Q-1 - 14530905

The de Broglie wavelength of an neutron corresponding to root mean square speed at 927 is λ. What will be the de Broglie wavelength of the neutron corresponding to root mean square speed at $27C$?

(A) $\frac{\lambda}{2}$

(B) λ

(C) 2λ

(D) 4λ

CORRECT ANSWER: C

SOLUTION:

$K.E.$ of neutron $E = \frac{3}{2}KT$

$$\lambda_d = \frac{h}{p} = \frac{h}{\sqrt{2mE}}$$

$$= \frac{h}{\sqrt{2m \times \frac{3}{2}kT}}$$

$$\Rightarrow \lambda_2$$

$$= \lambda\sqrt{\frac{(927 + 273)}{27 + 273}}$$

$$= 2\lambda$$

Q-2 - 17960249

The stopping potential for the photo-electrons emitted from a metal surface of work-function 1.7 eV is 10.4 eV. Find the wavelength of the radiation used. Also identify the energy-levels in hydrogen atom which will emit this wavelength.

Watch Video Solution On Doubtnut App

Q-3 - 19037628

A perfectly reflecting solid hemisphere of radius R is placed in the path of a parallel beam of light of large aperture. If the beam carrries an intensity l, find the force exerted by the beam on the hemisphere.

(A) $\dfrac{2\pi R^2 l}{c}$

(B) $\dfrac{\pi R^2 l}{c}$

(C) $\dfrac{4\pi R^2 l}{c}$

(D) None of these

CORRECT ANSWER: B

SOLUTION:

Effected area $= \pi R^2$

Pressure =

$\frac{l}{c}$,

where, c is speed of light

$$\therefore \quad \text{Force} = \frac{\pi R^2 l}{c}$$

Q-4 - 11033403

In a photoelectric effect experiment irradiation of a metal with light of frequency $5.2 \times 10^{14} s^{-1}$ yields elctrons with maximum kinetic ennergy $1.3 \times 10^{-19} J$.Calculate the threshold frequency (v_0) for the metal

SOLUTION:

We know that

$hv = hv_0 + KE$

or $v_0 = v - \frac{KE}{h}$

$KE = 1.3 \times 10^{-19} J, v$

$= 5.2 \times 10^{14} s^{-1}, h$

$= 6.626 \times 10^{-34} Js$

:. Theshold frequency

$v_0 = 5.2 \times 10^{24} s^{-1}$

$- \frac{1.3 \times 10^{19} J}{6.626 \times 10^{-34} Js}$

$= 5.2 \times 10^{14} s^{-1}$

$- 1.96 \times 10^{14} s^{-1}$

$3.24 \times 10^{14} s^{-1}$

Q-5 - 12015584

When the frequency of incident radiation is less than threshold frequency for a metal surface, what is value of stopping potential for that and why?

SOLUTION:

When the frequency of incident radiation becomes equal to threshold frequency, the blue of stopping potential becomes zero. When the frequency of incident radiation becomes less than threshold frequency no photoelectric emission take place. Hence, the involvement of stopping potential does not arise.

Q-6 - 19037625

Calculate the number of photons emitted by a 60 W bulb per second, if 10% of the electrical energy supplied to an incandescent light bulb is radiated as visible light.

(A) 1.8×10^{19}

(B) 1.8×10^{16}

(C) 1.8×10^{11}

(D) 1.8×10^{21}

CORRECT ANSWER: A

Watch Video Solution On Doubtnut App

Q-7 - 19037652

The stopping potential are V_1 and V_2. Calculate the $(V_1 - V_2)$, if the λ_1 and λ_2 are wavelength of incident lights, respectively.

