Midterm Exam No. 01 (Fall 2026)

PHYS 203B-001: COLLEGE PHYSICS

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

Date: 2026 Sep 17

(Name) (Signature)

Instructions

1. Seating direction: In alternate rows, B, D, F, ..., on seats numbered 4, 8, 12, ...
2. Total time = 75 minutes.
3. There are 4 short questions and 3 homework-style problems in this exam.
4. Equation sheet is provided separately.
5. For partial credit you need to present your work in detail and organize it clearly.
6. A simple calculator (with trigonometric functions) is allowed.
7. Use of smart devices, including smart watches, is strictly prohibited. They should stay out of reach during the exam.
8. Academic misconduct will lead to a failing grade in the course.

1. (**5 points.**) A conducting sphere B carries a charge q. Another conducting sphere C is uncharged. Sphere C is brought close to B, but not touched. Is the electric force on C due to B attractive, repulsive, or zero.

2. (**5 points.**) An electron and a proton are released from rest in a uniform electric field. [Recall that a proton is about 1800 times heavier than an electron.] In the same time interval Δt which of them picks up a higher speed?

3. (**5 points.**) A positive charge $q = +1.0\,\text{nC}$ is positioned on the y axis at $y = +1.0\,\text{cm}$. Determine the magnitude of the electric field due to this charge on the y axis at $y = -2.0\,\text{cm}$.

4. (**5 points.**) Consider a configuration of two oppositely charged parallel conducting plates. Draw an equipotential surface for this configuration.

5. (**10 points.**) Three charges $q_1 = q$, $q_2 = -q$, and $q_3 = +q$, with $q = +1.0\,\text{nC}$, are placed at three corners of a square of side $L = 3.0\,\text{cm}$. Refer Figure 1. Calculate the magnitude and direction of the total electric field at the center of the square.

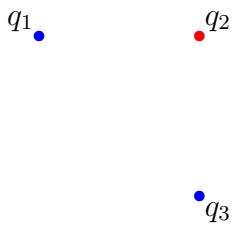

Figure 1: Problem 5

6. (**10 points.**) Two charges, $q_1 = +1.0\,\mu\text{C}$ and $q_2 = +9.0\,\mu\text{C}$, are separated by a distance of 10.0 cm. See Figure 2. Find the spot on the line shown where the net electric field is zero.

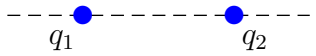

Figure 2: Problem 6.

7. (**10 points.**) Two charges $q_1 = q$ and $q_2 = -2q$ are placed at diagonally opposite corners of a square of side $L = 3.0\,\text{cm}$. Given $q = +1.0\,\text{nC}$. Refer Figure 3. Calculate the electric potential difference between the other two corners of the square marked $\times$.

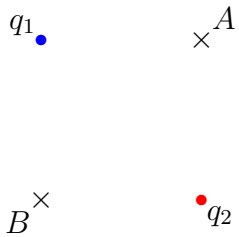

Figure 3: Problem 7