DUAL NATURE OF MATTER AND RADIATION

1. The work function of metal is 1 eV. Light of wavelength 3000 Å is incident on this metal surface. The velocity of emitted photo-electrons will be

(A) 10 m/sec (B) 1×10^3 m/sec

(C) 1×10^4 m/sec (D) 1×10^6 m/sec

Answer: (D)

$E = W_0 + K_{max}$; $E = \frac{12375}{3000} = 4.125$ eV

$\Rightarrow K_{max} = E - W_0 = 4.125 eV - 1 eV = 3.125$ eV

$\Rightarrow \frac{1}{2} m v_{max}^2 = 3.125 \times 1.6 \times 10^{-19}$ J

$\Rightarrow v_{max} = \sqrt{\frac{2 \times 3.125 \times 1.6 \times 10^{-19}}{9.1 \times 10^{-31}}} = 1 \times 10^6$ m/s

2. A material whose K absorption edge is 0.15 Å is irradiated with 0.1 Å X-rays. The maximum kinetic energy of photoelectrons that are emitted from K-shell is -

(a) 41 KeV (b) 51 KeV (c) 61 KeV (d) 71 KeV

Answer: (a)

$|E_K| = \frac{hc}{\lambda_K} = \frac{12.4 KeV Å}{0.15 Å} = 82.7$ KeV

The energy of incident photon

$E = \frac{hc}{\lambda} = \frac{12.4}{0.1} = 124$ KeV

The maximum kinetic energy is

$K_{max} = E - |E_K| = 41.3$ KeV $\simeq 41$ KeV

3. If the rate of emission of energy from a star is 2.7×10^{36} J/sec, the rate of loss of mass in the star will be -

(A) 3×10^{18} kg/sec
(b) 3×10^{19} kg/sec
(c) 3×10^{20} kg/sec
(d) 3×10^{21} kg/sec

Answer: (b)

$E = mc^2$

□□ $m = \frac{E}{c^2} = \frac{2.7□10^{36}}{9□10^{16}} = \frac{27□10^{35}}{9□10^{16}} = 3 \times 10^{19}$ kg/sec

4. When photons of energy h□□ are incident on the surface of photosensitive material of work function h□0, then -

(a) the kinetic energy of all emitted electrons is h□0
(b) the kinetic energy of all emitted electrons is h (□–□□0)
(c) the kinetic energy of all fastest electrons is h (□–□□0)
(d) the kinetic energy of all emitted electrons is h□□

Answer: (c)

$\frac{1}{2} mv^2_{max}$ = h□ – h□o

= h (□ –□o)

This is Einstein's equation of photoelectric effect.

5. The X-ray wavelength of L□ line of platinum (Z = 78) is 1.30 Å. The X-ray wavelength of L□ line of Molybdenum (Z = 42) is

(A) 5.41 Å
(B) 4.20 Å
(C) 2.70 Å
(D) 1.35 Å

Answer: (A)

The wavelength of line is given by

$$\frac{1}{\lambda} = R(z - 7.4)^2 \left[\frac{1}{2^2} - \frac{1}{3^2}\right] \Rightarrow \lambda \propto \frac{1}{(z - 7.4)^2}$$

$$\frac{\lambda_1}{\lambda_2} = \frac{(z_2 - 7.4)^2}{(z_1 - 7.4)^2} \Rightarrow \frac{1.30}{\lambda_2} = \frac{(4.2 - 7.4)^2}{(78 - 7.4)^2} \Rightarrow \lambda_2 = 5.41 \text{ Å}$$

6. The surface of a metal is illuminated with the light of 400 *nm*. The kinetic energy of the ejected photoelectrons was found to be 1.68 eV. The work function of the metal is (hc = 1240 eV. nm)

(a)3.09 eV (b)1.41 eV (c)1.51 eV (d)1.68 eV

Answer: (b)

$$\frac{hc}{\lambda} = \phi + \frac{1}{2}mv^2$$

$$\Rightarrow \phi = \frac{hc}{\lambda} - \frac{1}{2}mv^2 = \frac{1240}{400} - 1.68 = 1.41 eV$$

7. A cesium photocell, with a steady potential difference of 60 V across, is illuminated by a bright point source of light 50 cm away. When the same light is placed 1 m away, the photoelectrons emitted from the cell -