(A) $\frac{hc}{e}\left(\frac{1}{\lambda_1} - \frac{1}{\lambda_2}\right)$

(B) $\frac{hc}{e}\left(\frac{1}{\lambda_1} + \frac{1}{\lambda_1}\right)$

(C) $\frac{e}{hc}\left(\frac{1}{\lambda_1} + \frac{1}{\lambda_2}\right)$

(D) $\frac{e}{hc}\left(\frac{1}{\lambda_1}-\frac{1}{\lambda_2}\right)$

CORRECT ANSWER: A

SOLUTION:

$$eV_1 = \frac{hc}{\lambda_1} \text{ and } eV_2 = \frac{hc}{\lambda_2} \Rightarrow (V_1 - V_2) = \frac{hc}{e}\left(\frac{1}{\lambda_1}-\frac{1}{\lambda_2}\right)$$

Watch Video Solution On Doubtnut App

Q-8 - 19037660

Graph of stopping potential for most energetic emitted photoelectron (V_S) with frequency of incident radiation on metal is given below.

The value of $\frac{AB}{BC}$, in graph is

(h=Planck's constant, e = electronic charge)

(A) h

(B) e

(C) $\frac{h}{e}$

(D) $\frac{e}{h}$

CORRECT ANSWER: C

SOLUTION:

By Einstein's photoelectric equation

$$KE_{\max} = eV_s = hv - hv_0$$

$$\Rightarrow \quad V_s = \left(\frac{h}{e}\right)v - \frac{hv_0}{e}$$

Graph of V_s with v is straight line whose slope = $\frac{h}{e}$

Slope of graph $= \frac{AB}{BC} \Rightarrow \frac{AB}{BC} = \frac{h}{e}$

Q-9 - 12015710

The work function for a certain metal is 4.2eV. Will this metal give photoelectric emission for incident radiation of wavelength 330nm?

Given, charge on electron,

$e = 1.6 \times 10^{-19} C, c = 3 \times 10^8 m/s, h = 6.62 \times 10^{-34} Js$

.

SOLUTION:

$\phi_0 = 4.2 eV = 4.2 \times 1.6 \times 10^{-19} = 6.72 \times 10^{-19} J$

$$E = \frac{hc}{\lambda}$$

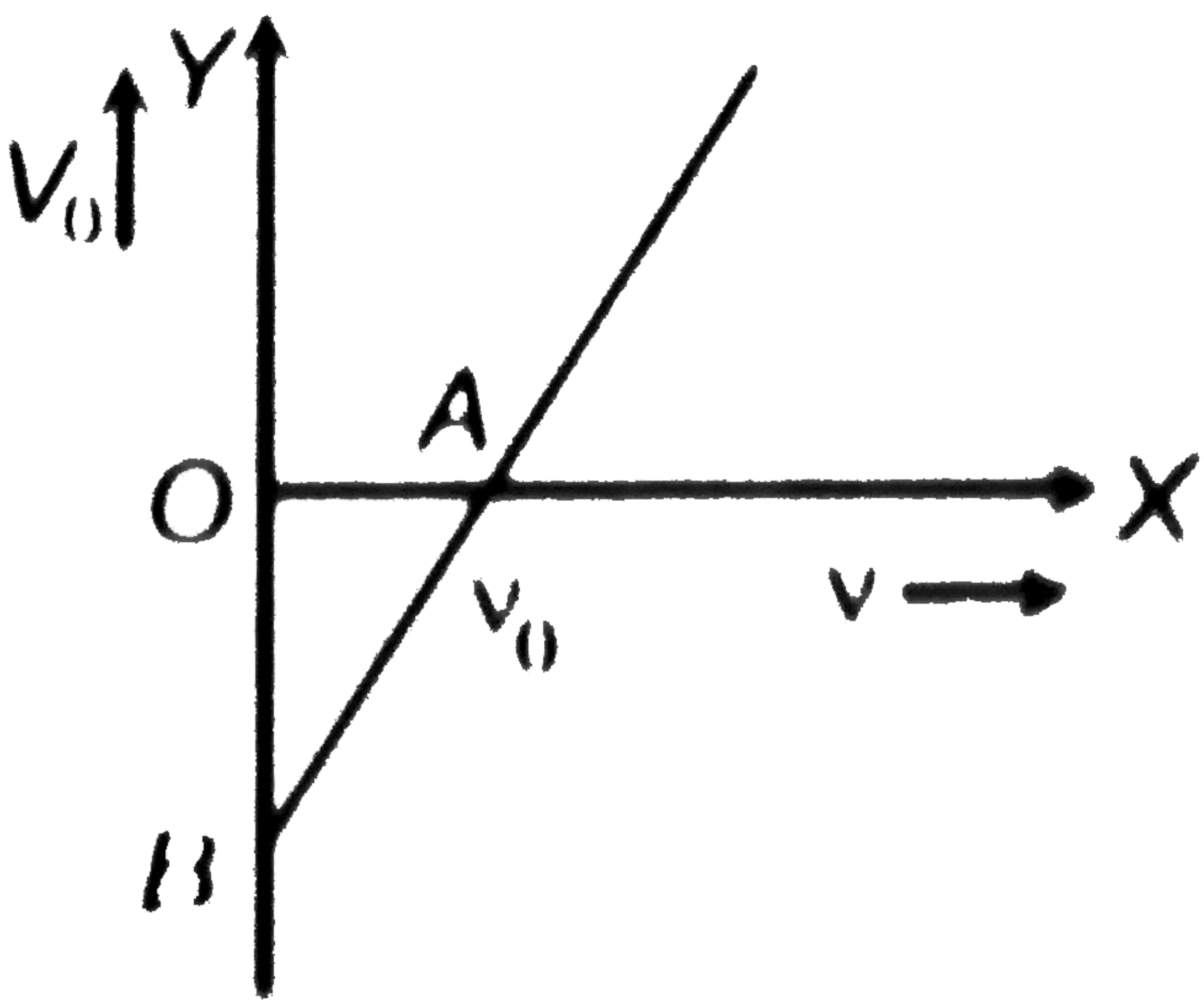
$$= \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{330 \times 10^{-9}} = 6.018 \times 10^{-19} J$$

