Physics 2020
Spring 2007
Sid Rudolph

COVER SHEET — EXAM 2

Seat #

Data

$e^- = -1.6 \times 10^{-19}$ C

$k = \frac{1}{4\pi\epsilon_o} = 9.0 \times 10^9$ Nm^2/C^2

micro (μ) = 10^{-6}

$p^+ = 1.6 \times 10^{-19}$ C

$\epsilon_o = 8.85 \times 10^{-12}$ C^2/N-m^2

area (circle) = πr^2

Equations

$$v = \lambda f$$

$$f = \frac{1}{T}$$

Superposition

Diffraction Minima:

(a) rectangular opening

$$n\lambda = D \sin\theta \qquad n = 1, 2, \ldots$$

(b) circular opening

$$1.22 n\lambda = D \sin\theta$$

Standing Waves

(a) string (fixed at both ends)

$$f_n = \frac{n}{2L} v \qquad n = 1, 2, \ldots$$

$$v = \sqrt{\frac{T}{\rho}}$$

(b) sound in tubes

open at both ends

$$f_n = \frac{n}{2L} v \qquad n = 1, 2, \ldots$$

closed at one end

$$f_n = \frac{n}{4L} v \qquad n = 1, 3, 5, \ldots$$

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

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

$$F_E = k \frac{q_1 q_2}{r^2}$$

For a distribution of point charges

$$\vec{E}_{tot} = \sum \vec{E}_i$$

$$\vec{E} = \frac{\vec{F}_E}{q_o}$$

$$\vec{F}_E = q\vec{E}$$

Parallel Plate Device

$$E = \frac{Q}{\epsilon_o A}$$

$$\Delta V = V_B - V_A \equiv \frac{W_{A\to B}}{q_o} \equiv \frac{\Delta PE_E}{q_o}$$

$$\Delta PE_E = q\Delta V$$

Cases

(a) Parallel Plates

ΔV (between plates) = Ed

(b) Point Charge

$$\Delta V = V_B - V_A = kQ\left(\frac{1}{r_B} - \frac{1}{r_A}\right)$$

Absolute Electric Potential Due to Point Charge

$$V = \frac{kQ}{r}$$

Gauss' Law

$$\phi_{tot} \text{ (inside Gaussian surface)} = \frac{q_{tot}}{\epsilon_o}$$

$$\phi_{tot} = \sum E \Delta A \cos\theta$$