(a) Are one quarter as numerous

(b) Are half as numerous

(c) Each carry one quarter of their previous momentum

(d) Each carry one quarter of their previous energy

Answer: (a)

d1 = 50 cm

d2 = 1m = 100 cm

$d_2 = \left(I \propto \frac{1}{d^2} \right)$

$2d_1 \quad I_2$

$= I_1/4$

$n_{Ph_2} = \frac{n_{Ph_1}}{4}$

$n_{e_2} = \frac{n_{e_1}}{4}$

8. In an experiment tungsten cathode which has a threshold wavelength 2300 Å is irradiated by ultraviolet light of wavelength 1800 Å. The maximum energy of emitted photo-electron will be –

(a) 1.2 eV (b) 1.5 eV (c) 1.6 eV (d) 1.8 eV

Answer: (b)

$$K_{max} = hc\left(\frac{1}{\lambda} - \frac{1}{\lambda_0}\right) = \frac{6.62 \times 10^{-34} \times 3 \times 10^{8}}{1.6 \times 10^{-19}}\left(\frac{10^{10}}{1800} - \frac{10^{10}}{2300}\right) = 1.5 \text{ eV}$$

9. A photosensitive metallic surface has work function, $h\nu_0$. If photons of energy $2h\nu_0$ fall on this surface, the electrons come out with a maximum velocity of 4×10^6 m/s. When the photon energy is increased to $5h\nu_0$, then maximum velocity of photoelectrons will be –

(a) 2×10^7 m/s (b) 8×10^6 m/s

(c) 2×10^6 m/s (d) 8×10^5 m/s

Answer: (b)

$$\frac{\frac{1}{2}mv_1^2}{\frac{1}{2}mv_2^2} = \frac{K_1}{K_2} = \frac{h(\nu_1 - \nu_0)}{h(\nu_2 - \nu_0)} = \frac{2h\nu_0 - h\nu_0}{5h\nu_0 - h\nu_0} = \frac{1}{4}$$

□ $\frac{v_1^2}{v_2^2} = \frac{1}{4}$ □□ $v_2 = 2v_1 = 8 \times 10^6$ m/s

10. The frequency of incident light falling on a photo sensitive plate is doubled, then maximum kinetic energy of the emitted photoelectrons will become –

(a) 2 times of the earlier value

(b) More than 2 times of the earlier value

(c) Less than 2 times of the earlier value

(d) Unchanged

Answer: (b)

$KE_{max} = h(\nu - \nu_0)$

$$\frac{KE'_{max}}{KE_{max}} = \frac{h(2\nu - \nu_0)}{h(\nu - \nu_0)} > 2$$

11. Stopping potentials of 24, 100, 110, 115 kV are measured for photoelectrons emitted from a certain element when it is irradiated with monochromatic X-rays. The element is used as a target in an X-ray tube. The energy of K_α line is –

(a)54 KeV (b)76 KeV (c)88 KeV (d)32 KeV

Answer: (b)

Let EK, EL, EM, EN be the binding energies of K, L, M and N shell. Let EP be energy of incident photon. Then

EP – EK = 24 KeV ... (1)

EP – EL = 100 KeV ... (2)

EP – EM = 110 KeV .... (3)

E(K)□ = EK – EL = 100 – 24 = 76 KeV

12.1.5 mW of 400 nm light is directed at a photo electric cell. If 0.1% of the incident photons produce photo electrons, the current in the cell is-

(a) 0.48μA (b)0.42mA (c)0.48 mA (d) 0.42μA

Answer: (a)

$n = \frac{P\lambda}{hc}$

$n_e = n \times \eta\,\% = \frac{P\lambda}{hc} \times \frac{\eta}{100}$

$n_e = \frac{1.5 \times 10^{-3} \times 400 \times 10^{-9}}{6.6 \times 10^{-34} \times 3 \times 10^{8}} \times \frac{0.1}{100}$

I = ne e = 0.48 μA

13.All electrons ejected from a surface by incident light of wavelength 200 nm can be stopped before travelling 1 m in the direction of uniform electric field of 4N/C. The work function of the surface is –

(a)4eV (b)6.2 eV (c)2 eV (d)2.2 eV

Answer: (d)

Vs= E.d

Vs= 4Volt

$eV_s = \frac{12400}{\lambda} - W$

$4\ eV = \frac{12400}{2000} eV - W$

4eV = 6.2eV – W

[W = 2.2 eV]

14. Photoelectron are emitted with maximum kinetic energy E from a metal surface when light of frequency □ falls on it when light of frequency □' falls on the same metal, the max. KE. Of emitted Photoelectrons is found to be 2E then □' is -

