PHYSICS-I

QUESTION BANK

1) Deduce an expression for de-Broglie wavelength? Derive its different expressions for K.E and its rest mass energy, voltage and temperature?

2) What do you understand by resolving power and dispersive power of diffraction grating?

3) Derive the necessary expression for both of it?

4) Discuss phase velocity and group velocity of a wave packet. Derive relation between them and also prove that v p. vg=c 2and v g= v (velocity of light)?

5) Explain plane polarized, circularly polarized light and elliptically polarized light? How elliptically polarized light can be converted into circularly polarized light?

6) Discuss the phenomenon of interference due to reflected, transmitted and wedge shaped film and also derive the fringe width expression for wedge shaped film ?

7) Discuss dual nature of matter waves and show how Davisson–Germer experiment can be used for the existence of matter waves?

8) What is Nicol prism? Explain the principle, construction, working and limitations of it? How nicol can be used as a polarizer and analyser?

9) In a biprism experiment, the distance between the slit and the screen is 160.0 cm. The biprism is 40cm away from the slit and its refractive index is 1.52. When a source of wavelength 5893A0 is used, the fringe width is found to be 0.01cm.Find the angle of prism?

10) What is Heiserberg's uncertainity principle? Using this principle show the non-existence of electrons inside nucleus and Bohr's first orbit?

11) Newton's rings are formed in reflected light of wavelength 6000A^0 with a liquid between the plane and curved surfaces. If the diameter of the 6th bright ring 3.1mm and the radius of curvature of the curved surface is 100cm, calculate the refractive index of the liquid?

12) Explain briefly why Newton's rings are circular? Describe and explain the construction, working and theory of formation of Newton's rings by reflected and transmitted monochromatic light (i.e. Diameter of bright and dark fringes).

13) Describe Schrodinger's time independent and time dependent equations of matter waves.

14) Give the physical interpretation of the wave function?

15) Derive an expression for the intensity distribution due to Fraunhofer's diffraction at a single, doule and N-slit also calculate the missing order in double slit diffraction pattern?

16) Discuss the Fresnel's theory of optical rotation and specific rotation?

17) What is the phenomenon of double refraction in a calcite crystal and explain Huygen's theory of double refraction?

18) What are missing orders in double slit Franuhofer diffraction pattern?

19) Describe how Newton's Ring experiment can be used to determine the refractive index of a liquid

20) Define coherent sources. Discuss why two independent sources of light of same wavelength cannot show interference.

21) Explain the phenomenon of interference in the films due to reflected light.

22) Discuss the formation of interference fringes due to a wedge shaped thin film seen by normally reflected sodium light and obtain an expression for the fringe width.

23) Describe how newton's rings experiment can be used to determine the refractive index of a liquid.

24) Drive the expression of the diameter of bright and dark ring of order n in Newton's ring experiment.

25) Explain the constructive and destructive interference in the thin films as seen by reflected monochromatic light.

26) Explain why a thin film appears coloured when observed in reflected light .Why is an extended source is necessary to observe the bands? Why colours are not observed in the case of thick film.

27) Show that the diameter D_n of the nth Newton's ring .when two surfaces of radii R_1 and R_2 are placed in contact , is given by the relation $1/R_1 + 1/R_2 = 4n\lambda/D_{2n}$

28) Obtain the expression for the intensity of the single slit Fraunhofer diffraction pattern.

29) Discuss the phenomenon of fraunhofer diffraction at a single slit and show that the relation intensities of the successive maximum are nearly $1 : 4/9\pi^2 : 4/25\pi^2 : 4/49\pi^2 :------------------$

30) Give the construction and theory of plane transmission grating and explain the formation of spectra by it .Explain what are absent spectra in the grating?

31) What is diffraction grating? Derive an expression for dispersive power of grating and explain it.

32) Define resolving power and dispersive power of a grating. Derive an expression for the resolving power if a plane transmission grating.

33) Explain Rayleigh criteria for limit of resolution. Obtain an expression for resolving power of grating.

34) What is signification of wave function?

35) Define operator eigen value AND eigen function?

36) Define phase velocities?

37) Explain Bragg's law?

38) Define wave function?

39) What is matter wave?

40) Application of Heisenberg Uncertainty principle?

41) What is the de Broglie wavelength of an electron after being accelerated through a potential difference of 25 kV in a television set?

42) If you double the kinetic energy of a particle, how does the de Broglie wavelength change?

43) If you double the speed of a particle, how does it de Broglie wavelength change?

44) Explain the normalized condition for wave function

45) Show that no signal can travel faster than light

46) How fast an electron move in order that it's mass equals to its rest mass m_0

47) What do you mean by time dilation? Discuss the limiting cases of time dilation.

48) Define relativistic momentum, relativistic force and write the formula for each of them.

49) What is the difference between Inertial and Non-inertial frame of references?

50) What is mass-less particle and write the relation for energy and momentum of mass less particle.

51) State the fundamental postulates of special theory of relativity and deduce from them the Lorentz Transformation equation.

52) What do you mean by length contraction and time dilation? Deduce the necessary expression for both.

53) Deduce relativistic velocity addition theorem show it's consistent with Einstein's second postulate.

54) Discuss Einstein's mass energy relation $E=mc^2$ and deduce it with the help of Newton's second law .

55) Write Short notes on Spontaneous and stimulated emission of radiation, population inversion.

56) Explain construction and working of Ruby and its applications.

57) Explain He-Ne lasers and laser applications.

58) Write short notes on Acceptance angle and cone, Numerical aperture, Single and Multi-Mode Fibers.

59) Explain the Construction and reconstruction of Image on hologram and applications of holography.