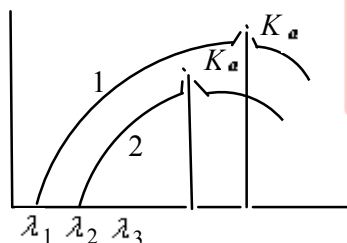


Topic :- Dual nature of radiation and matter

- The ratio of the energy of an X-ray photon of wavelength 1 \AA to that of visible light of wavelength 5000 \AA is
 a) 1 : 5000 b) 5000 : 1 c) $1 : 25 \times 10^6$ d) 25×10^6
- If light of wavelength λ_1 is allowed to fall on a metal, then kinetic energy of photoelectrons emitted is E_1 . If wavelength of light changes to λ_2 then kinetic energy of electrons changes to E_2 . Then work function of the metal is
 a) $\frac{E_1 E_2 (\lambda_1 - \lambda_2)}{\lambda_1 \lambda_2}$ b) $\frac{E_1 \lambda_1 - E_2 \lambda_2}{(\lambda_1 - \lambda_2)}$ c) $\frac{E_1 \lambda_1 - E_2 \lambda_2}{(\lambda_2 - \lambda_1)}$ d) $\frac{\lambda_1 \lambda_2 E_1 E_2}{(\lambda_2 - \lambda_1)}$

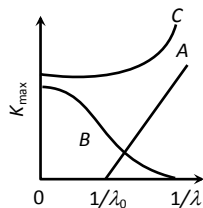
- When two different materials A and B having atomic number Z_1 and Z_2 are used as the target in Coolidge γ -ray tube at different operating voltage V_1 and V_2 respectively their spectrums are found as below.



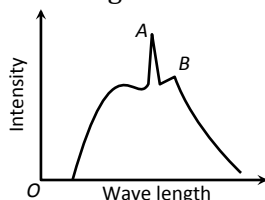
The correct relation is

- $V_1 > V_2$ and $Z_1 > Z_2$ b) $V_1 < V_2$ and $Z_1 < Z_2$ c) $V_1 < V_2$ and $Z_1 > Z_2$ d) $V_1 > V_2$ and $Z_1 < Z_2$
- If the linear momentum of a particle is $2.2 \times 10^4 \text{ kg}\cdot\text{ms}^{-1}$, then what will be its de-Broglie wavelength?
 (Take $h = 6.6 \times 10^{-34} \text{ Js}$)
 a) $3 \times 10^{-29} \text{ m}$ b) $3 \times 10^{-29} \text{ nm}$ c) $6 \times 10^{-29} \text{ m}$ d) $6 \times 10^{-29} \text{ nm}$
- The rest mass of the photon is
 a) 0 b) ∞
 c) Between 0 and ∞ d) Equal to that of an electron
- The value of Planck energy is
 a) $\frac{nhc}{\lambda}$ b) $nh\lambda$ c) $nhc\lambda$ d) $\frac{nh\lambda}{c}$
- The ratio of specific charge of an α -particle to that of a proton is
 a) 2 : 1 b) 1 : 1 c) 1 : 2 d) 1 : 3

8. The correct graph between the maximum energy of a photoelectron and the inverse of wavelength of the incident radiation is given by the curve

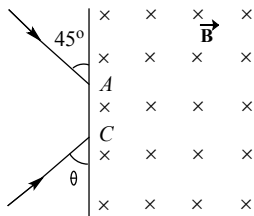


- a) A b) B c) C d) None of the above
9. Two identical metal plates shown photoelectric effect by a light of wavelength λ_A falls on plate A and λ_B on plate B ($\lambda_A = 2\lambda_B$). The maximum kinetic energy is
- a) $2K_A = K_B$ b) $K_A < K_B/2$ c) $K_A = 2K_B$ d) $K_A = K_B/2$
10. Quantum nature of light is explained by which of the following phenomenon
- a) Huygen wave theory b) Photoelectric effect
c) Maxwell electromagnetic theory d) De-Broglie theory
11. Energy from the sun is received on earth at the rate of 2 cal per cm^2 per min. if average wavelength of solar light be taken at 5500 A then how many photons are received on the earth per cm^2 per min?
(Take $h = 6.6 \times 10^{-34}$ Js, 1 cal = 4.2 J).
- a) 1.5×10^{13} b) 2.9×10^{13} c) 2.3×10^{19} d) 1.75×10^{19}
12. Which phenomenon best supports the theory that matter has a wave nature
- a) Electron momentum b) Electron diffraction c) Photon momentum d) Photon diffraction
13. The figure represents the observed intensity of X-rays emitted by an X-ray tube as a function of wavelength. The sharp peaks A and B denote



- a) Band spectrum b) Continuous spectrum
c) Characteristic radiations d) White radiations
14. The frequency of a photon, having energy 100 eV is ($h = 6.6 \times 10^{-34}$ J-s)
- a) 2.42×10^{26} Hz b) 2.42×10^{16} Hz c) 2.42×10^{12} Hz d) 2.42×10^9 Hz
15. Which of the following have highest specific charge
- a) Positron b) Proton c) He d) None of these
16. Planck's constant has the dimensions of
- a) Energy b) Mass c) Frequency d) Angular momentum
17. The de-Broglie wavelength is proportional to
- a) $\lambda \propto \frac{1}{v}$ b) $\lambda \propto \frac{1}{m}$ c) $\lambda \propto \frac{1}{p}$ d) $\lambda \propto p$

18. A parallel beam of light is incident normally on a plane surface absorbing 40% of the light and reflecting the rest. If the incident beam carries 60 W of power, the force exerted by it on the surface is
- a) $3.2 \times 10^{-8} \text{N}$ b) $3.2 \times 10^{-7} \text{N}$ c) $5.12 \times 10^{-7} \text{N}$ d) $5.12 \times 10^{-8} \text{N}$
19. Given below is a list of electromagnetic spectrum and its mode of production. Which one does not match
- a) Gamma rays – Radioactive of the nucleus
 b) Ultraviolet – Magnetron valve
 c) Infrared – Vibration of atoms and molecules
 d) Radiowave – Rapid acceleration and deceleration of electrons in conducting wires
20. A proton of mass $1.67 \times 10^{-27} \text{ kg}$ enters a uniform magnetic field of 1 T at point A as shown in figure, with a speed of 10^7 ms^{-1} . The magnetic field is directed normal to the plane of paper downwards. The proton emerges out of the magnetic field at point C, then the distance AC and the value of angle θ will respectively be



- a) 0.7 m, 45° b) 0.7 m, 90° c) 0.14 m, 90° d) 0.14 m, 45°

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