2020
PHYSICS
[HONOURS]
Paper : X
[PRACTICAL]

Full Marks : 80 Time : 6 Hours

The figures in the right-hand margin indicate marks.

Answer any **eight** questions: 10×8=80

1. a) In Fresnel's bi-prism experiment what apparatuses are used?

   b) What is a bi-prism and what role does it play in this experiment?

   c) How the distance between two virtual sources is measured?

   d) What is the central maxima and how it can be observed?

   e) In this experiment, which nature (wave/particle) is exhibited? Explain? (2+2+2+2+2)

2. a) In Newton's ring apparatus, how does interference occur? Explain using ray diagram.

   b) Why a glass plate inclined at 45° is employed?

   c) What light source is used? What would happen if white light is used instead?

   d) Why is the center of the fringe dark? Is it possible to make it bright? If yes, how?

   e) If the fringes are not exactly circular what do you infer? (2+2+2+2+2)

3. a) In single slit experiment, which phenomena of light is observed? How the fringes are formed?

   b) What is the difference between Fresnel and Fraunhofer diffraction? Give examples.

   c) If the width of the slit is doubled,how the size and intensity of the central diffraction band are affected?

   d) What formula do you use to find intensity at a point on the screen due single slit diffraction. Why the intensities of the diffraction maxima are different?

   e) Why a lamp-mirror-scale arrangement is used instead of direct spectrometer Vernier readings?

   (2+2+2+2+2)

4. a) Write down the formula for intensity distribution for double slit Fraunhofer diffraction.

b) What is meant by missing order? What is the required condition that 3rd, 6th, 9th … orders will be missing from interference pattern?

c) If the wavelength of the incident light is increased what changes would you expect in the fringe pattern and why?

d) What are the differences between single slit and double slit fringe pattern?

e) Can you mention a practical use of double slit apparatus? (2+2+2+2+2)

5. a) What is meant by rulings in a diffraction grating? How do you distinguish a grating from a glass plate without using any instrument?

b) Write down the formula for intensity distribution for diffraction grating.

c) What is ghost line?

d) What are the differences between grating spectra and prism spectra?

e) What do you mean by the terms "Dispersive Power" and "Resolving power". (2+2+2+2+2)

6. a) In the experiment of drawing refractive index – wavelength (μ vs λ) curve what light source have you used? Is it possible to perform the

experiment successfully using a white light source? Explain.

b) Write down the Cauchy's relation between refractive index and wavelength. Is the formula valid everywhere?

c) What do you mean by "Normal Dispersion" and"Anomalous Dispersion"?

d) Why Schuster's focusing is important before using a spectrometer?

e) Explain the terms "Slanting position" and "Normal position". (2+2+2+2+2)

7. a) State the Fresnel's law of reflection and Brewster's law.

b) What do you mean by "Plane of polarisation" and "Plane of vibration"

c) What is a polaroid and what are its practical uses?

d) How can you produce plane-polarised light at home without any sophisticated equipment?

e) What is Dichroism? (2+2+2+2+2)

8. a) What do you mean by optical activity and specific rotation?

b) What are the components of a polarimeter apparatus?

c) What are "Faraday effect" and "Kerr effect" ?

d) Explain the term "Birefringence".

e) Can sound waves be polarised? Explain.

(2+2+2+2+2)

9. a) Briefly explain the working principle of a Babinet's compensator?

b) What is a quarter wave plate?

c) What do you mean by elliptically polarised and circularly polarised light. Write their equations.

d) How can you convert an elliptically polarised light into a circularly polarised light?

e) What are the uses of Babinet's compensator? Why is it called a compensator? (2+2+2+2+2)

10. a) What is photo-electric effect? Which nature of light is established by this effect?

b) Explain why photo-electrons do not emit from metal surface in the visible light.

c) What are photomultiplier tube and photovoltaic cell?

d) How do you calculate work function by using a photoelectric cell?

e) What happens to the incident photon after it ejects one electron from the metal?

f) Why it is necessary to keep the photoelectric cell in a vacuum chamber? (2+2+2+2+1+1)

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