

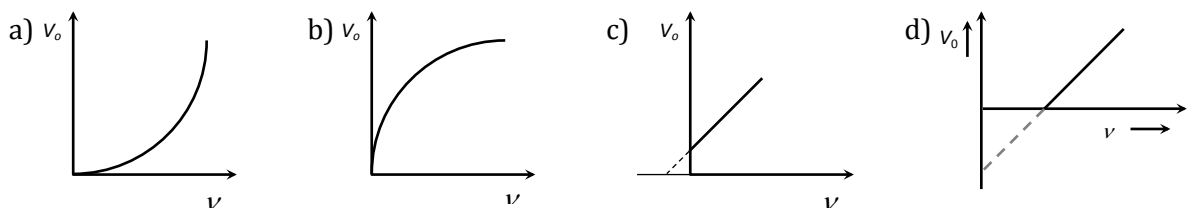
Topic :- Dual nature of radiation and matter

- Positive rays are very identical to
 - α -particle rays
 - β -rays
 - γ -rays
 - None of above
- When a piece of metal is illuminated by a monochromatic light of wavelength λ , then stopping potential is $3V_s$. When same surface is illuminated by light of wavelength 2λ , then stopping potential becomes V_s . The value of threshold wavelength for photoelectric emission will be
 - 4λ
 - 8λ
 - $\frac{4}{3}\lambda$
 - 6λ
- In photoelectric effect if the intensity of light is doubled, then maximum kinetic energy of photoelectrons will become
 - Double
 - Half
 - Four times
 - No change
- The energy of a photon is equal to the kinetic energy of a photon. The energy of the photon is E . Let λ_1 be the de-Broglie wavelength of the photon and λ_2 be the wavelength of the photon. The ratio $\frac{\lambda_1}{\lambda_2}$ proportional to
 - E^0
 - $E^{1/2}$
 - E^{-1}
 - E^{-2}
- Light of frequency ν is incident on a certain photoelectric substance with threshold frequency ν_0 . The work function for the substance is
 - $h\nu$
 - $h\nu_0$
 - $h(\nu - \nu_0)$
 - $h(\nu + \nu_0)$
- The momentum of a photon of energy $h\nu$ will be
 - $h\nu$
 - $h\nu/c$
 - $h\nu c$
 - h/ν
- Consider the following statements concerning electrons :
 - Electrons are universal constituents of matter.
 - J J Thomson received the very first Nobel prize in Physics for discovering the electron.
 - The mass of the electron is about $1/2000$ of a neutron.
 - According to Bohr the linear momentum of the electron is quantised in the hydrogen atom.Which of the above statements are not correct?
 - I
 - II
 - III
 - IV
- In a photoemissive cell with exciting wavelength λ , the fastest electron has speed v . If the exciting wavelength is changed to $3\lambda/4$, the speed of the fastest emitted electron will be
 - $v(3/4)^{1/2}$
 - $v(4/3)^{1/2}$
 - Less than $v(4/3)^{1/2}$
 - Greater than $v(4/3)^{1/2}$

9. The curve drawn between velocity and frequency of photon in vacuum will be a
- Straight line parallel to frequency axis
 - Straight line parallel to velocity axis
 - Straight line passing through origin and making an angle of 45° with frequency axis
 - Hyperbola
10. If a voltage applied to an X-ray tube is increased to 1.5 times the minimum wavelength (λ_{\min}) of an X-ray continuous spectrum shifts by $\Delta\lambda = 26 \text{ pm}$. The initial voltage applied to the tube is
- $\approx 10 \text{ kV}$
 - $\approx 16 \text{ kV}$
 - $\approx 50 \text{ kV}$
 - $\approx 75 \text{ kV}$
11. The characteristic X-rays radiation is emitted, when
- The electrons are accelerated to a fixed energy
 - The source of electrons emits a monoenergetic beam
 - The bombarding electrons knock out electrons from the inner shell of the target atoms and one of the outer electrons falls into this vacancy
 - The valence electrons in the target atoms are removed as a result of the collision
12. The minimum wavelength of X-rays produced in a Coolidge tube operated at potential difference of 40 kV is
- 0.31 \AA
 - 3.1 \AA
 - 31 \AA
 - 311 \AA
13. If m is the mass of an electron and c is the speed of light, the ratio of the wavelength of a photon of energy E to that of the electron of the same energy is
- $c \sqrt{\frac{2m}{E}}$
 - $\sqrt{\frac{2m}{E}}$
 - $\sqrt{\frac{2m}{cE}}$
 - $\sqrt{\frac{m}{E}}$
14. A photon of $1.7 \times 10^{-13} \text{ Joules}$ is absorbed by a material under special circumstance. The correct statement is
- Electrons of the atom of absorbed material will go to the higher energy states
 - Electron and positron pair will be created
 - Only positron will be produced
 - Photoelectric effect will occur and electron will be produced
15. The velocity of photon is proportional to (where ν is frequency)

- $\frac{\nu^2}{2}$
- $\frac{1}{\sqrt{\nu}}$
- $\sqrt{\nu}$
- ν

16. For a photoelectric cell the graph showing the variation of cut off voltage (V_o) with frequency (ν) of incident light is best represented by



17. Hydrogen atom does not emit X-rays because

- a) Its energy levels are too close to each other b) Its energy levels are too apart
c) It is too small in size d) It has a single electron

18. A particle of charge $-16 \times 10^{-18} \text{ C}$ moving with velocity 10 ms^{-1} along the x -axis enters a region where a magnetic field of induction B is along the y -axis and an electric field of magnitude 10^4 Vm^{-1} is along the negative z -axis. If the charged particle continues moving along the x -axis, the magnitude of B is

- a) 10^3 Wbm^{-2} b) 10^5 Wbm^{-2} c) 10^{16} Wbm^{-2} d) 10^{-3} Wbm^{-2}

19. An important spectral emission line has a wavelength of 21 cm . The corresponding photon energy is ($h = 6.62 \times 10^{-34} \text{ Js}$ and $c = 3 \times 10^8 \text{ ms}^{-1}$)

- a) $5.9 \times 10^{-8} \text{ eV}$ b) $5.9 \times 10^{-4} \text{ eV}$ c) $5.9 \times 10^{-6} \text{ eV}$ d) $11.8 \times 10^{-6} \text{ eV}$

20. A charge of magnitude $3e$ and mass $2m$ is moving in an electric field \mathbf{E} . The acceleration imparted to the charge is

- a) $2 Ee/3m$ b) $3 Ee/2m$ c) $2 m/3Ee$ d) $3 m/2Ee$

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