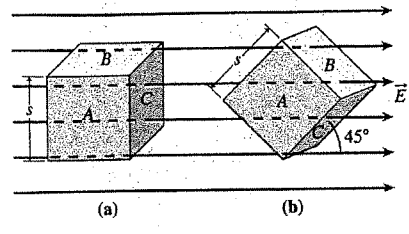


class problems, Wed Feb 26, 2020

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23.1 Electric flux

1. The cube below has sides of length $s = 2\text{m}$. The electric field is 9 N/C .



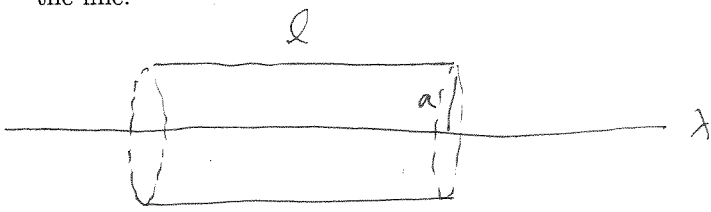
(a) Calculate the flux through each of the cube faces (A, B, C) in figure (a).
 (b) Repeat for the second orientation (b).

2. A flat surface A with an area 0.14m^2 lies in the $x-y$ plane in a uniform electric field $\vec{E} = (5.1\hat{i} + 2.1\hat{j} + 3.5\hat{k})\text{N/C}$.

(a) Sketch the surface A , the vector \vec{A} that represents this surface, and the electric field.
 (b) Write down \vec{A} . Use component form (that is $\hat{i}, \hat{j}, \hat{k}$)
 (c) Calculate the flux through this surface.

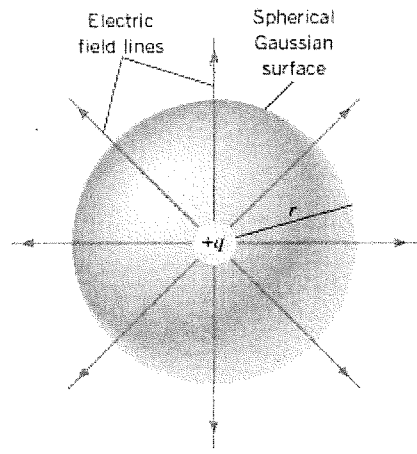
3. An infinite line of charge has an electric field with a magnitude of $E = \lambda/2\pi\epsilon_0 r$, where r is the distance from the line.

Part of the line charge is surrounded by a closed cylinder of radius a and length ℓ , centered along the line.



Determine an expression for the net flux through the cylinder surface. Use the terms given above (λ, π, a, ℓ , but not r).

4. A point charge sits in the center of a spherical surface. Calculate the net flux through the surface if the



- (a) charge is $+3\text{nC}$ and radius is 2m
- (b) charge is $+3\text{nC}$ and radius is 4m
- (c) charge is $+3\text{nC}$ and radius is 8m
- (c) suppose the charge is -3nC . What happens to your results?

Due Thu Feb 27, 2020, beginning of class

23.2 Gauss's law

Read 23.2.

1. What is Gauss's law? Write down 1-2 sentences. You're welcome to take this straight out of any text or website, but certainly give credit where it's due.
2. (a) Write down an equation that describes Gauss's law.
 (b) For every quantity in this equation, write down its name and its units.
 (c) Sketch a diagram that helps illustrate the quantities used in Gauss's law. Label your diagram.