Halliday/Resnick/Walker Fundamentals of Physics 8th edition

Classroom Response System Questions

Chapter 23 Gauss' Law

Interactive Lecture Questions

23.2.1. The end of a garden hose is enclosed in a mesh sphere of radius 4 cm. If the hose delivers five liters per minute, how much water flows through the sphere each minute?

a) 0.0013 liters

b) 0.67 liters

c) 3.2 liters

d) 5.0 liters

e) 20 liters

23.2.2. The a solid brass sphere of radius 3 cm is placed 0.5 m directly below a water faucet. The flow of water from the faucet is two liters per minute. How much water flows through the sphere each minute?

a) zero liters

b) 0.018 liters

c) 0.09 liters

d) 2 liters

e) 6 liters

23.2.3. In July, Joe set up his fixed array of solar panels to maximize the amount of electricity output from the array when the Sun was high in the sky. Unfortunately, Joe finds that the array doesn't operate as well during the winter months, even though there is nothing physical wrong with the array. What is the most likely cause of Joe's winter problem?

a) Less sunlight reaches the Earth during the winter months.

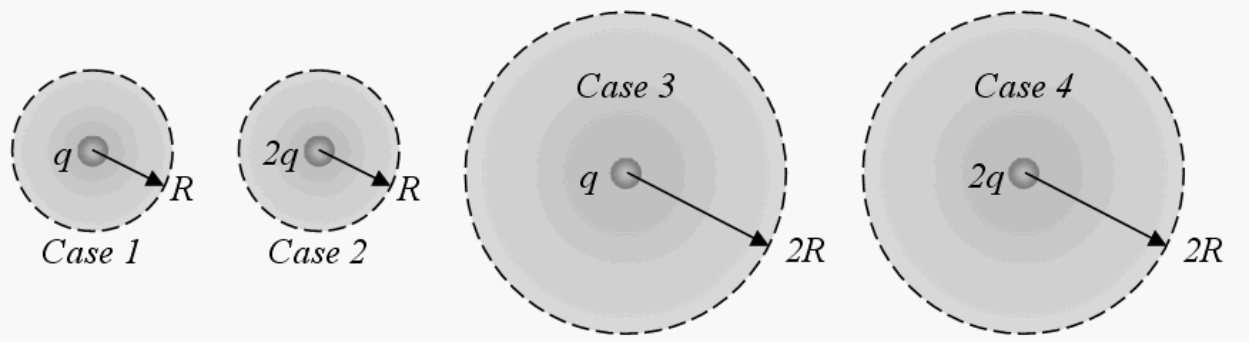
b) The sun is lower in the sky during the winter, so sunlight strikes the solar panels at an angle.

c) The average temperature is much colder during the winter months.

d) More sunlight is absorbed by the atmosphere during the winter months because the Sun is much lower in the sky.

e) The Sun is not as bright during winter months as it is during the summer months.

23.3.2. Consider the five situations shown. Each one contains either a charge q or a charge $2q$. A Gaussian surface surrounds the charged particle in each case. Considering the electric flux through each of the Gaussian surfaces, which of the following comparative statements is correct?



a) $\Phi_2 = \Phi_4 > \Phi_1 = \Phi_3$

b) $\Phi_1 = \Phi_3 > \Phi_2 = \Phi_4$

c) $\Phi_2 > \Phi_1 > \Phi_4 > \Phi_3$

d) $\Phi_3 = \Phi_4 > \Phi_2 = \Phi_1$

e) $\Phi_4 > \Phi_3 > \Phi_2 > \Phi_1$

23.4.3. Gauss' law may be written: $\Phi = \oint \vec{E} \cdot d\vec{A} = \frac{q}{\varepsilon_0}$. Which of the following statements concerning the charge q is true?

a) The charge q is the sum of all charges.

b) The charge q is the sum of all charges on the Gaussian surface.

c) The charge q is the sum of all charges enclosed by the Gaussian surface.

d) The electric field due to q is zero inside the Gaussian surface.

e) The charge q is the amount of charge present whenever the electric field is constant.

23.6.1. A conducting shell with an outer radius of 2.5 cm and an inner radius of 1.5 cm has an excess charge of 1.5×10^{-7} C. What is the surface charge density on the inner wall of the shell?

a) 1.5×10^{-9} C/m^2

b) 2.9×10^{-10} C/m^2

c) 4.8×10^{-10} C/m^2

d) 8.5×10^{-9} C/m^2

e) None of the above answers is correct.

23.7.2. A straight, copper wire has a length of 0.50 m and an excess charge of -1.0×10^{-5} C distributed uniformly along its length. Find the magnitude of the electric field at a point located 7.5×10^{-3} m from the midpoint of the wire.

a) 1.9×10^{10} N/C

b) 7.3×10^{8} N/C

c) 6.1×10^{13} N/C

d) 1.5×10^{6} N/C

e) 4.8×10^{7} N/C

23.8.1. An infinite slab of electrically insulating material has a thickness t. The slab has a uniform volume charge density ρ. Which one of the following expressions gives the electric field at a point P at a depth $t - d$ relative to the surface?

a) $E = \dfrac{\rho t}{2\varepsilon_0}$

b) $E = \dfrac{\rho d}{2\varepsilon_0}$

c) $E = \dfrac{\rho}{2(t-d)\varepsilon_0}$

d) $E = \dfrac{\rho(t-d)}{2\varepsilon_0}$

e) $E = \dfrac{\rho d}{2t\varepsilon_0}$

23.8.2. A large sheet of electrically insulating material has a uniform charge density σ. Let's compare the electric field produced by the insulating sheet with that produced by a thin metal (electrically conducting) slab with $\sigma/2$ charge density distributed on one large surface of the slab and $\sigma/2$ distributed over the surface on the opposite side. How does the electric field at a distance *d* from each surface compare?

a) The electric field near the insulating sheet is four times that near the conducting slab.

b) The electric field near the insulating sheet is twice that near the conducting slab.

c) The electric field near the insulating sheet is the same as that near the conducting slab.

d) The electric field near the insulating sheet is one half that near the conducting slab.

e) The electric field near the insulating sheet is one fourth that near the conducting slab.