

Reg. No. :

Name :

Third Semester B.Sc. Degree Examination, October 2019

First Degree Programme Under CBCSS

Complementary Course For Chemistry and Polymer Chemistry

PY 1331.2 – OPTICS, MAGNETISM AND ELECTRICITY

(2013 – 2017 Admissions)

Time : 3 Hours

Max. Marks : 80

SECTION – A

Answer **all** the questions. Answer should not exceed two sentences.

Each question carries 1 mark.

1. Define interference.
2. Give two examples of coherent sources.
3. What is Rayleigh's criterion for resolution?
4. State and explain grating law.
5. What is meant by plane polarised light?
6. What is a positive crystal? Give two examples.
7. Define power factor.
8. What is meant by pumping? Name two types of pumping.

9. What is numerical aperture of an optical fibre?
10. Give two properties of ferromagnetic substances.

(10 × 1 = 10 Marks)

SECTION – B

Answer **any Eight** questions. Answer should not exceed one small paragraph.

Each question carries **2** marks.

11. Draw the intensity distribution curve of interference pattern.
12. How will you test the optical flatness of a glass plate.
13. Obtain the expression for the resolving power of a grating.
14. State and explain Brewster's law.
15. What are the factors on which the optical rotation of an optically active solution depend on?
16. What is LASER? Give three properties of laser.
17. Explain total internal reflection.
18. How can paramagnetic and diamagnetic material rods be distinguished in a magnetic field?
19. Explain the theory of transformer.
20. Explain electromagnetic induction.
21. Derive the relation between **B**, **H** and **I** in magnetism.
22. What is the difference between step index fibre and graded index fibre?

(8 × 2 = 16 Marks)

SECTION – C

Answer **any Six** questions. Each question carries **4** marks.

23. Newton's rings are observed in reflected light of $\lambda = 5.9 \times 10^{-7} \text{ m}$. The diameter of the 10th dark ring is 0.5 cm. Find the radius of curvature of the lens and the thickness of the air film.
24. Light of wavelength 6000 Å is incident on a thin film of glass of $\mu = 1.6$, such that the angle of refraction in the plate is 60°. Calculate the smallest thickness of the plate which will make it dark by reflection.
25. A parallel beam of monochromatic light is allowed to be incident normally on a plane transmission grating having 5000 lines per cm and third order spectral line is found to be diffracted through 45°. Calculate the wavelength of light.
26. Calculate the thickness of
 - (a) a quarter wave plate and
 - (b) a half wave plate. Given that $\mu_o = 1.973$, $\mu_e = 2.656$ and $\lambda = 590 \text{ nm}$.
27. Sugar solution of concentration 0.2 gram/cc contained in a tube of length 18 cm, rotates the plane of polarization by 23.4°. Calculate the specific rotation of sugar solution.
28. If the number of lines per millimeter of a grating is 600, how many orders of spectra are possible for light of wavelength $5.89 \times 10^{-7} \text{ m}$?
29. The energy level difference between two laser level is 0.21 eV. Determine the wavelength of radiation.
30. Show that the current leads the applied e.m.f. by $\frac{\pi}{2}$, when A.C. is passed through a circuit containing a capacitor.
31. A coil of resistance 60Ω and inductance 3 H is connected in series with a capacitor $4 \mu\text{F}$ and an a.c. supply of 200 V and 50 Hz. Calculate the impedance in the circuit.

(6 × 4 = 24 Marks)

SECTION – D

Answer **any Two** questions. Each question carries **15** marks.

32. Discuss in detail Fraunhofer diffraction due to a double slit.
33. What is double refraction? Describe the construction, working and use of a nicol prism.
34. With a neat diagram, explain the construction and working of Laurent's half shade polarimeter.
35. Describe the principle, construction and working of a Ruby laser.

(2 × 15 = 30 Marks)