As energy of incident photon $E < \phi_0$, hence no photoelectric emission will take place.

Watch Video Solution On Doubtnut App

Q-10 - 11969578

In an experiment on photoelectric effect the frequency f of the incident light is plotted against the stopping potential V_0. The work function of the photoelectric surface si given by (e is the electronic charge)



(A) $OB \times eineV$

(B) $OB \text{in volt}$

(C) $OA \text{in} eV$

(D) The slope of the line AB

CORRECT ANSWER: A

SOLUTION:

Using Einstein's equation , $V_0 = \left(\frac{h}{e}\right)v - \frac{W_0}{e}$

Comparing this equation with $y - mx + c$,

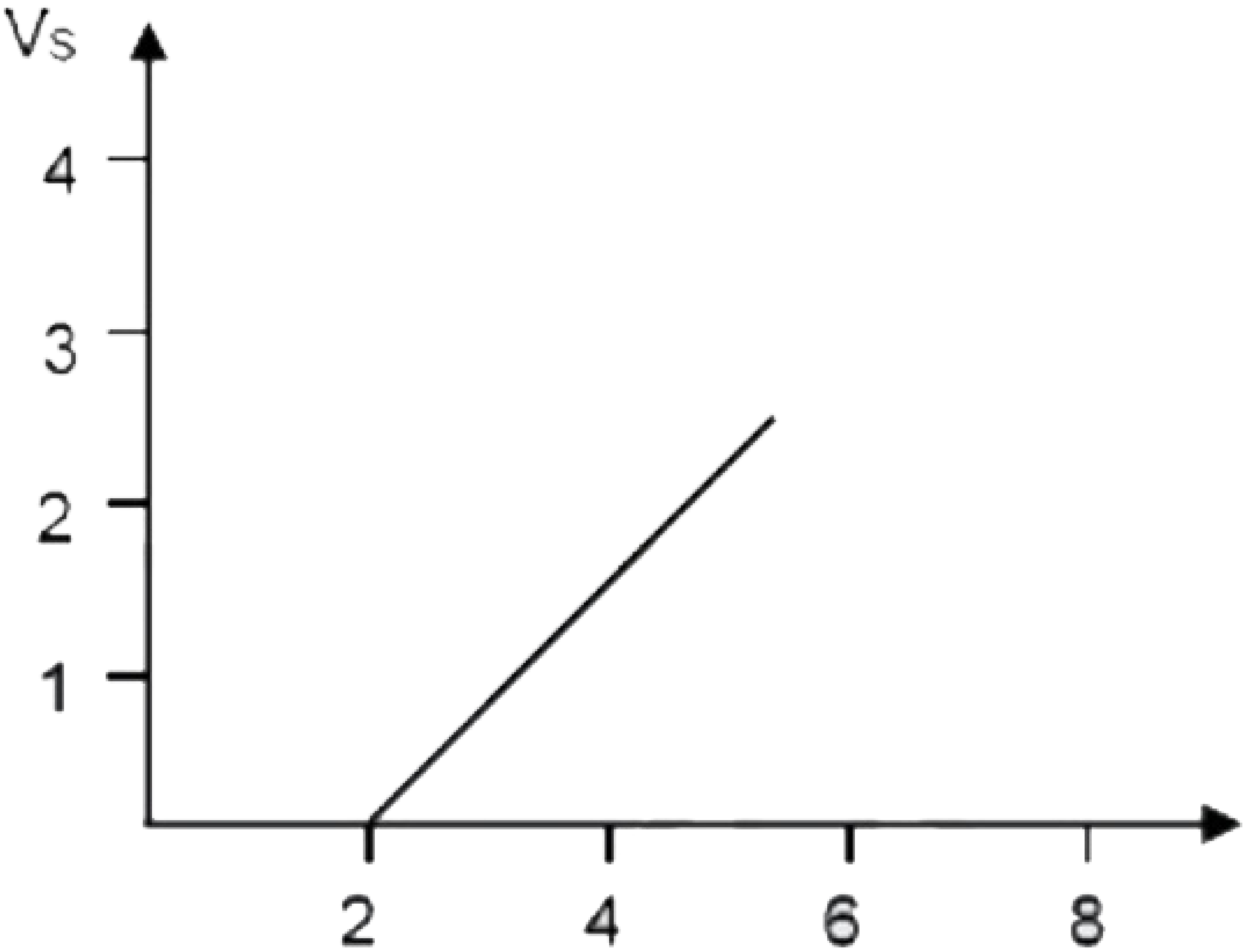
we get on $-V_0$ axis as $-\frac{W_0}{e}$.

$$\Rightarrow OB = \frac{W_0}{\Rightarrow} W_0$$

$$= OB \times e$$

Q-11 - 9677638

Graph between stopping potential and frequency of photon is given in figure



Find out work function of metal:

(A) 0.82

(B) 0.92

(C) 0.72

(D) 0.62

CORRECT ANSWER: A

Q-12 - 16757002

The stopping potential for acertain photosensitive metal is Vq when the frequency of incident radiation is V_0 When the frequency of the incident radiations is doubled, what will be the stopping potential ?

