SIR CV RAMAN COCACHING CENTRE – IDAPPADI,SALEM

XII- PHYSICS UNIT – 8 MODEL QUESTION PAPER – 2024

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PART – A (5 X 1 = 5 M)

1. In photoelectric emission, a radiation whose frequency is 4 times threshold frequency of a certain metal is incident on the metal. Then the maximum possible velocity of the emitted electron will be

a) $\sqrt{\frac{hv_0}{m}}$ b) $\sqrt{\frac{6hv_0}{m}}$

c) $2\sqrt{\frac{hv_0}{m}}$ d) $\sqrt{\frac{hv_0}{2m}}$

2. In an electron microscope, the electrons are accelerated by a voltage of 14 kV. If the voltage is changed to 224 kV, then the de Broglie wavelength associated with the electrons would

a) increase by 2 times b) decrease by 2 times

c) decrease by 4 times d) increase by 4 time

3. If a light of wavelength 330 nm is incident on a metal with work function 3.55 eV, the electrons are emitted. Then the wavelength of the wave associated with the emitted electron is

a) $< 2.75\times10^{-9}$ m b) $\geq 2.75\times10^{-9}$ m

c) $\leq 2.75\times10^{-12}$ m d) $< 2.5\times10^{-10}$ m

4. Two radiations with photon energies 0.9 eV and 3.3 eV respectively are falling on a metallic surface successively. If the work function of the metal is 0.6 eV, then the ratio of maximum speeds of emitted electrons in the two cases will be

a) 1:4 b) 1:3 c) 1:1 d)1:9

5. The threshold wavelength for a metal surface whose photoelectric work function is 3.313 eV is

a) 4125 Å b) 3750 Å

c) 6000 Å d) 2062.5 Å

PART- B (5 X 2 = 10 M)

ANSWER ANY FIVE QUESTIONS .COMPULSORY Q,NO 13

6. A proton and an electron have same kinetic energy. Which one has greater de Broglie wavelength? Justify

7.An electron and an alpha particle have same kinetic energy. How are the de Broglie wavelengths associated with them related?

8.Mention the two features of x-ray spectra, not explained by classical electromagnetic theory

9.Write the expression for the de Broglie wavelength associated with a charged particle of charge q and mass m, when it is accelerated through a potential *V*

10. How does photocurrent vary with the intensity of the incident light?

11. How many photons per second emanate from a 50 *mW* laser of 640 *nm*?

12.Calculate the maximum kinetic energy and maximum velocity of the photoelectrons emitted when the stopping potential is 81*V* for the photoelectric emission experiment

13. Calculate the cut-off wavelength and cutoff frequency of x-rays from an x – ray tube of accelerating potential 20,000 V.

PART – C (3 X 5 = 15 M)

Answer any three questions

14.Explain how frequency of incident light varies with stopping potential

15.Explain why photoelectric effect cannot be explained on the basis of wave nature of light

16 Give the construction and working of photo emissive cell

17.Calculate the momentum and the de Broglie wavelength in the following cases: i) an electron with kinetic energy 2 eV. ii) a bullet of 50 g fired from rifle with a speed of 200 m/s iii) a 4000 kg car moving along the highways at 50 m/s Hence show that the wave nature of matter is important at the atomic level but is not really relevant at macroscopic level.

18 Light of wavelength 390 nm is directed at a metal electrode. To find the energy of electrons ejected, an opposing potential difference is established between it and another electrode. The current of photoelectrons from one to the other is stopped completely when the potential difference is 1.10 V. Determine i) the

work function of the metal and ii) the maximum wavelength of light that can eject electrons from this metal

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