Questions

Chapter 23
Gauss' Law

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23-3 Flux of an Electric Field
m2-062

A uniform electric field $\vec{E} = a\,\hat{i} + b\,\hat{j}$ intersects a surface of area A. The flux through the area is:

A)bA if the surface lies yz plane.
B)Zero if the surface lies in the xz plane.
C)Zero if the surface lies in the yz plane.
D)aA if the surface lies in xz plane.
E)Zero if the surface lies in the xy plane.

Answer E

23-3 Flux of an Electric Field
m2-061

When a piece of paper is held with its face perpendicular to a uniform electric field the flux through it is 25.0 $N{\cdot}m^2/C$. When the paper is turned 25.0° with respect to the field the flux through it is:

A) 25.6 $N{\cdot}m^2/C$
B) 17.6 $N{\cdot}m^2/C$
C) 21.3 $N{\cdot}m^2/C$
D) 22.7 $N{\cdot}m^2/C$
E) zero

Answer D

23-4 Gauss' Law
m2-062

A point charge of 12 μC is placed at the center of a spherical shell of radius 12 cm. Find the ratio of the total electric flux through the entire surface of the shell to that of a concentric spherical surface of radius 6.0 cm.

A) 1/2
B) 2
C) 1
D) 1/3
E) 4

Answer C

23-4 Gauss' Law
m2-061

Charge Q is distributed uniformly throughout a spherical insulating shell. The net electric flux in $N \cdot m^2/C$ through the inner surface of the shell is:

A)0
B)Q/ε_o
C)$2Q/\varepsilon_o$
D)$Q/4\pi\varepsilon_o$
E)$Q/2\pi\varepsilon_o$

Answer A

23-4 Gauss' Law
m2-042

The net electric flux passing through a closed surface is -4.00×10^2 $N.m^2/C$. What is net electric charge contained inside the surface if the surface is a cylinder of height 3.52 cm and radius 1.12 cm.

A)-3.54×10^{-9} C.
B)-1.00×10^{-2} C.
C)3.54×10^{-9} C.
D)1.00×10^{-2} C.
E)zero.

Answer A

23-4 Gauss' Law
m2-041

An imaginary closed spherical surface S of radius R is centered on the origin. A positive charge is originally at the origin, and the flux through the surface is "Phi". The positive charge is slowly moved from the origin to a point 2R away from the origin. In doing so the flux through S :

A)remains the same Phi.
B)increases to 4 Phi.
C)increases to 2 Phi.
D)decreases to Phi/4.
E)decreases to zero.

Answer E

23-4 Gauss' Law
m2-041

Figure 1 shows three situations in which a Gaussian cube sits in an electric field. The arrows and the values indicates the directions(in Nxm2/C)of the flux through the six sides of each cube. In which situations does the cube enclose, positive net charge, a negative net charges and zero net charge? respectively.

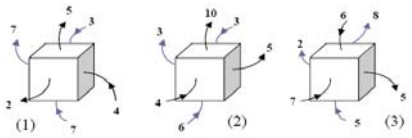


Figure (1)

A)1,2 and 3.
B)2,3 and 1.
C)3,2 and 1.
D)2,1 and 3.
E)1,3 and 2.

Answer B

23-7 Applying Gauss' Law: Cylindrical Symmetry
m2-062

The electric field, at a distance of 40 cm, from a very long uniform wire of charge is 840 N/C. How much charge is contained in a 2.0 cm long of the wire?

A) 0.68 nC
B) 0.37 nC
C) 10 nC
D) 5.0 nC
E) 3.5 nC

Answer B

23-7 Applying Gauss' Law: Cylindrical Symmetry
m2-061

A long wire, of linear charge density λ_ℓ, runs along the cylindrical axis, of a cylindrical conducting shell, which carries a net linear charge density of λ_c. The charge per unit length on the inner and outer surfaces of the shell, respectively are: [Note: linear charge density charge per unit length]

A) $-\lambda_\ell$ and $\lambda_c - \lambda_\ell$
B) λ_ℓ and λ_c
C) $-\lambda_\ell$ and $\lambda_c + \lambda_\ell$
D) $\lambda_\ell + \lambda_c$ and $\lambda_c - \lambda_\ell$
E) $\lambda_\ell - \lambda_c$ and $\lambda_c + \lambda_\ell$

Answer C

23-7 Applying Gauss' Law: Cylindrical Symmetry
m2-041

In figure 2, the magnitude of the electric field at point A, due to an infinite line charge density of 9.0×10^{-6} C/m, is 7.2×10^{4} N/C. If the point A is at a distance R from the line charge, what is R?

A)0.3 m.
B)1.2 m.
C)3.4 m.
D)2.3 m.
E)25 m.

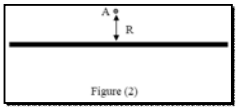


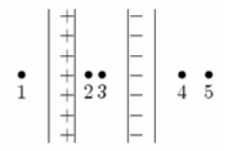
Figure (2)

Answer D

23-8 Applying Gauss' Law: Planar Symmetry
m2-061

Two large insulating parallel plates carry uniformly-distributed surface charge densities of equal magnitude, one positive and the other negative. Rank the points 1 through 5 according to the magnitude of the electric field at the points, least to greatest.

A)1, 2, 3, 4, 5
B)2, then 1, 3, and 4 tied, then 5
C)1, 4, and 5 tie, then 2 and 3 tie
D)2 and 3 tie, then 1 and 4 tie, then 5
E)2 and 3 tie, then 1, 4, and 5 tie



Answer C

23-8 Applying Gauss' Law: Planar Symmetry
m2-042

A charged, isolated, large non-conducting plate is placed on the XY-plane. At 1.5 m from the plate, on Z-axis, the electric field measured was 10^4 N/C and directed into the plate. What is the charge density on the plate?

A)zero.
B)1.8 x 10^{-7} C/m^2.
C)-3.2 x 10^{-7} C/m^2.
D)3.2 x 10^{-7} C/m^2.
E)-1.8 x 10^{-7} C/m^2.

Answer E

23-9 Applying Gauss' Law: spherical Symmetry
m2-062

An insulating sphere of radius R = 10 mm has a uniform charge density ρ = 6.00x10^{-3} C/m^3. Calculate the electric flux through a concentric spherical surface with radius 5.00 mm.

A)355 N.m^2/C
B)300 N.m^2/C
C)250 N.m^2/C
D)100 N.m^2/C
E)150 N.m^2/C

Answer A

23-9 Applying Gauss' Law: spherical Symmetry
m2-042

A positive point charge q sits at the center of a hollow spherical shell. The shell, with radius R and negligible thickness, has net charge -2q. The electric field strength outside the spherical shell (at r>R) will be:

A)kq/r^2 radially outwards.
B)kq/r^2 radially inwards.
C)3kq/r^2 radially inwards.
D)3kq/r^2 radially outwards.
E)zero.

Answer B

23-9 Applying Gauss' Law: spherical Symmetry
m2-041

A non conducting sphere, of radius 4.0 m, has a charge density of 2.0 micro-C/m^3. What is the electric field at a distance 1.7 m from the center?

A)1.9 x10^5 N/C.
B)2.5 x10^5 N/C.
C)1.3 x10^5 N/C.
D)4.8 x10^3 N/C.
E)6.2 x10^3 N/C.

Answer C