(A) V_0

(B) $2V_0$

(C) $4V_0$

(D) None of the above

Q-13 - 11312362

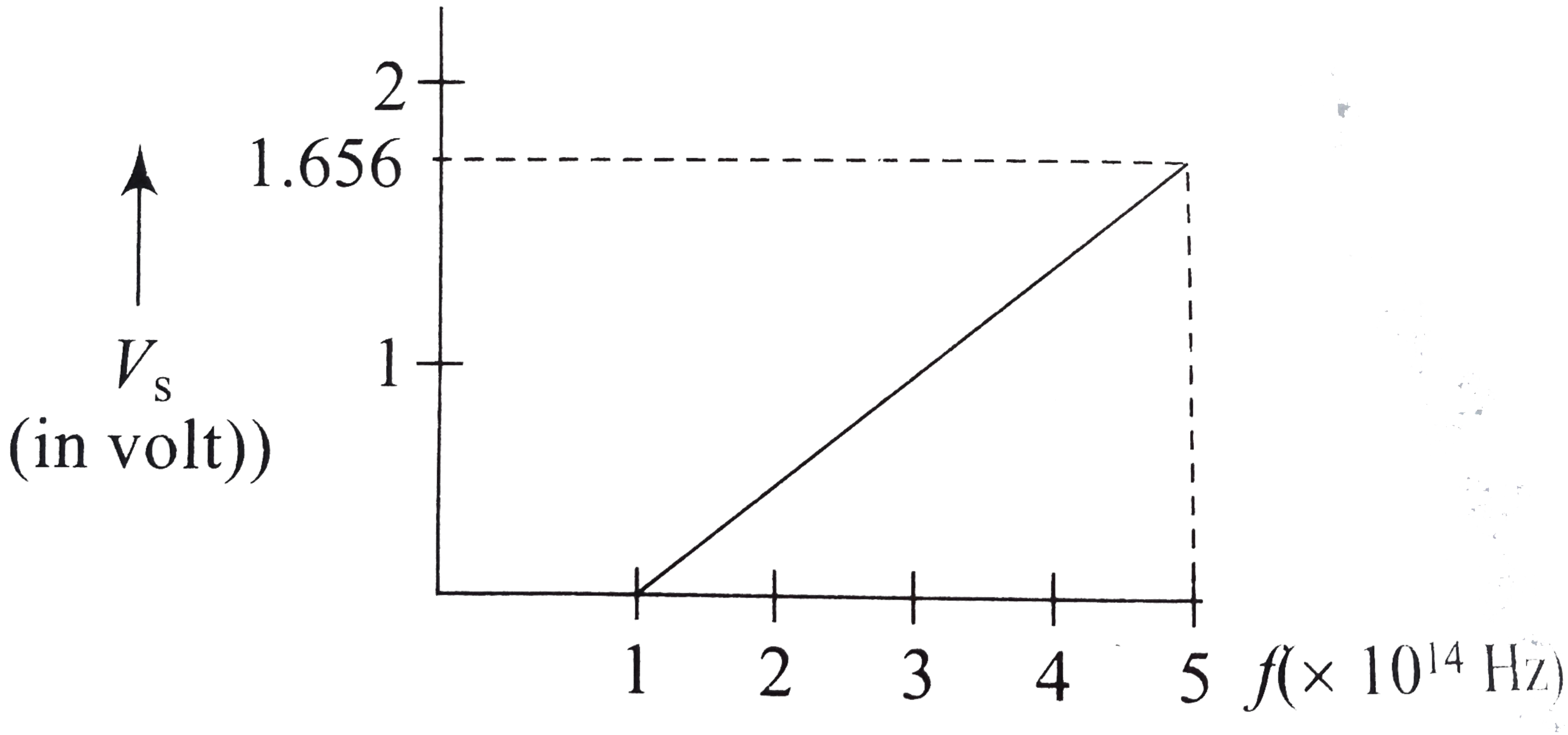


Figure shows the plot of the stopping potential versus the frequency of the light used in an experiment on photoelectric effect. The ratio $\frac{h}{e}$ is

(A) $10^{-15}Vs^{-15}Vs$

(B) $2 \times 10^{-15}Vs$

(C) $3 \times 10^{-15}Vs$

(D) $4.14 \times 10^{-15}Vs$

CORRECT ANSWER: D

SOLUTION:

$$eV_S = hc - \phi_0$$

$$V_S = \frac{h}{e}v - \frac{\phi_0}{e}$$

Now,

$$\frac{h}{e} = \text{slope}$$

$$= \frac{1.656}{4 \times 10^{14}}$$

$$= 0.414 \times 10^{-14} Vs$$

$$4.14 \times 10^{-15} Vs$$

Q-14 - 11969793

Photons with energy $5eV$ are incident on a cathode C in a photoelectric cell . The maximum energy of emitted photoelectrons is $2eV$. When photons of energy $6eV$ are incident on C , no photoelectrons will reach the anode A , if the stopping potential of A relative to C is

(A) $-1V$

(B) $-3V$

(C) $+3V$

(D) $+4V$

CORRECT ANSWER: B

SOLUTION:

$$eV_s = \frac{1}{2}mv_{\max}^2 = hv - \phi_0$$

$$2 = 5 - \phi_0 \Rightarrow \phi_0 = 3eV$$

In second case

$$eV_s = 6 - 3 = 3eV \Rightarrow V_s = 3V$$

$$\therefore V_{AC} = -3V$$

Q-15 - 16757064

A proton with KE equal to that a photono (E = 100 keV). λ_1 is the wavelength of proton and λ_2 is the wavelength of photon. Then $\left.\frac{\lambda_1}{\lambda}\right)_2$ is proportional to:

