

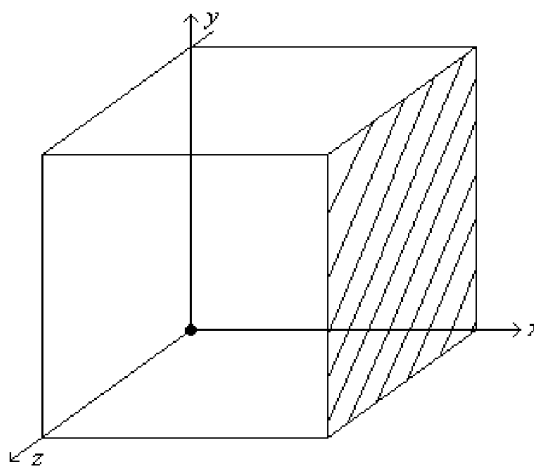
Name _____

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 1) A region of space contains an electric field $\vec{E} = E_1 \hat{i} + E_2 \hat{j}$ where E_1 and E_2 are positive constants. A frame whose corners are located at $(x, y, z) = (a/2, 0, a/2)$, $(-a/2, 0, -a/2)$, $(a/2, 0, -a/2)$, and $(-a/2, 0, a/2)$. What is the magnitude of the electric flux through the frame? 1) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

FIGURE 22-2



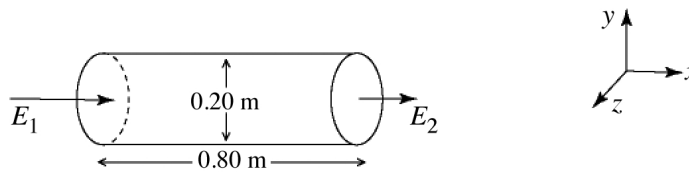
- 2) A uniform electric field with a magnitude of 6×10^6 N/C is applied to a cube of edge length 0.1 m as shown in Fig. 22-2. If the direction of the E -field is along the $+x$ -axis, what is the electric flux passing through the shaded face of the cube? 2) _____
- A) 6×10^4 Nm²/C
 B) 6000×10^4 Nm²/C
 C) 0.6×10^4 Nm²/C
 D) 600×10^4 Nm²/C
 E) 60×10^4 Nm²/C
- 3) A spherical, non-conducting shell of inner radius $r_1 = 10$ cm and outer radius $r_2 = 15$ cm carries a total charge $Q = 15 \mu\text{C}$ distributed uniformly throughout its volume. What is the electric field at a distance $r = 12$ cm from the center of the shell? (SHOW ALL YOUR WORK, DERIVE THE EXPRESSION) 3) _____
- A) 2.87×10^6 N/C
 B) 2.87×10^3 N/C
 C) 0
 D) 5.75×10^3 N/C
 E) 5.75×10^6 N/C

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 4) A nonconducting spherical shell of inner radius R_1 and outer radius R_2 contains a uniform volume charge density ρ throughout the shell. Use Gauss's law to derive an equation for the magnitude of the electric field at the following radial distances r from the center of the sphere. Your answers should be in terms of ρ , R_1 , R_2 , r , ϵ_0 , and π . (SHOW ALL YOUR WORK, DERIVE THE EXPRESSION)
- (a) $r < R_1$
- (b) $R_1 < r < R_2$
- (c) $r > R_2$
- 4) _____

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 5) A nonuniform electric field is directed along the x -axis at all points in space. This magnitude of the field varies with x , but not with respect to y or z . The axis of a cylindrical surface, 0.80 m long and 0.20 m in diameter, is aligned parallel to the x -axis, as shown in the figure. The electric fields E_1 and E_2 , at the ends of the cylindrical surface, have magnitudes of 9000 N/C and 5000 N/C respectively, and are directed as shown. ($\epsilon_0 = 8.85 \times 10^{-12} \text{ C}^2/\text{N} \cdot \text{m}^2$) The charge enclosed by the cylindrical surface is closest to
- 5) _____



- A) -1.1 nC. B) 1.1 nC. C) -4.8 nC. D) 4.8 nC. E) -2.4 nC.

Answer Key

Testname: RECITATION 4 ~ CHAPTER 22

1) $E_2 a^2$

2) A

3) A

4) (a) $E = 0$ (b) $E = \frac{\rho}{3\epsilon_0 r^2} (r^3 - R_1^3)$ (c) $E = \frac{\rho}{3\epsilon_0 r^2} (R_2^3 - R_1^3)$

5) A