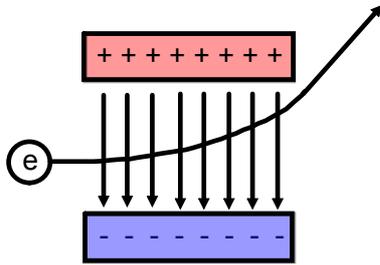


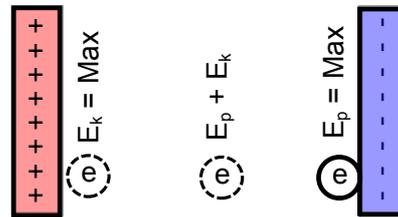
L08 - Parallel Plates and Projectile Motion

Projectile Motion



- L08 - Projectile Motion
 - $d = v_i t + \frac{1}{2} a t^2$ where $\vec{a} = \frac{\vec{F}_{net}}{m}$
 - Assignment: Pg 574 #1-2, Pg 576 #10

Conservation of Energy



- L09 - Conservation of Energy
 - $\Delta V = \frac{\Delta E_p}{q}$ can be written as $\Delta E_p = \Delta V q$
 - $E_k = \frac{1}{2} m v^2$
 - $E_{tot_i} = E_{tot_f}$ or $E_{k_i} + E_{p_i} = E_{k_f} + E_{p_f}$
 - Assignment: Pg 573 #1-2, Pg 575 #4-8

EQUATIONS

Kinematics

$$\vec{v}_{ave} = \frac{\Delta \vec{d}}{\Delta t} \quad \vec{d} = \vec{v}_i t - \frac{1}{2} \vec{a} t^2$$

$$\vec{a}_{ave} = \frac{\Delta \vec{v}}{\Delta t} \quad \vec{d} = \left(\frac{\vec{v}_f + \vec{v}_i}{2} \right) t$$

$$\vec{d} = \vec{v}_i t + \frac{1}{2} \vec{a} t^2 \quad v_f^2 = v_i^2 + 2 a d$$

$$|\vec{v}_c| = \frac{2\pi r}{T} \quad |\vec{a}_c| = \frac{v^2}{r} = \frac{4\pi^2 r}{T^2}$$

Dynamics

$$\vec{a} = \frac{\vec{F}_{net}}{m} \quad \left| \vec{F}_g \right| = \frac{G m_1 m_2}{r^2}$$

$$\left| \vec{F}_f \right| = \mu \left| \vec{F}_N \right| \quad \left| \vec{g} \right| = \frac{G m}{r^2}$$

$$F_s = -kx \quad \vec{g} = \frac{\vec{F}_g}{m}$$

Momentum and Energy

$$\vec{p} = m\vec{v} \quad E_k = \frac{1}{2} m v^2$$

$$F \Delta t = m \Delta \vec{v} \quad E_p = mgh$$

$$W = \left| \vec{F} \right| \left| \vec{d} \right| \cos \theta \quad E_p = \frac{1}{2} k x^2$$

$$W = \Delta E$$

$$P = \frac{W}{T}$$

Waves

$$T = 2\pi \sqrt{\frac{m}{k}} \quad m = \frac{h_i}{h_o} = \frac{-d_i}{d_o}$$

$$T = 2\pi \sqrt{\frac{l}{g}} \quad \frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$$

$$T = \frac{1}{f} \quad \frac{\sin \theta_1}{\sin \theta_2} = \frac{n_2}{n_1} = \frac{v_1}{v_2} = \frac{\lambda_1}{\lambda_2}$$

$$v = f \lambda \quad \lambda = \frac{d \sin \theta}{n}$$

$$f = \left(\frac{v}{v \pm v_s} \right) f_s \quad \lambda = \frac{x d}{n l}$$

Electricity and Magnetism

$$\left| \vec{F}_e \right| = \frac{k q_1 q_2}{r^2} \quad \Delta V = \frac{\Delta E}{q}$$

$$\left| \vec{E} \right| = \frac{k q}{r^2} \quad I = \frac{q}{T}$$

$$\vec{E} = \frac{\vec{F}_e}{q} \quad \left| \vec{F}_m \right| = I l \left| \vec{B} \right|$$

