



QUAID-I-AZAM UNIVERSITY ISLAMABAD

B.Sc. Annual Examinations--2013
(PART-I)

Roll No: _____

Subject: **Physics**

Paper: **B** (Waves, Optics & Thermal Physics)

Time Allowed: **3 Hours**

July 01, 2013

Max Marks: **50**

Note: Attempt total FIVE questions selecting not more than TWO from any section. All questions carry equal marks. Only simple scientific calculator is allowed.

SECTION-A (Waves)

Q. No.1

(a) What are the basic characteristics of Simple Harmonic Motion? Show that Simple Harmonic Motion can be described as the projection of uniform circular motion along the diameter of a circle. Find the equations for velocity, displacement and acceleration. (5)

(b) A body oscillates with Simple Harmonic Motion according to the equation:

$$x = (6.12 \text{ m}) \cos [(8.38 \text{ rad/s})t + 1.92 \text{ rad}]$$

For the motion find.

i. displacement ii. velocity iii. acceleration at the time $t = 1.90$ seconds iv. frequency v. period. (5)

Q. No.2

(a) Find the Wave Equation and its solution. (5)

(b) A Sinusoidal Wave travels along a string. The time for a particular point to move from maximum displacement to zero displacement is 178 milli second . The wavelength of the wave is 1.38 metre.

For the wave find ,

i. period ii. frequency iii. speed. (5)

SECTION-B (Optics)

Q. No.3

(a) What is meant by interference of light? Describe 'Young's Double-Slit' experiment and find the conditions for the maxima and minima. Show that bright and dark fringes are of equal width. (5)

(b) A Double-Slit experiment is performed with blue-green light of wavelength 512 nanometer. The slits are 1.2 millimeter apart and the screen is 5.4 meter away from the slits. How far apart are the bright fringes as seen on the screen? (5)

Q. No.4

(a) Derive the thin Lens formula:

$$1/o + 1/i = 1/f \quad \text{and also find the equation for magnification.} \quad (5)$$

(b) The Thin Lens formula is:

$$\left[\frac{1}{o} + \frac{1}{i} = \frac{1}{f} \right]$$

The Newtonian form is obtained by considering the distance x from the object to the First Focal Point and the distance x' from the Second Focal Point to the image. Show that, $xx' = f^2$ (5)

Q. No.5

(a) What is meant by Polarization of light? Describe Circular Polarization and derive a relation for the Intensity of light after Polarization by a Polarizing Sheet. (1+4=5)

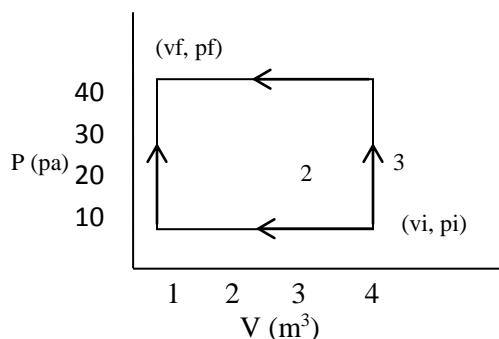
(b) When red light in vacuum is incident at the polarizing angle on a certain glass slab, the angle of refraction is 31.8° . What are

i. Index of Refraction of the glass ii. the Polarizing Angle (2.5+2.5=5)

SECTION-C (Thermal Physics)

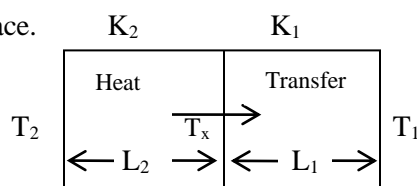
Q. No.6

- (a) Calculate work done in Thermal Isolation. (5)
- (b) A sample of gas consisting of 0.11 mol is compressed from a volume of 4.0 m^3 to 1.0 m^3 while its pressure increases from 10 to 40 Pascals. Compare the work done along the different paths shown in the following figure 6(b). (5)



Q. No.7

- (a) What are the mechanisms by which the transfer of heat takes place? Describe the Thermal Conduction briefly. (5)
- (b) Consider a Compound Slab consisting of 2 materials having different thickness L_1 and L_2 and different thermal conductivities K_1 and K_2 respectively. If temperatures of the outer surface are T_1 and T_2 ($T_2 > T_1$), find the rate of heat transfer through the Compound Slab in a steady state ($H_1 = H_2$). T_x be the temperature at the Interface. (5)



Q. No.8

- (a) State Second Law of Thermodynamics in terms of Entropy. Derive a relation for the change in Entropy of a system in Reversible Process. (1+4=5)
- (b) A Carnot Cycle has Efficiency of 22%. It operates between heat Reservoirs differing in temperature by 75°C . Find the temperature of the Reservoirs. (5)