(A) $E^{\frac{1}{2}}$

(B) $E^{-\frac{1}{2}}$

(C) E

(D) E^{-1}

Q-16 - 12015785

The slope of frequency of incident light and stopping potential for a given surface will be

(A) h

(B) h / e

(C) eh

(D) e

CORRECT ANSWER: B

Q-17 - 16593727

In a X - ray tube , electrons accelerated through a very high potential difference strike a metal target . If the potential difference is increased , the speed of the emitted X - rays :

(A) Increases

(B) Decreases

(C) Remains unchanged

(D) is always equal to $3 \times 10^8 ms^{-1}$ in space

Watch Video Solution On Doubtnut App

Q-18 - 11969784

When the energy of the incident radiation is increased by 20% , kinetic energy of the photoelectrons emitted from a metal surface increased from $0.5eV \rightarrow 0.8eV$. The work function of the metal is

(A) $0.65eV$

(B) $1.0eV$

(C) $1.3eV$

(D) $1.5eV$

CORRECT ANSWER: B

SOLUTION:

According to Einstein's photoelectric equation ,

$h\upsilon = \phi_0 + K_{\max}$

We have

$h\upsilon = \phi_1 + 0.5$.(i)

and $1.2h\upsilon = \phi_0 + 0.8$

Therefore , from above two equations $\phi_0 = 1.0eV$

Watch Video Solution On Doubtnut App

Q-19 - 15160187

Electrons originally at rest are accelerated through a potential difference of V volts. The applied potential differ- ence is measured using a voltmeter having a least count of DV. The electrons in the beam have a de-Broglie wavelength of $\lambda \pm \Delta\lambda [\Delta\lambda < \ <]$. Find $\left|\frac{\Delta\lambda}{\lambda}\right|$.

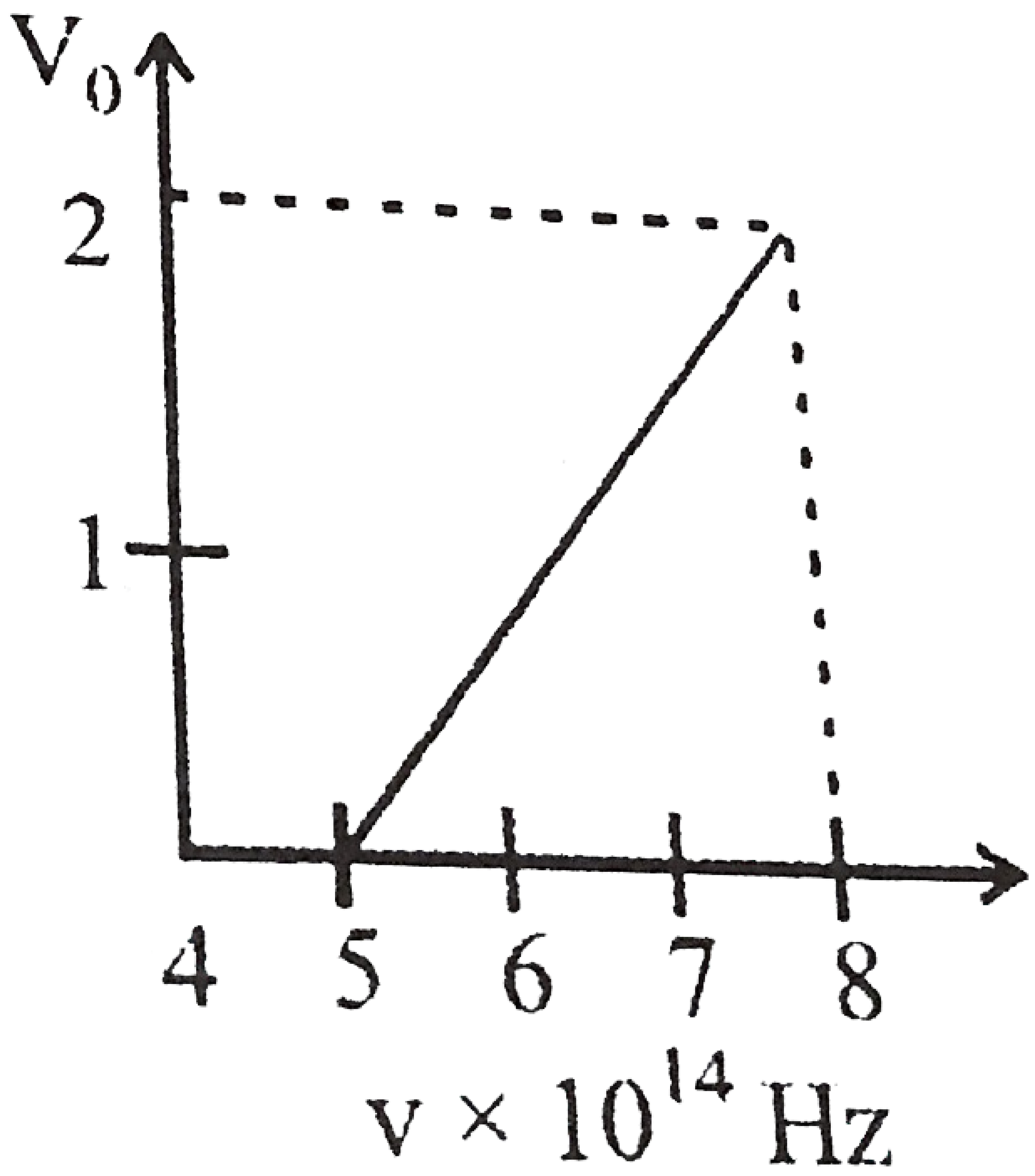
CORRECT ANSWER:

