**Physics Question Bank**

Interference.
1. a) Explain the following statement.
   'The interference patterns of the reflected side and transmitted side of the thin film are always complimentary. '
   b) What is stoks law?

2. a). A wedge is formed by separating two glass plates by an extremely thin wire kept at 10.0 cm from the edge. When illuminated by sodium light of wavelength 5890 A^0 the width of the Fizau's fringes is measured to be 2.945 mm. Calculate the diameter of the wire.
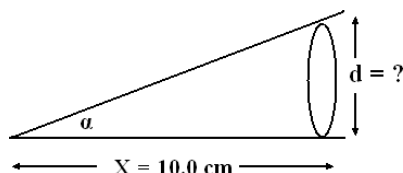
b). Explain: Why center of all concentric rings in the Newtons Ring experiment is always dark?
c). List the four applications of Newtons Ring experiment.

3. Write a short note on anti-reflection coatings?

4. A parallel beam of sodium light strikes a film of oil floating on water. When viewed at an angle 30 degrees from the normal, the eighth dark band is seen. Determine the thickness of the film. Refractive index of oil is 1.46. Wavelength (λ) = 5890 Å.

5. Newton's rings are observed in reflected light of wavelength 5900 Å. The diameter of the 10th dark ring is 0.50 cm. Find the radius of curvature of the lens.

6. a) When can you say that a light beam is coherent?
   b) Give examples of coherent and non-coherent sources of light?
   c) 'Only coherent light waves can interfere'- Explain what is wrong with this statement?\

7. a) In an interference pattern, where does the energy of the light at the dark fringe go to?
   b) Diffraction and interference are two phenomena exhibited by light, what are the scenarios in which diffraction happens and when does interference occur, or is it like always both are happening as light propagates?
   c) Assume two light beams are incident at the same region of a screen, one beam is horizontally polarized and the other is vertically polarized. Would we see interference pattern on the screen?

Diffraction
1. a) What is mean by Diffraction?
   b) What is the condition for diffraction?
   c) Why intensity of the diffracted light decreases with increasing order of diffraction?

2. (a) Write the condition for secondary Maxima and secondary Minima in diffraction?
   (b) Which light- red or green beam, will diffract more? why?

3. a) Distinguish between Interference and Diffraction of light.
   b) Write the four Characteristics of Diffraction.

4. Explain the Rayleigh's criteria for resolution. State the formulas for resolving power of telescope and a diffraction grating.

5. What is a diffraction grating. Write a formula for a grating element, Write 3 applications of a diffraction grating.

6. Compare and analyze the intensity distribution pattern obtained due to diffraction by a single slit and the diffraction by a diffraction grating.

7. How many lines per cm are there in a plane transmission grating which gives first order of light of wavelength 6000 Å at angle of diffraction 30 degree?

8. What is meant by resolving power. Write a formula for the Resolving power of diffraction grating.

Polarization

1. a) Define_ Polarization of Light
   b) "Sound waves cannot be polarized" _ explain.
   c) According to you where the Polarized goggles will be more useful?
   d) Give the types of Polarization.
   e) What is E and O ray? *(E= Extraordinary and O= Ordinary)*

2. State and explain a) Malus law. b) Brewster law

3. What is polarization of light? What are the different types of polarization?

4. a) Discuss the two applications of Polarization of light.
   b) Give the name of crystals used to Polarize light. (any four)

5. Explain the concept of double refraction. State min. 3 properties exhibited by the Ordinary and extraordinary rays.

6. Describe how polarization is used in each of the following cases
   a) LCD display
   b) Sunglasses

7. a) Give two examples of randomly polarized light. How can you generate linearly polarized light from a source which is randomly polarized?
   b) Suppose you have a source emitting vertically polarized light, and you have 3 polarizers at your disposal, how can you generate horizontally polarized light?

Quantum Mechanics

1. Write Postulates of the Planks Quantum theory. State Planck's radiation law.

2. a) What is De Broglie Hypothesis? Compose the De Broglie wavelength equation for the particle of charge q moving with avelocity v in the presence of magnetic field B.
   b) Formulate the De Broglie wavelength equation for the electron of charge q moving in the presence of accelerating electric potential V.

3. State and explain Heisenberg's Uncertainty principle. If the uncertainty in the location of the particle is equal to its De Broglie wavelength, then show that the uncertainty in its velocity is equal to its velocity.

4. Write down any three properties of matter waves. Find the De Broglie wavelength of 10 KeV electrons.

5. De Broglie argued that - 'If wave can behave like particles, particles should behave like waves too'.
   a) Mention an experiment, where we can see the particle-like nature of waves.
   b) Mention an experiment, where we can see the wave-like nature of particles.
   c) If particles have wave-like properties, explain if we all have wave like properties and what are its consequences?
   d) What are the requirements for an average human being to have a matter wave of 1×10^{-6} m. Can these requirements be achieved?

6. With the knowledge of the initial state of a system and the forces acting on it, classical mechanics can completely predict the future state of a system.
   b) How much knowledge of the initial state do you have in the quantum mechanical picture?
   c) Is it possible to completely predict the future of a system using quantum mechanics?
   d) Is quantum mechanics an incomplete theory?
   e) Is quantum mechanics an approximation of classical mechanics or vice versa?