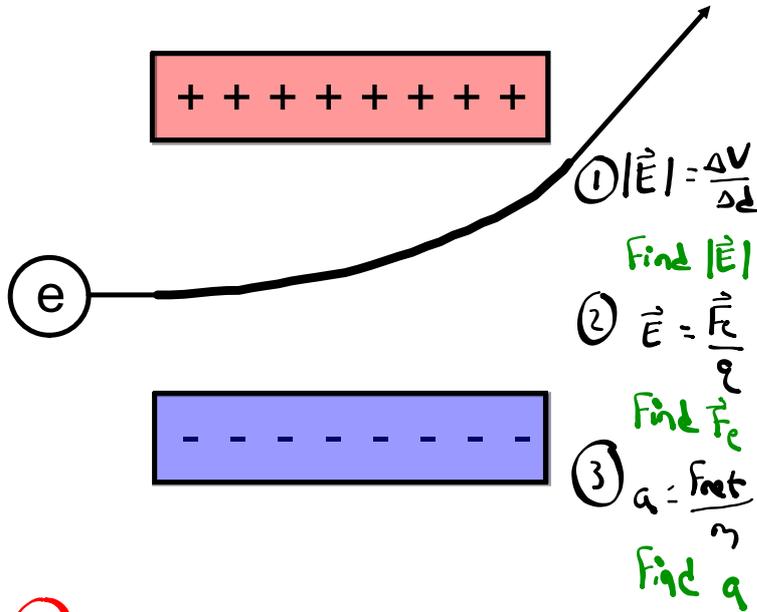
$$\left| \vec{E} \right| = \frac{\Delta V}{\Delta d} \quad \left| \vec{F}_m \right| = q v \left| \vec{B} \right|$$

Atomic Physics

$$W = h f_0 \quad E = h f = \frac{h c}{\lambda}$$

$$E_{k_{max}} = q_e V_{stop} \quad N = N_0 \left(\frac{1}{2} \right)^n$$

Projectile Motion - How it Works?



$$v_{ave} = \frac{\Delta d}{\Delta t}$$

$$d = v_i t + \frac{1}{2} a t^2$$

$$\vec{d} = \frac{\vec{F}_{net}}{m}$$

$$E_k = \frac{1}{2} m v^2$$

$$\Delta V = \frac{\Delta E}{q}$$

$$|\vec{E}| = \frac{\Delta V}{\Delta d}$$

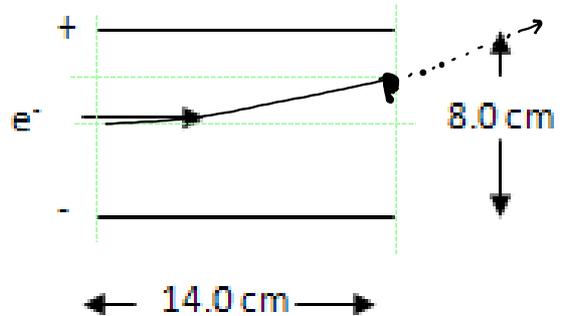
$$E = \frac{\vec{F}_e}{q}$$

④a) x-comp
 $v_x = \frac{dx}{dt}$

④b) y-comp
 $d = v_i t + \frac{1}{2} a t^2$
 $d = \frac{1}{2} a t^2$

Q1: An electron travelling horizontally at a velocity of 8.70×10^6 m/s to the right enters into an electric field of 1.32×10^3 N/C between two horizontal, parallel plates, as shown in the given diagram.

Calculate the vertical displacement of the electron as it travels between the plates.



Electron..... $-e$ 9.11×10^{-31} kg

$$v_{\text{ave}} = \frac{\Delta d}{\Delta t}$$

$$d = v_i t + \frac{1}{2} a t^2$$

$$a = \frac{F_{\text{net}}}{m}$$

$$E_k = \frac{1}{2} m v^2$$

$$\Delta V = \frac{\Delta E}{q}$$

$$|E| = \frac{\Delta V}{\Delta d}$$

$$E = \frac{F_e}{q}$$

① $|\vec{E}| = 1.32 \times 10^3$ N/C

② $\vec{E} = \frac{\vec{F}_e}{q}$

$$\vec{F}_e = q \vec{E} = (1.60 \times 10^{-19}) (1.32 \times 10^3)$$

$$= 2.112 \times 10^{-16} \text{ N}$$

③ $q = \frac{F_{\text{net}}}{m} = \frac{2.112 \times 10^{-16}}{9.11 \times 10^{-31}} = 2.31833150384 \times 10^{14} \text{ m/s}^2$ (up)

④ x-comp

$v_x = 8.70 \times 10^6$ m/s
 $dx = 14.0 \times 10^{-2}$ m
 $t = ?$

$v_x = \frac{dx}{t}$

$t = 1.6091954023 \times 10^{-8}$ s

y-comp

$v_{iy} = 0$
 $a = 2.31833150384 \times 10^{14}$ m/s²
 $dy = ?$
 $t = ?$

$d = v_i t + \frac{1}{2} a t^2$
 $d = \frac{1}{2} (2.318 \dots \times 10^{14}) (1.609 \dots \times 10^{-8})^2$

$d = 3.00 \times 10^{-2}$ m