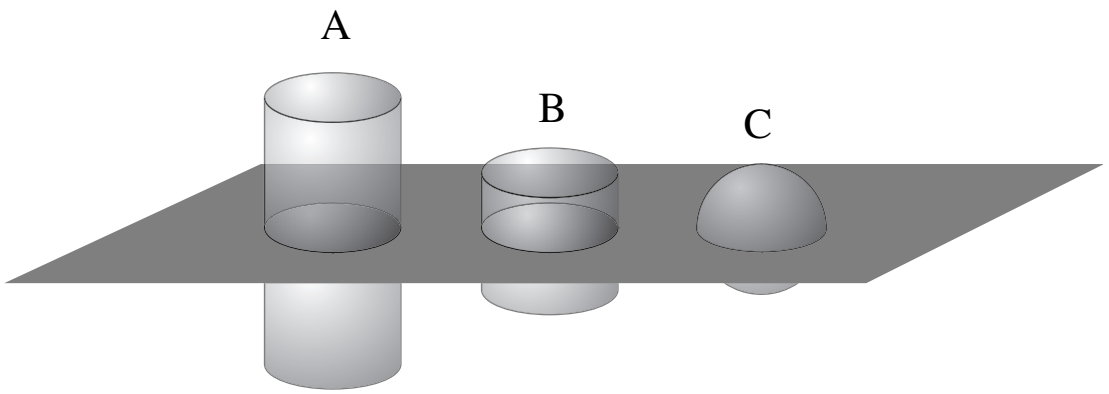
Three gaussian surfaces intersect a surface carrying a uniformly distributed charge. Cylinders A and B and sphere C all have the same radius *R*. The height of A is 2*R*, that of B is *R*.



Rank the three surfaces according to increasing electric flux through them

1. A > B > C
2. A = B > C
3. A = B = C
4. C > A = B
5. None of the above.

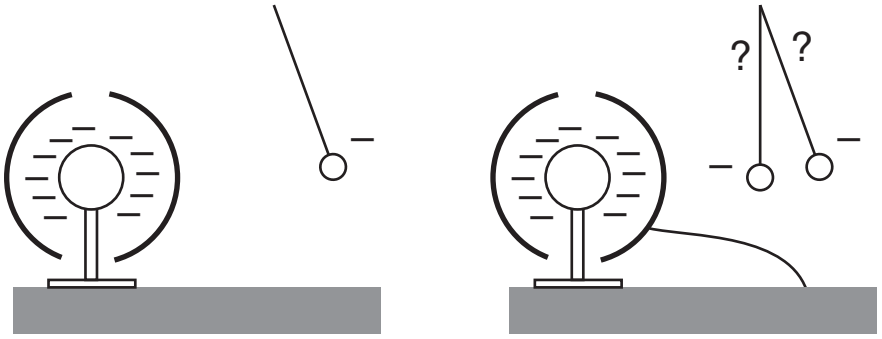
Three gaussian surfaces intersect an infinite surface carrying a uniformly distributed charge density. Cylinders A and B and sphere C all have the same radius R. The height of A is $2R$, that of B is R.



Through which of the following is the electric flux largest: (i) the top surface of A; (ii) the top surface of B; (iii) the hemispherical part of C above the charged surface?

1. (i)
2. (ii)
3. (iii)
4. (ii) and (iii)
5. None of the above.

When a negatively charged object is placed inside an uncharged hollow conductor, a negatively charged pith ball is repelled by the arrangement (see a). The uncharged hollow conductor is now grounded (see b). What happens to the pith ball?



(*a*) (*b*)

1. It stays where it is
2. It is repelled more
3. It is repelled less
4. It is no longer repelled
5. It is attracted to the conductor