

Homework No. 03 (Fall 2025)

PHYS 203B-001: COLLEGE PHYSICS

School of Physics and Applied Physics, Southern Illinois University–Carbondale

Due date: Thursday, 2025 Sep 11, 12:30 PM, on D2L

Instructions

- You are encouraged to use any of the resources to complete this homework. However, the extent to which you depend on resources while doing this homework is a measure of how much extra work you need to put in to master the associated concepts. Solutions should be the last resource.
- Links to solutions are provided.
- Variations of homework problems and additional problems are available in [Lecture Notes](#). These serve as practice problems.
- Describe your thought process in detail and organize it clearly. Make sure your answer has units and right number of significant digits.
- After completion, scan the pages as a single PDF file, and submit the file on D2L (under Assessments → Assignments). You can replace your PDF file as many times as you like, only the last file is graded. The deadline has an (undisclosed) buffer period, so do not hesitate to try submissions after the deadline.

Problems

1. **(10 points.)** The drawing shows an edge-on view of a planar surface of area 2.0 m^2 . Given $\theta = 30^\circ$. The electric field vector \vec{E} in the drawing is uniform and has a magnitude of $3.0 \times 10^2 \text{ N/C}$. Determine the electric flux across the planar surface.

Solution

2. **(10 points.)** Consider a uniform electric field $\vec{E} = E_0 \hat{x}$. A cube, of edge length $L = 10.0 \text{ cm}$, is placed in this electric field with one of the faces perpendicular to the field. Find the electric flux across each of the six faces of the cube. Find the total flux across the total surface of the cube.

Solution

3. **(10 points.)** Consider a perfectly conducting sphere of radius $R = 7.0 \text{ cm}$ with charge $Q = 1.0 \mu\text{C}$ on the surface.

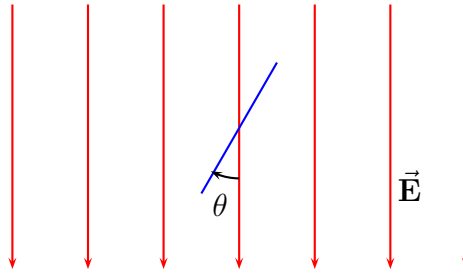


Figure 1: Problem 1.

- (a) Determine the electric flux through the surface of a (Gaussian) sphere of radius 5.0 cm, concentric with respect to the conducting sphere.
- (b) Determine the electric flux through the surface of a (Gaussian) sphere of radius 9.0 cm, concentric with respect to the conducting sphere.
- (c) Determine the electric flux through the surface of a (Gaussian) cube of side length 9.0 cm, with center shared with the conducting sphere.

Solution

4. (10 points.) Charges are placed on the $z = 0$ plane such that it forms a square lattice of

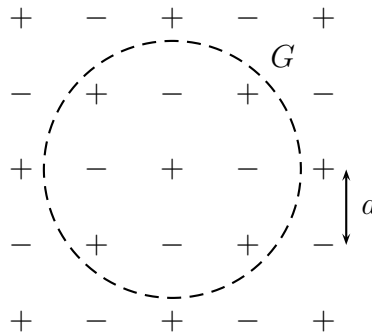


Figure 2: Problem 4

length a that extends to infinity in the plane. Refer Figure 2. The charge on each lattice point has a magnitude of 17.7×10^{-12} C. Determine the electric flux through the surface G of a sphere of radius $R = 1.7a$ shown in Figure 2.

Solution