

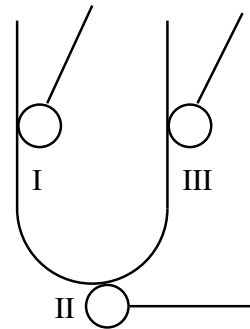
Part I

1. One Coulomb is defined as the amount of charge that
 - (a) produces an electric field of 1 volt/metre at a distance of 1 metre.
 - (b) produces a potential of 1 volt at a distance of 1 metre.
 - (c) when placed at each of two points which are separated by 1 metre produces a force of 1 newton.
 - (d) flows passed a point in a circuit in 1 second when the current is 1 Ampere.

2. Two charges $q_1 = Q$ and $q_2 = -2Q$ are placed on the x -axis at $x = 0$ m and $x = 1$ m respectively. The value of x when the electric field is zero lies in the interval
 - (a) $x < 0$
 - (b) $x > 0$
 - (c) $0 < x < 1$
 - (d) nowhere.

3. A small uncharged ball touches a positively charged metal container in one of the positions I, II, III. The ball will be charged after touching
 - (a) only at positions II and III.
 - (b) only at position I
 - (c) only at position II
 - (d) at positions I, II, III

4. A point charge Q_1 exerts an electrostatic force F on a point charge Q_2 when they are 3.0 cm apart. If the charges are placed 6.0 cm apart, the magnitude of the electrostatic force Q_1 exerts on Q_2 will be
 - (a) $4F$
 - (b) $2F$
 - (c) $F/2$
 - (d) $F/4$



Part II

1. Illustrate how electric field lines are drawn to represent the properties of the electric field and by drawing electric field lines for the following charge configurations:

(a) a small sphere with radius r and positive charge $+q$.

(b) a small sphere with radius r and negative charge $-q$ a distance $8r$ from a sphere of radius r with a charge of $3q$.

(c) a small sphere with radius r and positive charge $+q$ placed inside a larger electrically neutral conducting shell with inner radius $4r$ and outer radius $5r$.

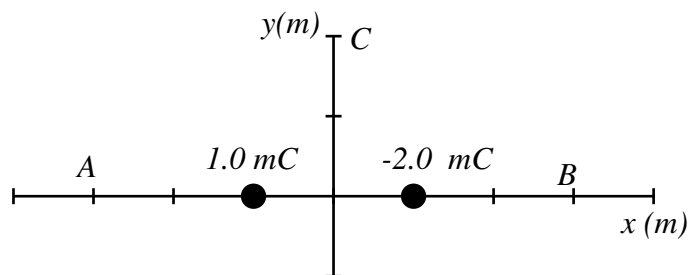
2. Consider a uniformly charged insulating balloon.

(a) If the balloon is spherical is the field inside the balloon zero. Explain.

(b) If the balloon is sausage shaped is the field inside zero? Explain.

(c) Do your answers change if the balloon is coated with conducting paint before being charged?

3. Two charges are placed in a line as shown below



(a) Find the electric field strength at points A and B.

(b) Find the location where the electric field is zero.

(c) Repeat your calculation for the case where both charges are positive.