$$\frac{DELTALAMBDA}{LAMBDA} = \frac{DELTAV}{2V}$$

Watch Video Solution On Doubtnut App

Q-20 - 14930704

The stopping potential (V_0) versus frequency (v) plot of a substance is shown in figure, the threshold wavelength is



(A) $5 \times 10^{14} m$

(B) 6000 �

(C) 5000 �

(D) cannot be estimated from given data

Q-21 - 9729170

Let p and E denote the linear momentum and energy of a photon. If the wavelength is decreased,

(A) both p and E increase

(B) p increases and E decreases

(C) p decreases and E increases

(D) both p and E decrease.

CORRECT ANSWER: A

Q-22 - 11969521

The energy of a photon is $E = hv$ and the momentum of photon

$p = \frac{h}{\lambda}$, then the velocity of photon will be

(A) E / p

(B) Ep

(C) $\left(\frac{E}{P}\right)^2$

(D) $3 \times 10^8 m / s$

CORRECT ANSWER: A

SOLUTION:

Momentum of photon $p = \frac{E}{c}$

$\Rightarrow$ Velocity of photon $c = \frac{E}{p}$

Watch Video Solution On Doubtnut App

Q-23 - 11969832

Assertion : The energy (E) and momentum (p) of a photon are related by $p = E / c$.

Reason : The photon behaves like a particle.

(A) If both assertion and reason are true and reason is the correct explanation of the assertion.

(B) If both assertion and reason are true but reason is not correct explanation of the assertion.

(C) If assertion is true but the reason is false.

(D) If both the assertion and reason are false.

CORRECT ANSWER: A

SOLUTION:

Momentum of a photon is given by $y = \frac{h}{\lambda}$.

Also the photon is a form of energy packets behave as a particle having energy $E = \frac{hc}{\lambda}$. So $p = \frac{E}{c}$.

Q-24 - 16803920

An electron and a photon have same wavelength of 10^{-9} m. If E is the energy of the photon and p is the momentum of the electron, the magnitude of E/p in SI units is

(A) 1.00×10^{-9}

(B) 1.50×10^{8}

(C) 3.00×10^{8}

(D) 1.20×10^{7}

CORRECT ANSWER: C

Q-25 - 14162408

The curve drawn between velocity and frequency of a photon in vacuum will be

(A) straight line parallel to frequency axis

(B) straight line parallel to velocity axis.

