# PHY2054 QUIZ

## Please Print Clearly

**Instructions:**

- You have 20 minutes to complete this quiz.
- Show your work in the space provided for each question. Writing a correct answer without showing work will not earn credit.
- Include correct units for final numerical answers.
- Do not use or refer to any additional paper or resources other than what is provided during the quiz by the instructor.
- You may use a non-programmable scientific calculator. You may not use an app or program on a smartphone, tablet, or laptop.
- Do not discuss the contents of this quiz or your answers with anyone.

Preserve the integrity of the testing environment:

- Remove any hats or hoods, unless this direction interferes with religious customs.
- Please keep noises and distractions to a minimum.
- Silence and stow your cellphone

Submitting your quiz:

- When you are finished, return all provided materials to your instructor.

Submitting your quiz for evaluation signifies your understanding and compliance of the instructions above, and that you completed the quiz according to the standards and intentions defined by the Honor Code, including that you neither provided nor received assistance answering the following quiz questions.

# Exam 1 Reference Sheet

## *Fundamental Principles*

$$\vec{F}_{net} = m\vec{a}$$

$$\Delta\vec{p} = \vec{F}_{net}\Delta t$$

$$F_g = mg$$

$$K = \frac{1}{2}mv^2$$

$$\vec{p} = m\vec{v}$$

## *Kinematics and Geometry*

$$v_{f,x} = v_{i,x} + a_x\Delta t$$

$$v_{f,x}^2 = v_{i,x}^2 + 2a_x\Delta x$$

$$x_f = x_i + v_{i,x}\Delta t + \frac{1}{2}a_x(\Delta t)^2$$

$$x_f = x_i + v_x\Delta t$$

$$a_c = \frac{v^2}{R}$$

$$A_{circ} = \pi R^2$$

$$A_{sphere} = 4\pi R^2$$

## *Electrostatics*

$$F_{el} = k\frac{qQ}{r^2} \qquad E_Q = \frac{1}{4\pi\epsilon_0}\frac{Q}{r^2} \qquad V(r) = \frac{1}{4\pi\epsilon_0}\frac{Q}{r}$$

$$\Delta U_{el} = q\Delta V$$

$$\Delta U_{el} = -W_{field}$$

$$\vec{F}_{el} = q\vec{E}_{net} \qquad E_{cap} = \frac{Q/A}{\epsilon_0} \qquad E = \frac{\Delta V}{d} \qquad C = \kappa\epsilon_0\frac{A}{d}$$

$$U_{cap} = \frac{1}{2}C(\Delta V)^2$$

$$\Delta V = -\vec{E}\cdot\vec{x} = -|\vec{E}||\Delta\vec{x}|\cos\theta \qquad Q = C\Delta V$$

$$u_E = \frac{1}{2}\kappa\epsilon_0 E^2$$

## *Fundamental Constants*

$$g = 9.8\,\mathrm{m/s^2}$$

$$e = 1.6\times10^{-19}\,\mathrm{C}$$

$$k = \frac{1}{4\pi\epsilon_0} = 9.0\times10^{9}\ \mathrm{Nm^2/C^2}$$

$$1\mathrm{eV} = 1.6\times10^{-19}\ \mathrm{J}$$

$$m_{electron} = 9.1\times10^{-31}\,\mathrm{kg}$$

$$\epsilon_0 = 8.85\times10^{-12}\ \mathrm{C^2/(Nm^2)}$$

$$m_n \approx m_p = 1.7\times10^{-27}\,\mathrm{kg}$$

## *Circuits*

$$R = \rho\frac{L}{A} \qquad P = I\Delta V = \frac{\Delta U}{\Delta t}$$

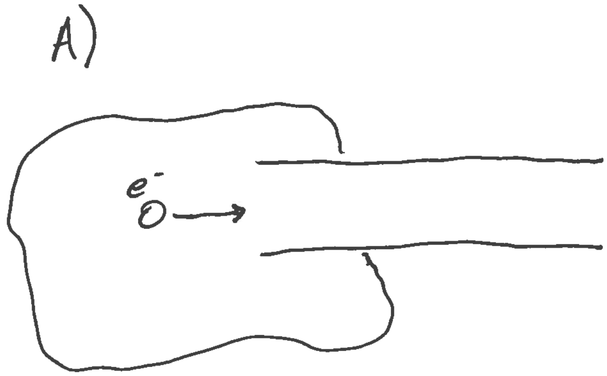
$$I = \frac{\Delta q}{\Delta t} = neAv_d \qquad J = \frac{I}{A} = \sigma E$$

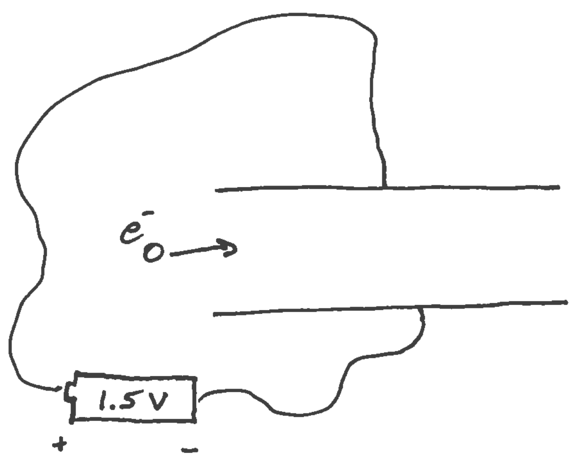
$$\Delta V = IR$$

*Prefixes*

| | |
|---|---|
| f | $10^{-15}$ |
| p | $10^{-12}$ |
| n | $10^{-9}$ |
| μ | $10^{-6}$ |
| m | $10^{-3}$ |
| c | $10^{-2}$ |
| k | $10^{3}$ |
| M | $10^{6}$ |
| G | $10^{9}$ |

1. Two separate electrons are each moving between separate pairs of large, conducting plates as seen below. In case A the two plates are connected directly to each other with a wire. In case B the two plates are connected to a AA battery (1.5 volts) via wires. Using dashed or dotted lines, draw the trajectories that each of the electrons will travel.




2. Using the above example, if the electrons are initially exactly between the pairs of plates, moving at an initial velocity of 3.0 x 10^5 m/s along the plates, separately provide the final velocities of each electron when they either pass through the pair of plates or impact one of the plates. Assume the plates are very long.