**Assignments**

**Interference**

Q 1: Explain briefly why the fringes in Newton's ring arrangement are circular in shape?

Q 2: State giving reason what change do you expect in Newton's ring, if the distance between the lens and the plate is increased.

Q 3: Why do you require a convex lens of large radius of curvature in Newton's ring experiment?

Q 4: What is the difference between biprism fringe and those obtained with Newton's rings?

Q 5: Why colours are not observed in reflected light from a thick film?

Q 6: Why does an excessively thin film appears to be dark in the reflected light?

Q 7: Two optically plane glass strips of length 10 cm are placed one over the other. A thin foil of thickness 0.010 mm is introduced between the plates at one end from an air film, if the light used has wavelength 590 nm find the separation between consecutive bright fringes?

Q 8: White light is used in Young' double slit experiment, find the minimum order of the violet fringe of wavelength 400 nm which overlaps with red fringe of wavelength 700 nm.

Q 9: Light of wavelength 600 nm falls normally on thin wedge shaped film of refractive index 1.4 forming fringes that are 2 mm apart, find the angle of wedge in seconds.

Q 10: What will happen if a little water is introduced between the lens and the glass plate of Newton's ring experiment?

**Diffraction**

Q 1: What is the effect on fringes if

(a) the slit width is increased?

(b) the slit separation is increased?

(c) the wavelength of the light used is increased?

Q 2: 2 plane diffraction gratings A & B have same width of ruled surface but A has more number of lines than B. Compare

(a) intensity of fringes.

(b) width of principal maxima

(c) Dispersive power

(d) Resolving power

Q 3 : Differentiate between prism spectra and grating spectra.

Q 4 : A diffraction grating is just able to resolve 2 lines of wavelengths 5140.34 Å & 5140.85 Å in the first order. Will it resolve the lines 8037.2 Å & 8037.5 Å in second order.

Q 5: Sound wave can undergo diffraction at the corner of a building but not light wave. Why?

Q 6: A lens whose focal length is 40 cm forms a Fraunhoffer diffraction pattern of a slit 0.3 mm width. Calculate the distances of first dark band and of the next bright band from the axis. (λ= 5890 Å)

Q 7: Monochromatic light of λ= 6560x 10-8 m falls normally on a grating 2 cm wide. The first order spectrum is produced at an angle 180 14' from the normal. What is the total number of lines on the grating?

Q 8: There are 15,000 LPI in a grating, what is the maximum number of orders obtained by using light of λ = 6000 Å?

Q 9: Calculate the least width that a grating must have to resolve the components of sodium D-lines in the second order, the grating having 1000 lines per cm. Two wavelengths of sodium light are 5896 Å and 5890 Å, respectively.

Q 10: The spectral lines of λ1 = 5890 Å & λ2 = 5896 Å are observed through a diffraction grating of 2 cm width having 425 lines/cm. Find out whether the 2 lines can be resolved in (a) first order (b) second order.

**Polarisation**

Q 1: If unpolarised light falls on a system of two cross polarised sheets, no light is transmitted. If thin polarising sheet is placed between them will light be transmitted? Explain.

Q 2: Why do we use monochromatic light for Laurent half shade polarimeter?

Q 3: Why there should be no air bubble in the polarimeter tube?

Q 4: If the plane of vibration of incident beam makes an angle of 300 with the optic axis compare the intensities of extraordinary ray and ordinary ray.

Q 5: Differentiate between

(a) e-ray and o-ray

(b) Positive and negative uniaxial crystal

(c) Polarised and unpolarised light

Q 6: A half wave plate is constructed for a wavelength of 600 nm. For what wavelength does it work as quarter wave plate?

Q 7: Calculate the thickness of half wave plate for sodium light of wavelength 589.3 nm. If refractive index of o-ray is 1.54 and ratio of velocities of o-ray and e-ray is 1.007. Is this crystal positive or negative?

Q 8: A 200 mm long tube and containing 48 cm3 of sugar solution produces an optical rotation of 110 when placed in Lorentz half shade polarimeter. If the specific rotation of sugar solution is 660, calculate the quantity of sugar contained in the tube in the form of a solution.

Q 9: The value of refractive index of e-ray and o-ray for quartz are 1.5508 and 1.5418 respectively. Calculate the phase retardation for wavelength 500 nm and when the plate thickness is 0.032 mm.

Q 10: What is the use of canada balsam in Nicol prism?

