

RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

SECOND YEAR

B.A./B.SC. FOURTH SEMESTER (January – June), 2012

Mid-Semester Examination, March 2012

Date : 21/03/2012

PHYSICS (General)

Time : 2 pm – 3 pm

Paper : IV

Full Marks : 25

[Use separate Answer Books for each Section]

Section – I

Answer any one questions

1. a) What do you mean by primitive translation vector and basis ? [2+2]
b) Write down the volume of primitive unit cell having \vec{a} , \vec{b} and \vec{c} as the fundamental translation vectors. [1]
2. a) Find the Miller indices for planes with each of the following sets of intercepts i) 5a, -6b, c
ii) a/2, b, ∞ where a, b and c are lattice parameters. [3]
b) The K_{α} line from a X-ray tube is reflected in the first order at an angle 6° by a NaCl crystal. Calculate the wavelength of the above line. Lattice spacing of NaCl is 2.80\AA . [2]

Section – II

Answer any one questions

3. a) What is de Broglie hypothesis? Derive an expression for the wave length of electron when it is subjected to a potential difference V, in relativistic approach. [2+3]
4. a) Derive an expression for kinetic energy of recoil electron. [3]
b) Hence calculate the kinetic energy of electron when photon is scattered at an angle 30° .
[Incident photon energy = 10 KeV, rest mass of electron = $9.11 \times 10^{-31} \text{ Kg}$.] [2]

Section – III

Answer any one questions

5. What is a rectifier? Draw a neat circuit diagram for a bridge rectifier and explain its operation. [1+1+3]
6. Distinguish between avalanche breakdown and Zener breakdown. Show that forward dynamic resistance of a p-n junction is inversely proportional to the forward current. [2+3]

Section – IV

Answer any one questions

7. What is wave front of a ray ? Explain the reflection of light from a plane surface using Huygens' principle. [1+4]
8. What do you mean by polarization of light ? Explain Brewster's law for production of polarized light. [1+4]

Section – V

Answer any one questions

9. Derive the condition of interference of reflected light waves from a plane parallel thin film. [5]
10. Deduce an expression for wave length of a monochromatic light to be measured by Newton's ring method. [5]

