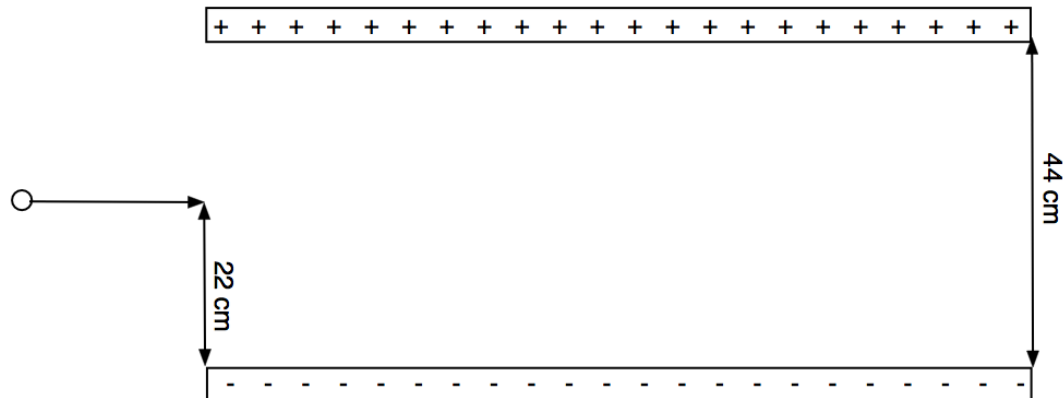


Physics 10164 – Spring 2019 Exam 1F

Partial credit will be given provided you show all work and are solving parts of the problem correctly. Points will be deducted if you don't show your work even if you get the right answer. Clearly indicate your answer with a circle or a box and remember to include correct units and significant figures.

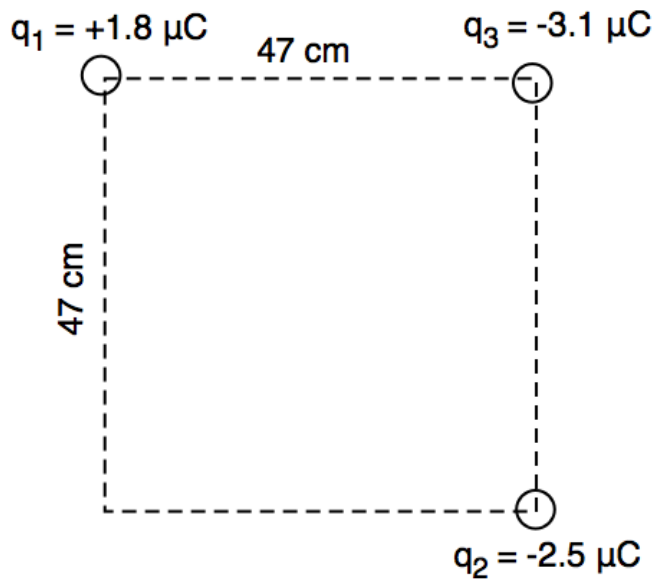
1. (35 pts) A 45 gram mass with a charge of $-120\ \mu\text{C}$ is moving at a constant speed of 85 cm/s along a horizontal path. It then enters a region of uniform electric field of 5500 V/m between two parallel plates as shown below and travels in a parabolic path toward one plate until it hits. You can assume gravity and the electric force are relevant in this problem.

- Which plate does the mass strike?
- Assuming the left edge of the plate is $x = 0.0$ meters, at what x-coordinate does the mass strike one of the plates?



2. (35 pts) Three charges are arranged at the corners of a square as shown below.

- a) What is the magnitude and direction of electric force on charge q_3 due to the other two charges?
- b) How much work would be done by the electric force if charge q_3 were moved from its shown location to the center of the square?



3. (30 pts) A parallel plate capacitor is connected to a 240-Volt battery, and the positive plate is fully charged to $+0.17 \text{ nC}$. The plate has a surface area of 13 cm^2 .

a) What is the separation between the plates?

Suppose the battery is disconnected. After a $K = 4.4$ dielectric is inserted in between the plates...

b) What is the voltage difference between the plates?

c) What is the charge on the positive plate?

d) What is the capacitance of the capacitor?

The dielectric remains in place. After the 240-Volt battery is reconnected...

e) What is the charge on the positive plate?

f) What is the magnitude of the electric field between the plates?