DPP 04

1. When the wavelength of radiation falling on a metal is changed from 500 nm to 200 nm, the maximum kinetic energy of the photoelectrons becomes three times larger. The work function of the metal is close to

(A) 0.81eV (B) 1.02eV (C) 0.52eV (D) 0.61eV

2. Two sources of light emit X-rays of wavelength 1 nm and visible light of wavelength 500 nm, respectively. Both the sources emit light of the same power 200 W. The ratio of the number density of photons of X-rays to the number density of photons of the visible light of the given wavelengths is

(A) $\frac{1}{500}$ (B) 250 (C) $\frac{1}{250}$ (D) 500

3. The electric field of light wave is given as

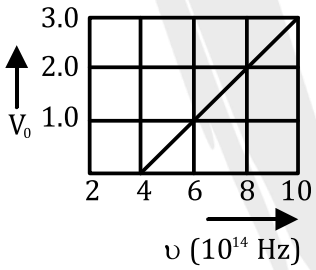
$$\vec{E} = 10^{-3}\cos\left(\frac{2\pi x}{5\times10^{-7}} - 2\pi\times6\times10^{14}t\right)\times\frac{N}{C}$$

This light falls on a metal plate of work function 2eV. The stopping potential of the photo electrons is Given, $E(\text{ in eV}) = \frac{12375}{\lambda(\text{ in Å})}$

(A) 0.48 V (B) 0.72 V (C) 2.48 V (D) 2.0 V

4. The stopping potential V_0 (in volt) as a function of frequency (v) for a sodium emitter, is shown in the figure. The work function of sodium, from the data plotted in the figure, will be

(Given: Planck's constant (h) $= 6.63\times10^{-34}$ J s, electron charge e $= 1.6\times10^{-19}$C)



(A) 1.95eV (B) 1.66eV (C) 1.82eV (D) 2.12eV

5. Surface of certain metal is first illuminated with light of wavelength $\lambda_1 = 350$ nm and then, by light of wavelength $\lambda_2 = 540$ nm. It is found that the maximum speed of the photo electrons in the two cases differ by a factor of 2. The work function of the metal (in eV) is close to

$\left(\text{Energy of photon } = \frac{1240}{\lambda(\text{ in nm})}\text{eV }\right)$

(A) 5.6 (B) 2.5 (C) 1.4 (D) 1.8

6. The magnetic field associated with a light wave is given, at the origin, by $B = B_0[\sin(3.14\times10^7)ct + \sin(6.28\times10^7)ct]$. If this light falls on a silver plate having a work function of 4.7eV, what will be the maximum kinetic energy of the photo electrons?

($c = 3 \times 10^8$ m s^{-1}, $h = 6.6 \times 10^{-34}$ J s)

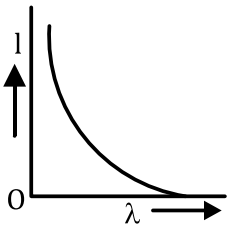
(A) 12.5eV (B) 8.52eV (C) 6.82eV (D) 7.72eV

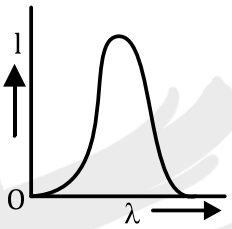
7. When photons of wavelength λ_1 are incident on an isolated sphere, the corresponding stopping potential is found to be V. When photons of wavelength λ_2 are used, the corresponding stopping potential was thrice that of the above value. If light of wavelength λ_3 is used then find the stopping potential for this case

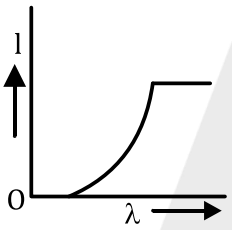
(A) $\frac{hc}{e}\left[\frac{1}{\lambda_3}+\frac{1}{\lambda_2}-\frac{1}{\lambda_1}\right]$ (B) $\frac{hc}{e}\left[\frac{1}{\lambda_3}+\frac{1}{2\lambda_2}-\frac{1}{\lambda_1}\right]$

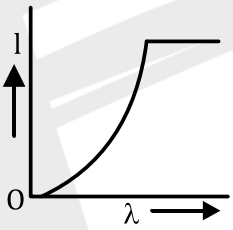
(C) $\frac{hc}{e}\left[\frac{1}{\lambda_3}-\frac{1}{\lambda_2}-\frac{1}{\lambda_1}\right]$ (D) $\frac{hc}{e}\left[\frac{1}{\lambda_3}+\frac{1}{2\lambda_2}-\frac{3}{2\lambda_1}\right]$

8. The anode voltage of a photocell is kept fixed. The wavelength λ of the light falling on the cathode is gradually changed. The plate current I of the photocell varies as follows

(A) 

(B) 

(C) 

(D) 

9. This question has Statement-1 and Statement-2. Of the four choices given after the statements, choose the one that best describes the two statements.

Statement-1: When ultraviolet light is incident on a photocell, its stopping potential is V_0 and the maximum kinetic energy of the photoelectrons is K_{max}. When the ultraviolet light is replaced by X-rays, both V_0 and K_{max} increase.

Statement-2: Photoelectrons are emitted with speeds ranging from zero to a maximum value because of the range of frequencies present in the incident light.

(A) Statement- 1 is true, statement- 2 is false.

(B) Statement-1 is true, statement-2 is true; statement-2 is the correct explanation of statement-1.

(C) Statement-1 is true, statement-2 is true; statement-2 is not the correct explanation of statement-1.

(D) Statement-1 is false, statement-2 is true.

10. If a source of power 4 kW produces 10^{20} photons/ second, the radiation belongs to a part of the spectrum called

(A) γ-rays (B) X-rays (C) ultraviolet rays (D) microwaves

PHOTO ELECTRIC EFFECT

ANSWER KEY

1.	(D)	**2.**	(A)	**3.**	(A)	**4.**	(B)	**5.**	(D)	**6.**	(D)	**7.**	(D)
8.	(A)	**9.**	(B)	**10.**	(A)								