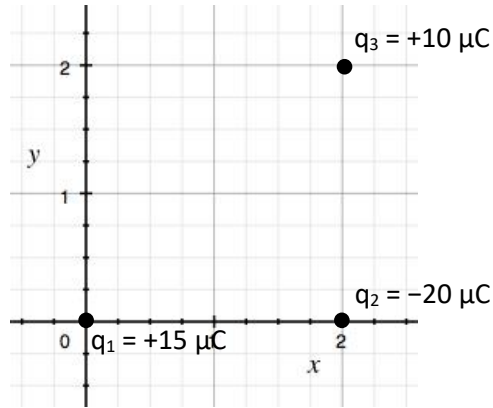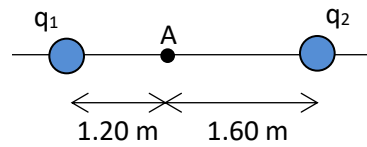# Review Problems for Chapters 19-20 Test

1. Three point charges are located in a plane, as in the diagram below. Find the net force (magnitude and direction) acting on q_3.


$q_3 = +10\ \mu C$

$q_2 = -20\ \mu C$

$q_1 = +15\ \mu C$

2. In the diagram at right, each sphere carries a charge of $+2.00\ \mu C$.

q_1 A q_2

1.20 m   1.60 m

    a. What is the electric field at point A due to q_1?
    b. What is the electric field at point A due to q_2?
    c. What is the electric field at point A due to both spheres?
   d. Draw appropriate field lines.

3. In a cathode ray tube, an electron starting from rest is accelerated through a potential difference of 20 kV. The electron's mass is 9.11×10^{-31} kg. What is its final velocity?

4. A proton is suspended in mid-air between two charged plates, as shown below. The plates are separated by a distance of 5.00 cm. The proton's mass is 1.67×10^{-27} kg. What is the voltage between the plates?

5.00 cm
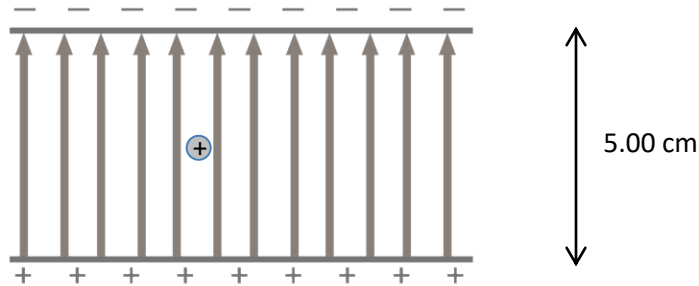
5. Three point charges are located in a plane, as in the diagram below.
        a. Find the electric field vector (magnitude and direction) at point A.
        b. Find the potential at point A.

$q_3 = +10\ \mu C$

A

$q_1 = +15\ \mu C$

$q_2 = -20\ \mu C$
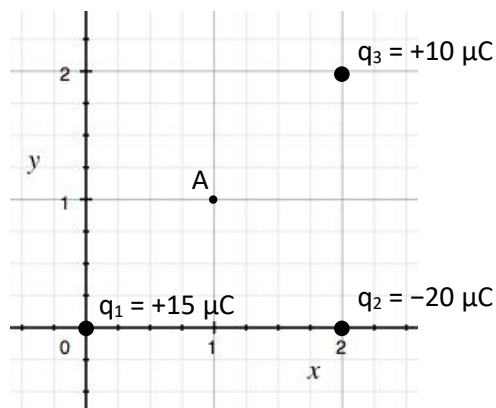
6. Why would you be safe inside a car during a lightning storm?

7. A 48.0-μF parallel plate capacitor is connected to a 12-V battery and fully charged. How much positive charge does it carry? How much negative charge does it carry?

8. The plates of a capacitor consist of two 2.00-m² sheets of copper separated by a 0.10-mm sheet of teflon, whose dielectric constant is 2.1. How much charge will have to be put on the plates to produce a potential difference of 20.0 V across them?

9. A capacitor is connected to a 9.0-V battery and receives a charge of 20.0 μC. How much energy does the capacitor store?

10. A 20-pF capacitor with a mica dielectric of thickness 0.50-mm is connected to a 12-V battery, as shown below. The dielectric constant of mica is 4.8.
      a. What is the area of the plates?
      b. How much energy is stored in the capacitor?

Conductive plates

A

d = 0.50 mm

Dielectric