Q 1

In an experiment with photoelectric effect, the stopping potential,

A. is $\left(\frac{1}{e}\right)$ times the maximum kinetic energy of the emitted photoelectrons

B. increases with increase in the intensity of the incident light

C. decreases with increase in the intensity of the incident light

D. increases with increase in the wavelength of the incident light

Q 2

UV light of $4.13 \mathrm{~eV}$ is incident on a photosensitive metal surface having work function $3.13 \mathrm{~eV}$. The maximum kinetic energy of ejected photoelectrons will be:

A 4.13 eV

B 1 eV

C 7.26 eV

D 3.13 eV

Q 3

A proton, an electron and an alpha particle have the same energies. Their de-Broglie wavelengths will be compared as :

A $\lambda_p > \lambda_e > \lambda_\alpha$

B $\lambda_\alpha < \lambda_p < \lambda_e$

C $\lambda_e > \lambda_\alpha > \lambda_p$

D $\lambda_p < \lambda_e < \lambda_\alpha$

Q 4

In photoelectric experiment energy of $2.48 \mathrm{~eV}$ irradiates a photo sensitive material. The stopping potential was measured to be $0.5 \mathrm{~V}$. Work function of the photo sensitive material is :

(A) 1.98 eV

(B) 1.68 eV

(C) 2.48 eV

(D) 0.5 eV

Q 5

Which of the following statement is not true about stopping potential (V_0) ?

A It depends upon frequency of the incident light.

B It is $1/\mathrm{e}$ times the maximum kinetic energy of electrons emitted.

C It increases with increase in intensity of the incident light.

D It depends on the nature of emitter material.

Q 6

Given below are two statements: one is labelled as Assertion $\mathbf{A}$ and the other is labelled as Reason R.

Assertion A: Number of photons increases with increase in frequency of light.

Reason R: Maximum kinetic energy of emitted electrons increases with the frequency of incident radiation.

In the light of the above statements, choose the most appropriate answer from the options given below:

A. $\mathbf{A}$ is not correct but $\mathbf{R}$ is correct.

B. $\mathbf{A}$ is correct but $\mathbf{R}$ is not correct.

C. Both $\mathbf{A}$ and $\mathbf{R}$ are correct and $\mathbf{R}$ is the correct explanation of $\mathbf{A}$.

D. Both $\mathbf{A}$ and $\mathbf{R}$ are correct and $\mathbf{R}$ is NOT the correct explanation of $\mathbf{A}$.

Q 7

The de Broglie wavelengths of a proton and an α particle are λ and 2λ respectively. The ratio of the velocities of proton and α particle will be :

A $8:1$

B $1:2$

C $1:8$

D $4:1$

Q 8

When a metal surface is illuminated by light of wavelength λ, the stopping potential is $8\ \mathrm{V}$. When the same surface is illuminated by light of wavelength 3λ, stopping potential is $2\ \mathrm{V}$. The threshold wavelength for this surface is:

A 3λ

B 9λ

C 5λ

D 4.5λ

When UV light of wavelength $300 \mathrm{~nm}$ is incident on the metal surface having work function $2.13 \mathrm{eV}$, electron emission takes place. The stopping potential is :

(Given hc $= 1240 \mathrm{eV} \mathrm{~nm}$)

A 4 V

B 2 V

C 4.1 V

D 1.5 V

Q 10

The work function of a substance is $3.0 \mathrm{eV}$. The longest wavelength of light that can cause the emission of photoelectrons from this substance is approximately;

A 215 nm

B 400 nm

C 414 nm

D 200 nm

Q 11

The work functions of Aluminium and Gold are $4.1 \mathrm{~eV}$ and and $5.1 \mathrm{~eV}$ respectively. The ratio of the slope of the stopping potential versus frequency plot for Gold to that of Aluminium is

A 1.5

B 1.24

C 1

D 2

Q 12

The ratio of de-Broglie wavelength of an α particle and a proton accelerated from rest by the same potential is $\frac{1}{\sqrt{m}}$, the value of m is -

A 2

B 16

C 8

D 4

Q 13

The ratio of wavelengths of proton and deuteron accelerated by potential V_p and V_d is $1 : \sqrt{2}$. Then the ratio of V_p to V_d will be :

A) $1 : 1$

B) $\sqrt{2} : 1$

C) $2 : 1$

D) $4 : 1$

Q 14

The light of two different frequencies whose photons have energies 3.8 eV and 1.4 eV respectively, illuminate a metallic surface whose work function is 0.6 eV successively. The ratio of maximum speeds of emitted electrons for the two frequencies respectively will be :

A 1 : 1

B 2 : 1

C 4 : 1

D 1 : 4

Q 15

A moving proton and electron have the same de-Broglie wavelength. If K and P denote the K.E. and momentum respectively. Then choose the correct option :

A $K_p < K_e$ and $P_p = P_e$

B $K_p = K_e$ and $P_p = P_e$

C $K_p < K_e$ an $P_p < P_e$

D $K_p > K_e$ and $P_p = P_e$

Q 16

In a photoelectric experiment, increasing the intensity of incident light :

A) increases the number of photons incident and also increases the K.E. of the ejected electrons

B) increases the frequency of photons incident and increases the K.E. of the ejected electrons

C) increases the frequency of photons incident and the K.E. of the ejected electrons remains unchanged

D) increases the number of photons incident and the K.E. of the ejected electrons remains unchanged

Q 17

An electron moving with speed v and a photon moving with speed c, have same D-Broglie wavelength. The ratio of kinetic energy of electron to that of photon is :

A $\frac{3c}{v}$

B $\frac{v}{3c}$

C $\frac{v}{2c}$

D $\frac{2c}{v}$

Q18

An α particle and a proton are accelerated from rest by a potential difference of 200V. After this, their de Broglie wavelengths are λ_α and λ_p respectively. The ratio $\frac{\lambda_p}{\lambda_\alpha}$ is :

A 8

B 2.8

C 7.8

D 3.8

Q 19

Given below are two statements :

Statement I : Two photons having equal linear momenta have equal wavelengths.

