

CLASS XII

SAMPLE PAPER

PHYSICS

DUAL NATURE OF MATTER AND RADIATION

One Mark questions--

- 1) According to the quantum theory, what happens when the intensity of light increases?
- 2) If a LASER of power 3.98MW produces a monochromatic light of energy 2.48eV, how many photons per second, on an average, are emitted by the source?
- 3) Can all photons from a monochromatic light source emit photo-electrons of same kinetic energy?
- 4) What is maximum frequency of X-rays produced by 30KV electrons?
- 5) A nucleus of mass M, initially at rest splits into two fragments of masses $M'/3$ and $2M'/3$ ($M > M'$). Find the ratio of de-Broglie wavelengths of two fragments.
- 6) What does the slope of the Graph between frequency ν /s stopping potential represent?
- 7) What is the nature of graphical relation between frequency of incident radiation and the stopping potential?
- 8) On which factor the magnitude of saturation photoelectric current depends upon?
- 9) The work function of aluminium is 4.2eV. If two photons each of energy 3.5eV strike an electron of aluminium sheet then what will be the speed of electrons?
- 10) Write down the rest mass of photon?

Two marks questions--

11. Calculate the number of photons in 6.62J of radiation energy of frequency 1012 Hz. Given $h = 6.62 \times 10^{-34}$ Js.
12. When photons of energy $h\nu$ falls on an aluminium plate (of work function E_0), photoelectrons of maximum kinetic energy K are ejected. If the frequency of radiation is doubled, find the maximum kinetic energy of the ejected photoelectrons.

13. If electron, proton and helium have same momentum, then write relation between de-Broglie's wavelengths of the above particles.

14. The energy of a photon is equal to the Kinetic energy of proton. Let λ_1 be the de-Broglie wavelength of the proton and λ_2 be the wavelength of the photon. Find the ratio λ_1/λ_2 in terms of energy 'E' of photon.

15. Draw the Graph which represents the variation of particle momentum and associated de-Broglie wave length?

Three marks questions--

16. Alkali metals are most suitable for photoelectric effect. Explain why?

17. Show that the product of the slope of the stopping potential versus frequency graph and the electronic charge gives the value of Planck's constant.

18. When radiation of wavelength λ is incident on a metallic surface, the stopping potential is 4.8 volts. If the same surface is illuminated with a radiation of double the wavelength, then the stopping potential becomes 1.6 volts. What is the threshold wavelength for the surface?

19. A source of 25 watt emits monochromatic light of wavelength 6600\AA . If efficiency for photoelectric emission is 3 %, then find the photoelectric current.

20. What is the De-broglie wavelength of a nitrogen molecule in air at 300K? Assume that the molecule is moving with the root mean square speed of molecules at this temperature. (Atomic mass of nitrogen is = 14.0076u)

Two metals A and B have work functions 2 eV and 5 eV respectively. Which metal has lower threshold wavelength ?

How will the photoelectric current change on decreasing the wavelength of incident radiation for a given photosensitive material ?

If the intensity of the incident radiation on a photosensitive surface is doubled, how does the kinetic energy of the emitted electrons get affected ?

Define work function for a given metallic surface.

Two beams, one of red light and the other of blue light, of the same intensity are incident on a metallic surface to emit photoelectrons. Which one of the two beams emits electrons of greater kinetic energy ?