QUESTIONS FROM COMPETITIVE EXAMS

8.1 Introduction

(MHT-CET 2001)

1. A charged particle is projected in a chamber with velocity v. It moves undeflected. What can be definitely said about the field ?
   a) only $\vec{E}$ present b) only $\vec{B}$ present
   c) both $\vec{E}$ and $\vec{B}$ present d) none of these

2. An electron moving at the speed of 10^7 m/s, enters a magnetic field of induction 0.1 T at right angle to the velocity of electron. The radius of circular path followed by the electron is
   a) 0.57 cm b) 5.7 cm c) 0.57 mm d) 0.27 mm

(MHT-CET 2004)

3. An electron experiences a force equal to its weight, when placed in an electric field. Then intensity of electric field will be
   a) 1.7×10^{-11} N/C b) 5×10^{-11} N/C c) 17×10^{-11} N/C d) 50×10^{-11} N/C

4. Mutually perpendicular electric and magnetic fields are given by, E = 1500 V/m and B = 0.04 T. Then velocity is given by
   a) 60 m/s b) 3.75×10^6 m/s c) 3.75×10^4 m/s d) 60×10^4 m/s

5. Electron moves in uniform magnetic field perpendicular to direction of field. The magnitude of field is 35.21×10^{-6} T. Calculate the time in which it will perform one revolution. ($e/m = 1.76 \times 10^{11}$ C/kg)
   a) 1 μs b) 0.5 μs c) 2 μs d) 1.5 μs

6. An electron is projected in a perpendicular uniform magnetic field of 3×10^{-3} T. If electron moves in circle of radius 4 mm, then linear momentum of electron is
   a) 1.92×10^{-21} kg m/s b) 1.92×10^{-24} kg m/s
   c) 1.2×10^{-21} kg m/s d) 3.2×10^{-21} kg m/s

(MHT-CET 2007)

7. An electron is fired through a region of crossed electric and magnetic field (0.05 T). The electric field is formed between two plates separated by a distance of 2 mm having a P. D of 125 V. The speed of the electron is
   a) 12.5×10^6 m/s b) 1250 Km/s c) 125 Km/s d) 1.25×10^7 m/s

8. A charge q, having mass m, is fired perpendicular to a magnetic field (B) with a velocity v. The frequency of revolution of the charge is
   a) $2\pi/Bq$ b) $2\pi Bq/m$ c) $2\pi m/Bq$ d) $Bq/2\pi m$

(MHT-CET 2008)

9. An electron enters in a magnetic field of induction 2 mT with velocity of 1.8×10^7 m/s The radius of circular path is
   a) 5.1 cm b) 5.1 mm c) 5 km d) 2.1 cm

(MHT-CET 2012)

10. In Millikan's experiment, an oil drop having charge q, mass m, gets accelerated by applying a potential difference V in between two plates separated by a distance 'd' The acceleration is
   a) qVd b) $q\frac{d}{V}$ c) $\frac{qm}{Vd}$ d) $\frac{qV}{md}$

8.2 Photoelectric Effect or Emission

(MHT-CET 2004)

When light of 2.5 eV falls on a metal surface, maximum kinetic energy of electron is 1.5 eV. If incident radiation of 4 eV falls on same metal surface, maximum kinetic energy of electrons is doubled. The work function of metal is

a) 1 eV b) 4 eV c) 1.5 eV d) 0.5 eV

Photoelectric emission takes place

a) when incident wavelength is greater than threshold wavelength
b) when incident wavelength is less than threshold wavelength
c) when incident frequency is greater than threshold frequency
d) at any frequency

(MHT-CET 2005)

When an electron is accelerated from rest to potential V, the final velocity of electron is

a) $\sqrt{\frac{eV}{2m}}$ b) $\sqrt{\frac{eV}{m}}$ c) $\sqrt{\frac{4eV}{m}}$ d) $\sqrt{\frac{2eV}{m}}$

(MHT-CET 2006)

The stopping potential of a given photoelectric device is dependent on

a) intensity b) frequency
c) velocity of photon d) work function

The radiations of 1 eV and 2.5 eV are incident on a metal having a work function of 0.5 eV. The ratio of their maximum velocities is

a) $\frac{1}{2}$ b) $\frac{1}{4}$ c) $\frac{2}{5}$ d) $\sqrt{\frac{5}{2}}$

(MHT-CET 2007)

When temperature of a metal increases,

a) K.E. of the electrons increases
b) K.E. of the electrons decreases
c) all the electrons are ejected from the atom
d) all the atoms are ionised