**Laser**

Q 1: Differentiate between spontaneous and stimulated emission.

Q 2: Differentiate between three level and four level laser. Which is more preferable?

Q 3: Population inversion is not possible in two level laser. State reason.

Q 4: What are the basic conditions for the laser action to take place?

Q 5: What are metastable states? What is the role played by them in working of a laser?

Q 6: LASER action is sometimes called "Inverted absorption". Explain, in what situation may A21/B21 be small enough for laser beam.

Q 7: What is the role of He in He-Ne laser?

Q 8: What is population inversion and how is it achieved? Explain, why laser action cannot be achieved without population inversion?

Q 9: Describe qualitatively 4-level laser scheme. Do you think energy conservation is violated in lasing action.

Q 10: State the important characteristics and uses of laser beam.

**Optical fibre**

Q 1: Differentiate between step-index and graded index fibre. Which of these types is better for wide area network (WAN) communication.

Q 2: What is an optical fibre cable? Explain the basic theory of propagation of light in fibre? Explain numerical aperture and acceptance angle.

Q 3: What do you understand by the term "mode" in optical fibre. Distinguish between multimode and single mode transmission.

Q 4: Write a short note on

(a) Pulse dispersion

(b) Multimode graded index fibre

(c) Application of optical fibre.

Q 5: An optical fibre has numerical aperture of 0.20 and a cladding refractive index of 1.59. Determine the acceptance angle for the fibre in water, which has refractive index of 1.33.

Q 6: Why the output pulse is more dispersed in step index than in graded index ?

Q 7: An optical fibre has the following data; , ; and core diameter is 50 µm. Calculate numerical aperture and acceptance angle. How many reflection/m are suffered by the guided ray at steepest angle with respect to the fibre axis.

**The Special Theory of relativity**

Q 1 : According to the postulates of the special theory of relativity, laws of physics are same in all inertial frame. What about non- inertial frames? Why they can't be same in non- inertial frame?

Q2 : No signal can travel faster than light, Justify.

Q3. If photons have zero rest mass, then how they have momentum?

Q4. Show the invariance of space time interval in Lorentz transformation and explain, why it is taken as y=y' and z=z'?

Q5. At what speed the mass of a particle shall be double its rest mass?

Q6. What was the aim and the conclusions of Michelson Morley experiment?

Q 7. Why we do not observe Time dilation in day to day phenomena?

Q8. Moving clock ticks slow, explain.

Q9. No two velocities can be added to a value greater than the velocity of light, Justify.

Q10. In a laboratory two particles are observed to travel in opposite directions with speed 2.8x1010 cm/s. Deduce the relative speed of the particles.

Q11. An electron is moving with the speed 1.4x108 m/s. How much additional energy must be imparted to double the speed ?

Q 12. Calculate the velocity of an electron if kinetic energy is equal to twice its rest mass energy.

Q 13. The length of a rocket is measured to 2/3 of its proper length. What is the speed of the rocket with respect ground observer and the time dilation?

**Ultrasonics**

Q 1: What are the ultrasonics and why are they important?

Q 2: What is magnetostriction and what is its relevance to ultrasonic?

Q 3: Differentiate between ordinary sound and ultrasound.

Q 4: What is the difference between acoustic grating and plane diffraction grating?

Q 5: Explain direct and inverse piezoelectric field.

Q 6: Discuss the properties of ultrasonic. Mention two of its important applications.

Q 7: Describe the piezoelectric method for producing ultrasonic waves?

Q 8: Describe the application of ultrasonic waves in SONAR and medicine.

Q 9: Why it is necessary to use R.F. oscillator in the experiment of acoustic grating?

**Basic nuclear physics**

Q 1: Explain the difference between ionization chamber and G.M. counter. How is quenching is achieved in G.M. counter.

Q 2: Why do we say that a nucleus behaves like a drop of liquid? What are the essential features which are common in a drop of liquid and a nucleus?

Q 3: What is the difference between the positron emission and electron capture.

Q 4: What are nuclear reactions? How are these different from chemical reaction?

Q 5: What is the difference between mean life and half life in radioactivity.

Q 6: Why are γ-rays more penetrating than X-rays even though both are electromagnetic waves?

Q 7: State the function of nuclear reactor.

Q 8: Find amount of energy released, when a milligram mass is converted into energy.

Q 9: Define effective multiplication factor for chain reaction in the nuclear reactor.

Q 10: What is dead time in the GM counter?