Student #: _____ Student Name: _____

# Grade 12 Physics Class 9: Electric Field

_____ 1. There are four charged objects: A, B, C, and D. Object A is charged positively. Object A is attracted to Object B. Object B is repelled from Object C. Object C is attracted to Object D. What are the charges on Objects B, C, and D?

(a) B is negative, and C and D are positive.
(b) B and C are positive, and D is negative.
(c) B, C, and D are positive.
(d) B, C, and D are negative.
(e) B and C are negative, and D is positive.

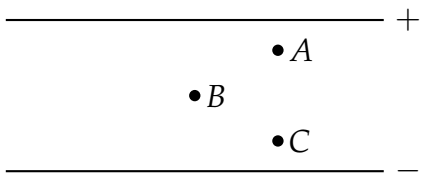
_____ 2. An electron and a proton are separated by $1.50 \times 10^{-10}\,\text{m}$. If they are released, which one will accelerate at a greater rate, and what is the magnitude of that acceleration?

(a) The electron; $1.12 \times 10^{22}\,\text{m/s}^2$
(b) The proton; $1.12 \times 10^{22}\,\text{m/s}^2$
(c) The electron; $6.13 \times 10^{18}\,\text{m/s}^2$
(d) The proton; $6.13 \times 10^{18}\,\text{m/s}^2$
(e) They both accelerate at the same rate; $1.02 \times 10^{-8}\,\text{m/s}^2$

_____ 3. An electron is placed between two charged parallel plates at $A$. It is then moved to $B$ and then to $C$. Which of the following statements are true:

I. The electrostatic force is greater at $A$ than at $B$.
II. The work done from $A$ to $B$ to $C$ is the same as the work done from $A$ to $C$.
III. The electrostatic force is the same at points $A$ and $C$.
IV. The electric field strength decreases as the electron is repelled upward.

(a) I and II
(b) I and III
(c) II and III
(d) II and IV
(e) III and IV



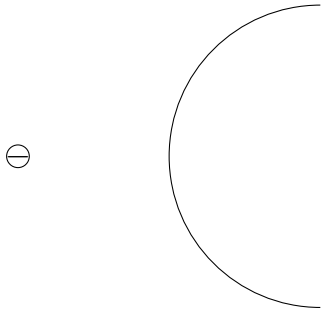

4. Using your vast knowledge of electric fields, draw diagrams showing the electric field around the following configurations:

(a) A single stationary charge

(b) Between two parallel plates

(c) Three point charges

(d) Point charge and a uniformly negative charged sphere



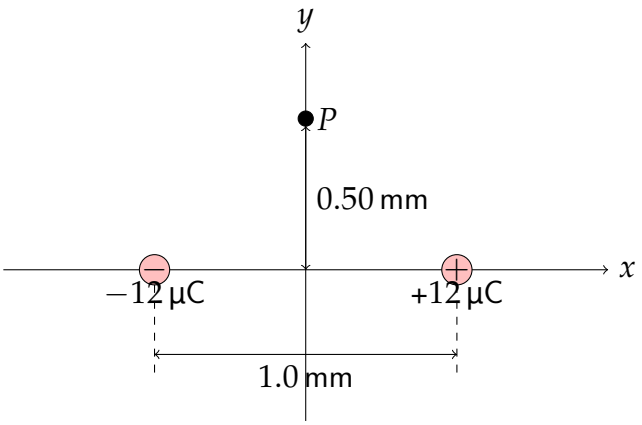
5. Two $1\,\mathrm{kg}$ charges, each carry a charge of $+1$ C. What is the ratio of gravitational force to the electrostatic force?

6. A positively charged particle is fixed in place, unable to move. Another charged particle is then brought near and released.
   (a) Which way does it move?
   (b) What happens to the force, acceleration, and velocity on the moving particle as it moves?
   (c) What happens to the charge's electric potential energy as it moves?

7. Physicist Robert Millikan used an *oil drop experiments* to discover the elementary charge, by suspending charged oil drops inside a known electric field (between two parallel plates). In an experiment replicating Millikan's oil drop experiment, a pair of parallel plates placed $0.0020\,\mathrm{m}$ apart and the top plate is positive. When the potential difference across the plates is $240\,\mathrm{V}$, an oil drop of mass $2.0 \times 10^{-14}\,\mathrm{kg}$ gets suspended between the plates.
   (a) Draw a free-body diagram for the charge.
   (b) What is the charge on the oil drop?
   (c) Is there an excess or deficit of electrons on the oil drop?
   (d) How many electrons are in excess or deficit?

8. A positive charge of $3.2 \times 10^{-5}\,\mathrm{C}$ experiences a force of $4.8\,\mathrm{N}$ to the right when placed in an electric field. What is the magnitude and direction of the electric field at the location of the charge?

9. An *electric dipole* is a pair of particles whose charges are equal and opposite. It resembles many molecules. One such case is shown in the diagram below. Two particles with charges $+12\,\mu C$ and $-12\,\mu C$ are $1.0\,mm$ apart along the $x$-axis. What is the electric field (magnitude and direction) at $P$?




10. A test charge of $+5.0$ µC experiences a force of $2.0 \times 10^3$ N [S] when placed at the midpoint of two oppositely charge parallel plates. Assuming that the plates are electrically isolated and have a distance of separation of $8.0\,mm$, what will be the force experienced by a different charge of $-2.0\,\mu C$, located $2.0\,mm$ from the negative plate?