(MHT-CET 2008)

7. The stopping potential of a photoelectric diode is 9 volts. $e/m = 1.8 \times 10^{11}$ C kg^{-1}, then what is its velocity ?

a) 1.8×10^{6} m/s b) 1.8×10^{5} m/s c) 2.1×10^{5} m/s d) 1.8×10^{4} m/s

(MHT-CET 2009)

8. In photoelectric effect if the intensity of light is doubled, then maximum kinetic energy of photoelectrons will be

a) double b) half c) four times d) no change

(MHT-CET 2012)

9. In photoelectric effect, stopping potential for a light of frequency n_1 is V_1. If light is replaced by another having a frequency n_2, then its stopping potential will be

a) $V_1 - \frac{h}{e}(n_2 - n_1)$ b) $V_1 + \frac{h}{e}(n_2 + n_1)$ c) $V_1 + \frac{h}{e}(n_2 - 2n_1)$ d) $V_1 + \frac{h}{e}(n_2 - n_1)$

(MHT-CET 2014)

20. Light of wavelengths λ_A and λ_B falls on two identical metal plates A and B respectively. The maximum kinetic energies of photoelectrons are K_A and K_B respectively, then which one of the following relations is true ($\lambda_A = 2\lambda_B$) ?

a) $K_A < \frac{K_B}{2}$ b) $2K_A = K_B$ c) $K_A = 2K_B$ d) $K_A > 2K_B$

(MH-CET 2015)

21. When monochromatic light of wavelength 'λ' is incident on a metallic surface, the stopping potential for photoelectric current is '$3V_0$'. When same surface is illuminated with light of wavelength '2λ', the stopping potential is 'V_0'. The threshold wavelength for this surface when photoelectric effect takes place is

a) λ b) 2λ c) 3λ d) 4λ

(MH-CET 2016)

22. Light of wavelength 'λ' which is less than threshold wavelength is incident on a photosensitive material. If incident wavelength is decreased so that emitted photoelectrons are moving with same velocity, then stopping potential will

a) increase b) decrease
c) be zero d) become exactly half

23. When light of wavelength 'λ' is incident on photosensitive surface, the stopping potential is 'V'. When light of wavelength '3λ' is incident on same surface, the stopping potential is $\frac{'V'}{6}$. Threshold wavelength for the surface is

a) 2λ b) 3λ c) 4λ d) 5λ

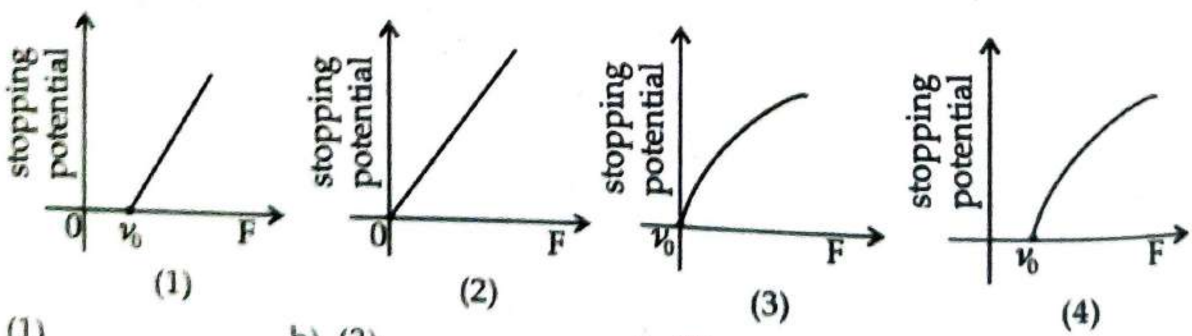
(MH-CET 2017)

24. On a photosensitive material, when frequency of incident radiation is increased by 30%, kinetic energy of emitted photoelectrons increases to 0.9 eV from 0.4 eV. The work function of the surface is

a) 1 eV b) 1.267 eV c) 1.4 eV d) 1.8 eV

(MH-CET 2018)

25. Following graphs show the variation of stopping potential corresponding to the frequency of incident radiation (F) for a given metal. The correct variation is shown in graph (V_0 = Threshold frequency)



a) (1) b) (2) c) (3) d) (4)

34. A metal surface having work function 'W_0' emits photoelectrons when photons of energy 'E' are incident on it. The electron enters the uniform magnetic field (B) in perpendicular direction and moves in circular path of radius 'r'. Then 'r' is equal to

a) $\frac{m(E-W_0)}{eB}$ b) $\frac{\sqrt{m(E-W_0)}}{eB}$ c) $\frac{2m(E-W_0)}{eB}$ d) $\frac{\sqrt{2m(E-W_0)}}{eB}$

