

**CARMEL COLLEGE OF ARTS, SCIENCE AND COMMERCE FOR WOMEN,
NUVEM, GOA.**

SEMESTER END EXAMINATION, JULY 2021

B.SC. Semester: 4

Optics and Modern Physics (PYC 104)

Maximum marks: 40

Date: 13/07/2021

Duration: 2 hours

Instructions: 1) All questions are compulsory.

2) Figures to the right indicate maximum marks.

3) Use of log tables and non-programmable calculators is permitted.

4) Symbols have their usual meanings unless specified.

Q.1) Answer any five of the following:

(2 marks x 5 = 10 marks)

- 1) How many orders will be visible if the wavelength of the incident radiation is 5000\AA and the number of lines on the grating is 2620 in one inch.
- 2) Quartz has refractive indices $\mu_E = 1.553$ and $\mu_O = 1.542$. Calculate the thickness of the half wave plate for sodium light of wavelength 6000\AA .
- 3) Find the specific rotation of a sugar solution if the plane of polarization is turned through 20.2° . The length of the tube containing 10% sugar solution is 20cm.
- 4) In an experiment with Michelson's interferometer, the distance between two successive positions of the movable mirror for maximum distinctness of fringes is 0.2945mm. The mean wavelength of the component D' lines is 5893\AA . Calculate the difference between the wavelengths of sodium D' lines used.
- 5) A cyclotron in which the flux density is 1.4 Web/m^2 is employed to accelerate protons. How rapidly should the electric field between the dees be reversed? Mass of proton = $1.67 \times 10^{-27}\text{ kg}$ and charge = 1.6×10^{-19} .
- 6) Cu has an FCC structure with lattice constant $a = 3.61\text{\AA}$. Calculate the radius of Cu atom.
- 7) X-rays are more penetrative than visible light. Why?
- 8) State any one use of the mass spectrograph.

Q2. Answer any SIX of the following:

(5 marks x 6 = 30)

- 1) What is a Nicol prism? Show how it is used to produce plane polarised light.
- 2) Give the theory for thin films in the reflected system.
- 3) Give the Rayleigh's criterion for resolution of close lying images, using this resolution arrive at the resolving power of a telescope.
- 4) With the help of a diagram, show how a Polarimeter is used to study optically active substances.
- 5) Derive an expression for e/m for cathode rays.

- 6) Explain and derive Bragg's Law of X-ray diffraction from a crystalline solid.
- 7) Explain the construction and working of a linear accelerator. Calculate the final energy of the ion.
- 8) Distinguish between crystalline and amorphous solids.