Statement II : If the wavelength of photon is decreased, then the momentum and energy of a photon will also decrease.

In the light of the above statements, choose the correct answer from the options given below.

A Statement I is false but Statement II is true

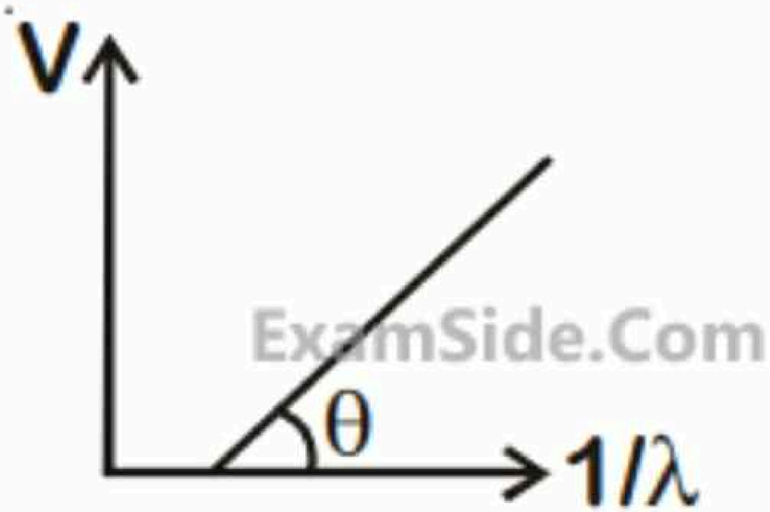
B Both Statement I and Statement II are false

C Both Statement I and Statement II are true

D Statement I is true but Statement II is false

Q 20

In a photoelectric effect experiment, the graph of stopping potential V versus reciprocal of wavelength obtained is shown in the figure. As the intensity of incident radiation is increased :



A Slope of the straight line get more steep

B Graph does not change

C Straight line shifts to left

D Straight line shifts to right

Q 21

A particle moving with kinetic energy E has de Broglie wavelength λ. If energy ΔE is added to its energy, the wavelength become $\lambda/2$. Value of ΔE, is :

A E

B 3E

C 2E

D 4E

Q 22

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

A X -rays

B ultraviolet rays

C microwaves

D γ - rays

Q 23

A Laser light of wavelength 660 nm is used to weld Retina detachment. If a Laser pulse of width 60 ms and power 0.5 kW is used the approximate number of photons in the pulse are :

[Take Planck's constant $h = 6.62 \times 10^{-34}$ Js]

(A) 10^{20}

(B) 10^{18}

(C) 10^{22}

(D) 10^{19}

Q 24

A particle A of mass m and initial velocity v collides with a particle B of mass m/2 which is at rest. The collision is head on, and elastic. The ratio of the de-Broglie wavelengths λ_A to λ_B after the collision is:

A $\frac{\lambda_A}{\lambda_B}=\frac{1}{3}$

B $\frac{\lambda_A}{\lambda_B}=2$

C $\frac{\lambda_A}{\lambda_B}=\frac{2}{3}$

D $\frac{\lambda_A}{\lambda_B}=\frac{1}{2}$

Q 25

An X-ray tube is operated at 1.24 million volt. The shortest wavelength of the produced photon will be :

A) 10^{-2} nm

B) 10^{-1} nm

C) 10^{-3} nm

D) 10^{-4} nm

Q 26

A particle of mass 4M at rest disintegrates into two particles of mass M and 3M respectively having non zero velocities. The ratio of de-Broglie wavelength of particle of mass M to that of mass 3M will be :

(A) $1:3$

(B) $3:1$

(C) $1:\sqrt{3}$

(D) $1:1$

Q 27

A particle is travelling 4 time as fast as an electron. Assuming the ratio of de-Broglie wavelength of a particle to that of electron is 2 : 1, the mass of the particle is :

A $\frac{1}{16}$ times the mass of e^-

B 8 times the mass of e^-

C 16 times the mass of e^-

D $\frac{1}{8}$ times the mass of e^-

Q 28

Two identical photocathodes receive the light of frequencies f_1 and f_2 respectively. If the velocities of the photo-electrons coming out are v_1 and v_2 respectively, then

A $v_1 - v_2 = \left[\frac{2h}{m}(f_1 - f_2)\right]^{\frac{1}{2}}$

B $v_1^2 + v_2^2 = \frac{2h}{m}[f_1 + f_2]$

C $v_1 + v_2 = \left[\frac{2h}{m}(f_1 + f_2)\right]^{\frac{1}{2}}$

D $v_1^2 - v_2^2 = \frac{2h}{m}[f_1 - f_2]$

Q 29

The de-Broglie wavelength of a proton and α-particle are equal. The ratio of their velocities is :

A 4 : 2

B 4 : 3

C 4 : 1

D 1 : 4

Q 30

A photoelectric surface is illuminated successively by monochromatic light of wavelengths λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface is :

A $\frac{hc}{3\lambda}$

B $\frac{hc}{2\lambda}$

C $\frac{hc}{\lambda}$

D $\frac{3\,hc}{\lambda}$