(MHT-CET 2021)

35. A light of wavelength 'λ' and intensity 'I' falls on photosensitive material. If 'N' photo electrons are emitted, each with kinetic energy 'E', then

a) $E \propto I, N \propto \lambda$ b) $E \propto I, N \propto I$ c) $E \propto I, N \propto 1/\lambda$ d) $E \propto 1/\lambda, N \propto I$

36. The photoelectric threshold wavelength for silver is 'λ_0'. What is the energy of the electron ejected from the surface of silver by an incident photon of wavelength 'λ' where $\lambda < \lambda_0$?

a) $hc(\lambda-\lambda_0)$ b) $hc\left(\frac{\lambda_0-\lambda}{\lambda\lambda_0}\right)$ c) $hc\left(\frac{\lambda-\lambda_0}{\lambda\lambda_0}\right)$ d) $hc(\lambda_0-\lambda)$

37. Photoelectrons are emitted when photons of energy 4.2 eV are incident on a photosensitive metallic sphere of radius 10 cm and work function 2.4 eV. The number of photoelectrons emitted before the emission is stopped is

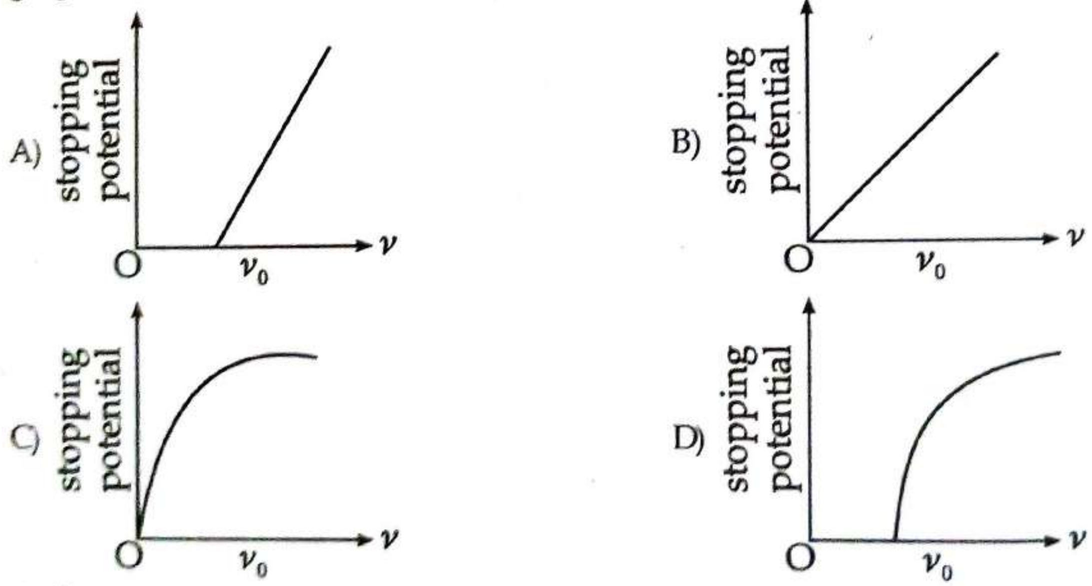
a) 1.25×10^6 b) 1.25×10^8 c) 1.25×10^2 d) 1.25×10^4

(MHT-CET 2022)

38. Light of two different frequencies whose photons have energies 1.3 eV and 2.8 eV respectively, successively illuminate a metallic surface whose work function is 0.8 eV. The ratio of maximum speeds of emitted electrons will be

a) 1 : 5 b) 1 : 2 c) 1 : 3 d) 1 : 4

39. Following graphs show the variation of stopping potential corresponding to the frequency of incident radiation (ν) for a given metal. The correct variation is shown in graph (ν_0 = threshold frequency)



a) D b) C c) A d) B

40. Photoelectric emission is observed from a metallic surface for frequencies 'ν_1' and 'ν_2' of the incident light rays ($\nu_1 > \nu_2$). If the ratio of maximum value of the kinetic energy of the photoelectrons emitted in first case to that in second case is 2 : K, then the threshold frequency of the metallic surface is

a) $\frac{K\nu_1-\nu_2}{K-1}$ b) $\frac{K-2}{K\nu_1-2\nu_2}$ c) $\frac{K\nu_1-2\nu_2}{K-2}$ d) $\frac{K-1}{K\nu_1-\nu_2}$