(a)□1 = □ (b)□1 = 2□ (c)□1 > 2□ (d)□1 < 2□

Answer: (c)

KE = h□ + □□ .....(i)

2KE = h□' + □ ......(ii)

or 2 (h□ + □) = h□' + □□

or □' = 2□ + $\frac{□}{h}$□□□' > 2□

15. If K1 and K2 are the maximum kinetic energies of photo electrons emitted when lights of wavelength □1 and □2 respectively incident on a metallic surface and □1 = 3□2. Then -

(a)K1 > $\frac{K2}{3}$ (b)K1 < $\frac{K2}{3}$ (c)K1 = 3K2 (d) K2 = 3K1

Answer: (b)

$K1 = \frac{hc}{\lambda_1} - \phi$

$K2 = \frac{hc}{\lambda_2} - \phi$

$$\frac{K2}{K1} = \frac{\frac{3hc}{\lambda_1} - \phi}{\frac{hc}{\lambda_1} - \phi} = \frac{3\left(\frac{hc}{\lambda_1} - \frac{\phi}{3}\right)}{\frac{hc}{\lambda_1} - \phi}$$

$\therefore \frac{K2}{K1} > 3$

16. The threshold frequency for photo electric effect on sodium corresponds to a wavelength 5000 Å. Its work function is

(a)15 Joule

(b)10 × 10–19 Joule

(c)4 × 10–19 Joule

(d)None of these

Answer: (c)

$\phi = \frac{hc}{\lambda_0}$

$\phi = \frac{20 \times 10^{-26}}{5000 \times 10^{-10}} = 4 \times 10^{-19}$ Joule

17.Monochromatic light of frequency f1 is incident on a photo cell and the stopping potential is found to be V1. What is the new stopping potential of the cell if it is radiated by monochromatic light of frequency f2 ?

(a)$V \pm \frac{h}{e}$ (f2 – f1)

(b)$V \pm \frac{h}{e}$ [f1 + f2]

(c) $V1 - \frac{h}{e}$ [f1 + f2] (d) None

Answer: (a)

eV1 = hf1 – □ eV2 =

hf2 – □ e(V1 – V2) =

h (f1 – f2)

$V_1 - V_2 = \frac{h}{e}$ (f1 – f2)

$V_2 = V_1 + \frac{h}{e}$ (f2 – f1)

18. The stopping potentials are V1 and V2 with incident lights of wavelength □1 and □2 respectively. Then V1 – V2 -

(a) hc□□ 1□2□□ / e□□1–□ 2□ (b) hc□1 – 1□ / e□□1 □2□ (c) he□1 – 1□ / c□ □1 □2□ (d) $\frac{he}{c□1□2}$ □1–□2□

Answer: (b)

eV1= $\frac{hc}{□1}$ – □

eV2= $\frac{hc}{□2}$ – □

V1 – V2 = $\frac{hc}{e}$ □ $\frac{1}{□1}$ – $\frac{1}{□2}$ □

19. A photon behaves as if it had a mass equal to -

(a) $\frac{h□}{c}$ (b) $\frac{h□}{c2}$ (c) $\frac{c2}{h□}$ (d) h□c

Answer: (b)

E = mc2

$$m = \frac{E}{c^2} = \frac{h\nu}{c^2}$$

20. When a metal surface is illuminated by light of wavelengths 400 nm and 250 nm, the maximum velocities of the photoelectrons ejected are v and 2v respectively. The work function of the metal is –
(h = Planck's constant, c = velocity of light in air)

(a) $2\ hc \times 10^6$ J
(b) $1.5\ hc \times 10^6$ J
(c) $hc \times 10^6$ J
(d) $0.5\ hc \times 10^6$ J

Answer: (d)

$$\frac{1}{2} m v_{max}^2 = K.E._{max} = \frac{hc}{\lambda} - W$$

$$\frac{1}{2} m v_1^2 = \frac{hc}{\lambda_1} - W \quad ....(1)$$

$$\frac{1}{2} m v_2^2 = \frac{hc}{\lambda_2} - W \quad ....(2)$$

$$\frac{eq^n(1)}{eq^n(2)} \Rightarrow \left(\frac{v_1}{v_2}\right)^2 = \frac{\frac{hc}{\lambda_1} - W}{\frac{hc}{\lambda_2} - W} = \left(\frac{v}{2v}\right)^2$$

$$\frac{hc}{\lambda_2} - W = 4\left(\frac{hc}{\lambda_1} - W\right)$$

$$3W = \frac{4hc}{\lambda_1} - \frac{hc}{\lambda_2}$$

$$W = \frac{hc}{3}\left(\frac{4}{\lambda_1} - \frac{1}{\lambda_2}\right) = \frac{hc}{3}\left(\frac{4}{400\times10^{-9}} - \frac{1}{250\times10^{-9}}\right)$$

$$= \frac{hc}{3} \times 10^9 \times \frac{150}{100\times250} = 0.5\ hc \times 10^6 \text{ J}$$

