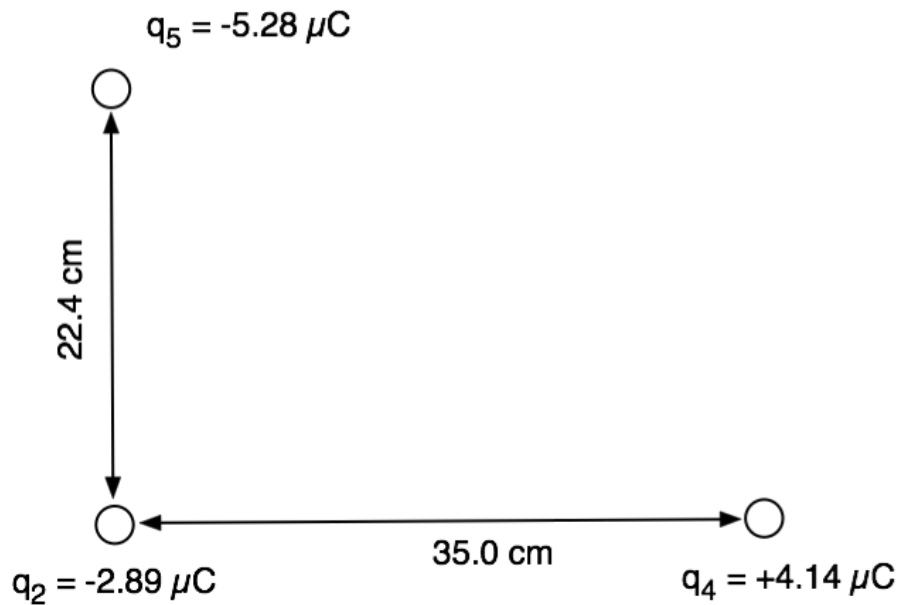


## Physics 10164 - Spring 2020 Exam 1F

1) (35 pts) A 244-gram mass ( $q_5$ ) is located in the vicinity of two other charges as shown below.

- What is the magnitude and direction of the electric field at the location of charge  $q_5$  due to the other charges?
- What is the magnitude and direction of the acceleration of charge  $q_5$  as a result of the electric force it feels?



2) (30 pts) A parallel-plate capacitor has a cross-sectional area of  $9.4 \text{ cm}^2$  and a plate separation of  $0.35 \text{ mm}$ . It is connected to a 12-Volt battery.

- a) What is the charge on the positive plate of the capacitor?
- b) What is the magnitude of the electric field between the plates?

The battery is disconnected, and a  $K = 7.2$  dielectric is inserted between the plates.

- c) What is the voltage difference between the plates now?
- d) What is the charge on the positive plate now?
- e) What is the capacitance of the capacitor with the dielectric inserted?

3) (35 pts) For the arrangement shown below, calculate the work done by the electric force as charges  $q_2$  and  $q_4$  remain fixed in place while charge  $q_5$  moves from its initial location shown to point x, which is directly above its initial location.