21.A cesium photocell with a steady potential difference of 60 V across it is illuminated by a small bright light placed 1 m away. When the same light is placed 2m away, the electrons crossing the photocell -

(a)each carry one-quarter of their previous momentum

(b)each carry one-quarter of their previous energy

(c)are one-quarter as numerous

(d)are half as numerous

Answer: (c)

$i \propto \frac{1}{r^2}$

$\Rightarrow \frac{i_2}{i_1} = \left(\frac{r_1}{r_2}\right)^2 = \left(\frac{1}{2}\right)^2 = \frac{1}{4}$

$\Rightarrow n_2 = \frac{n_1}{4}$

22. Light of wavelength λ strikes a photo-sensitive surface and electrons are ejected with kinetic energy E. If the kinetic energy is to be increased to 2E, the wavelength must be changed to λ' where -

(a) $\lambda' = \frac{\lambda}{2}$ (b) $\lambda' = 2\lambda$ (c) $\frac{\lambda}{2} < \lambda' < \lambda$ (d) $\lambda' > \lambda$

Answer:(c)

If $\lambda' = \lambda/2$ $\Rightarrow$ E2 > 2E1

But here E2 = 2E1

So $\lambda' > \lambda/2$

So answer is $\frac{\lambda}{2} < \lambda' < \lambda$

23. The kinetic energy of most energetic electrons emitted from a metallic surface is doubled when the wavelength □ of the incident radiation is changed from 400 nm to 310 nm. The work function of the metal is -

(a) 0.9 eV (b) 1.7 eV

(c) 2.2 eV (d) 3.1 eV

Answer: (c)

K = 12400/4000 – □ = 3.1 – □□

2K = 12400/3100 –□□ = 4 – □

□□6.2 – 2□ = 4 – □

or 2.2 eV = □

□□□ = 2.2 eV

24. Two identical metal plates show photoelectric effect. Light of wavelength □A falls on plate A and □B falls on plate B. □A = 2□B. The maximum K.E. of the photoelectrons are KA and KB respectively. Which one of the following is true?

(a) 2KA = KB (b) KA = 2KB (c) KA < KB/2 (d) KA > 2KB

Answer: (c)

KA = hc/□A – □ = hc/2□B – □□

.... (i)

$K_B = \frac{hc}{\lambda_B} - \phi$ ... $\frac{hc}{\lambda_B} = K_B + \phi$

.... (ii)

From eqn (i) & (ii)

$K_A = \frac{1}{2}(K_B + \phi) - \phi = \frac{1}{2}K_B - \frac{\phi}{2}$

$K_A < \frac{1}{2} K_B$

25.The work function of a substance is 4 eV. What is the approximate longest wavelength of light that can cause photo-emission ?

(a) 309 nm (b)209 nm (c)109 nm (d)9 nm

Answer: (a)

$\lambda_{th} = \frac{hc}{\phi} = \frac{12400}{4}$ Å = 3100Å = 310nm

$\therefore$ λ_{th} $\approx$ 310 nm

26.A modern 200 watt sodium street lamp emits yellow light of wavelength 0.6 μm. Assuming it to be 25% efficient in converting electrical energy to light, number of photons of yellow light it emits per second is -

(a)6.2×10^{20} (b) 3×10^{19} (c)1.5×10^{20} (d) 6×10^{18}

Answer: (c)

$\frac{n}{t} = \frac{IA}{h\nu} = \frac{IA\lambda}{hc} = \frac{W\lambda}{hc}$

$= \frac{50 \times 6 \times 10^{-7}}{6.6 \times 10^{-34} \times 3 \times 10^{8}}$

$= \frac{300}{20} \times 10^{19}$

$= 1.5 \times 10^{20}$

27.The human eye can barely detect a yellow light (6000 Å) that delivers 1.7×10^{-18} watt to the retina. Nearly how many photons per second does the retina receive?

(a) 50 (b) 5

(c)500 (d)More than 5 million

Answer: (b)

$n_{Ph} = 5 \times 10^{24} P \lambda$/sec

W m

$= 5 \times 10^{24} (1.7 \times 10^{-18}) (6000 \times 10^{-10})$

$= 5 \times 1.7 \times 6 \times 10^{27-28}$

$= 51 \times 10^{-1} = 5.1$/sec

$n_{Ph} \approx 5$/sec

28. The threshold frequency for a certain metal is ν_0. When light of frequency $\nu = 2\nu_0$ is incident on it, the maximum velocity of photoelectrons is 4×10^6 m/s. If the frequency of incident radiations is increased to $5\nu_0$, then the maximum velocity of photoelectrons in m/s will be -

(a) $\frac{4}{5} \times 10^6$ (b) 2×10^6 (c) 8×10^6 (d) 2×10^7

Answer: (c)

$v_{max.} = \sqrt{\frac{2}{m}(E_{Ph} - W)} = \sqrt{\frac{2}{m}(h\nu - h\nu_0)}$

$(v_{max.})_1 = \sqrt{\frac{2h}{m}(2\nu_0 - \nu_0)}$

$(v_{max.})_2 = \sqrt{\frac{2h}{m}(5\nu_0 - \nu_0)}$

$\frac{v_{max._2}}{v_{max._1}} = 2 \Rightarrow v_{max._2} = 2v_{max._1}$

$v_{max._2} = 2 \times 4 \times 10^6 = 8 \times 10^6 m/s$

29. The rest mass of a photon is -

(a) $h\nu/c^2$ (b) $h\nu/c$ (c) $h\nu$ (d) zero

Answer: (d)

Rest mass of photon = zero

30. When a metallic surface is illuminated with monochromatic light of wavelength λ, stopping potential for photoelectric current is 3 V0. When the same metallic surface is illuminated with a light of wavelength 2λ, the stopping potential is V0. The threshold wavelength for the surface is-

(a) 6λ (b) 4λ (c) 4λ/3 (d) 8λ

Answer: (b)

$3V_0 = \frac{hc}{e\lambda} - \frac{hc}{e\lambda_0}$ ...(1)

$V_0 = \frac{hc}{2e\lambda} - \frac{hc}{e\lambda_0}$ ...(2)

$\frac{eq\,n\,(1)}{eqn(2)} \Rightarrow \frac{3V_0}{V_0} = \frac{\frac{hc}{e\lambda} - \frac{hc}{e\lambda_0}}{\frac{hc}{2e\lambda} - \frac{hc}{e\lambda_0}}$

$$\frac{3}{2}\frac{hc}{e\lambda} - \frac{3hc}{e\lambda_0} = \frac{hc}{e\lambda} - \frac{hc}{e\lambda_0}$$

$$\frac{3}{2\lambda} - \frac{3}{\lambda_0} = \frac{1}{\lambda} - \frac{1}{\lambda_0}$$

$$\frac{2}{\lambda_0} = \frac{1}{2\lambda}$$

$$\lambda_0 = 4\lambda$$

31.A metallic surface ejects photoelectrons when hit by green light but none when hit by yellow light. Will the electrons be ejected if the same surface is hit by red light?

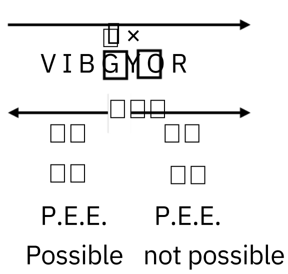
(a)Yes

(b)Yes, if the red beam is sufficiently intense

(c)Yes, if the red beam is allowed to fall for sufficient duration

(d) No

Answer: (d)



*Green is a threshold of metal

So it is not possible from red light.

32. The graph between the frequency of incident light and the stopping potential is a -

(a)parabola (b) straight line (c) hyperbola (d) circle

Answer: (b)

$V_0 = \frac{h}{e}$ □ $- \frac{W}{e}$

↓ y ↓ x

y = mx– c (straight line).

33Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material, photoelectric current is emitted. If the frequency of light is halved and intensity is doubled, the photoelectric current becomes -

(a) 4 times the original current 2
(b) times the original current half the
(c) original current zero times the
(d) original current

Answer: (d)

$v_1 = 1.50$

□2= $\frac{□1}{2}$ = 0.75 □0 < □0

□photoelectric effect (P.E.E.) not possible.

34. What is the force exerted by a photon of intensity 1.4 kWm–2 if it falls on a perfect absorber of radius 2 metre?

(a)2.35 × 10–4 N (b)108 N

(c)8.35 × 104 N (d)8.8 × 10–8 N

Answer: (a)

$$F_{ex} \square \frac{P}{c} \square \frac{IA}{c}$$

I = 1.4 × 103 W/m2

A = 4□r2 = 4 × 3.14 × (2)2 m2

$F_{ex} = 2.35 \times 10^{-4}$ N

35.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

Answer: (b)

Photoelectric effect.

36.An image of the sun is formed by a lens of focal length 30 cm on the metal surface of a photoelectric cell and it produces a current I. The lens forming the image is then replaced by another lens of the same diameter but of focal length of 15 cm. The photoelectric current in this case will be - (In both cases the plate is kept at focal plane and normal to the axis lens)

(a) I/2 (b) 2I (c)I (d) 4I

Answer: (c)

The number of photons incident in both the case is same.

37. When a metallic surface is illuminated with monochromatic light of wavelength λ, the stopping potential is 5V0. When the same surface is illuminated with light of wavelength 3λ, the stopping potential is V0. Then the work function of the metallic surface is -

(a) $\frac{hc}{6\lambda}$ (b) $\frac{hc}{5\lambda}$ (c) $\frac{hc}{4\lambda}$ (d) $\frac{2hc}{4\lambda}$

Answer: (a)

$5eV_0 = \frac{hc}{\lambda} - W$ ...(1)

$eV_0 = \frac{hc}{3\lambda} - W$ ...(2)

Solving equation (1) & (2)

$\frac{hc}{\lambda} - W = \frac{5hc}{3\lambda} - 5W$

$4W = \frac{2hc}{3\lambda} \Rightarrow W = \frac{hc}{6\lambda}$

38. Light of wavelength 400 nm is incident continuously on a cesium ball (work function 1.9 eV) The maximum potential to which the ball will be charged is-

(a)3.1 V (b)1. 2 V (c)Zero (d)Infinite

Answer: (b)

$eV_s = \frac{12400}{4000} - 1.9 = 3.1 - 1.9$

eVs = 1.2 eV

Vs = 1.2 V

39.In photoelectric effect, the number of photoelectrons emitted is proportional to -

(a) intensity of incident beam
(b) frequency of incident beam
(c) velocity of incident beam
(d) work function of photo cathode

Answer: (a)

Intensity Number of photons Number of emitted electrons.

40.Light rays of wavelengths 6000 Å and of photon intensity 39.6 watt/m2 is incident on a metal surface. If only one percent of photons incident on surface emit photoelectrons, then the number of electrons emitted per second per unit area from the surface will be : (h = 6.64 × 10–34 J-s, velocity of light = 3 × 108 m/s)

(a) 12×10^{18} (b) 10×10^{18} (c) 12×10^{17} (d) 12×10^{16}

Answer: (c)

$\frac{I}{At} = \frac{nhc}{\lambda}$

$39.6 = \frac{n \times 6.6 \times 10^{-34} \times 3 \times 10^{8}}{1 \times 1 \times 6000 \times 10^{-10}}$

41. The energy of a photon corresponding to the visible light of maximum wavelength is approximately

(a)1 eV (b)1.6 eV (c)3.2 eV (d)7 eV

Answer: (b)

$E = \frac{12400}{\square_{(Å)}} eV$

$E = \frac{12400}{8000Å} = 1.6\ eV$

42.The dual nature of light is exhibited by -

(a) diffraction and photoelectric effect
(b) diffraction and reflection
(c) diffraction and interference
(d) photoelectric effect

Answer: (a)

Diffraction shows wave nature and photoelectric effect shows particle nature.

43. A source of light is placed at a distance of 1 m from a photocell and cut-off potential is found to be V0. If the distance is doubled, the cut-off potential will be -

(a) 2V0 (b) V0/2 (c) V0 (d) V0/4

Answer: (c)

Stopping potential does not depend on intensity means number of photons.

44. When light of wavelength 300 nm (nanometer) falls on a photoelectric emitter, photoelectrons are liberated. For another emitter, however light of 600nm wavelength is

sufficient for creating photoemission. What is the ratio of the work functions of the two emitters?

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

Answer: (b)

W = h□0 = hc/□0

$\frac{W1}{W2}$ = $\frac{□02}{□01}$ = $\frac{600}{300}$ = 2: 1