(C) straight line passing through oritgin and making an angle of 45° with frequency axis

(D) hyperbola.

CORRECT ANSWER: A

Q-26 - 18253684

The energy of a photon depends upon Planck's constant and frequency of light. Find the exprression for photon energy.

(A) $E = hv$

(B) $E = \frac{h}{v}$

(C) $E = \frac{v}{h}$

(D) $E = hv^2$

SOLUTION:

(a) $E = h^a . v^b$..(i)

where $h =$ Planck's constant and $v =$ frequency

$[E] = \left[ML^2T^{-2}\right], [v]$

$= \left[M^0L^0T^{-1}\right]$

and $[h] = \left[ML^2T^{-1}\right]$

From Eq. (i)

$\left[ML^2T^{-2}\right]$

$= \left[ML^2T^{-1}\right]^a$

$\left[M^0L^0T^{-1}\right]^b$

$\left[ML^2T^{-2}\right]$

$= \left[M^3L^{2a}T^{-a-b}\right]$

$\Rightarrow a = 1$ and

$-a - b = -2 \Rightarrow a$
$+ b = 2 \Rightarrow b = 1$

$\Rightarrow E = hv$

Q-27 - 14531088

A hydrogen atom initially in the ground level absorbs a photon , which excites it to then $n = 4$ level. Determine the wavelength and frequency of photon.

SOLUTION:

$$\frac{1}{\lambda} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

$$\frac{1}{\lambda} = 1.09 \times 10^7\left(\frac{1}{1^2} - \frac{1}{4^2}\right)$$

$$= 1.09 \times 10^7 \left(\frac{16 - 1}{16}\right)$$

$$= 1.09 \times 10^7 \times \frac{15}{16}$$

$$\lambda = \frac{16}{1.09 \times 15 \times 10^7}$$

$$= 9.8 \times 10^{-8} m$$

$\therefore$ Frequency

$$(v) = \frac{C}{\lambda}$$

$$= \frac{3 \times 10^8}{9.8 \times 10^{-8}} = 3.06 \times 10^{15} s^{-1}$$

Q-28 - 23583189

The energy of a photon is given as, ΔE/atom

$= 3.03 \times 10^{-19} Jatom^{-1}$ then, the wavelength (λ) of the photon is

(A) $65.6nm$

(B) $656nm$

(C) $0.656nm$

(D) $6.56nm$

CORRECT ANSWER: B

SOLUTION:

$$\Delta E = \frac{hc}{\lambda} \text{ or } \lambda = \frac{hc}{\Delta E}$$

$$= \frac{6.62 \times 10^{-34} \times 3 \times 10^{8}}{3.08 \times 10^{-19}}$$

$$= 656nm$$

.

Q-29 - 11033468

A photon of 3000 is obserbed by a gas and then re-emmited as two photon .One photon in red (7600) what would be the wavelength of the other photon ?

SOLUTION:

$$hv = hv_1 + hv_2$$

$$\text{or } \frac{hv}{\lambda} = \frac{hv}{\lambda_1} + \frac{hv}{\lambda_2}$$

$$\text{or } \frac{1}{3000} = \frac{1}{7600} + \frac{1}{\lambda_2}$$

$$\text{or } \frac{1}{3000} = \frac{1}{7600} + \frac{1}{\lambda_2}$$

or $\lambda_2 = \frac{228000}{46}$

$= 4956.5$

Watch Video Solution On Doubtnut App

Q-30 - 11969503

Photon and electron are given same energy $(10^{-20} J)$. Wavelength associated with photon and electron are λ_{ph} and λ_{el} then correct statement will be

(A) $\lambda_{ph} > \lambda_{el}$

(B) $\lambda_{ph} < \lambda_{el}$

(C) $\lambda_{ph} = \lambda_{el}$

(D) $\frac{\lambda_{el}}{\lambda_{ph}} = C$

CORRECT ANSWER: A

SOLUTION:

Wavelength of photon will be greater than that of electron because mass of photon is less than that of electron $\Rightarrow \lambda_{ph} > \lambda_e$

Watch Video Solution On Doubtnut App

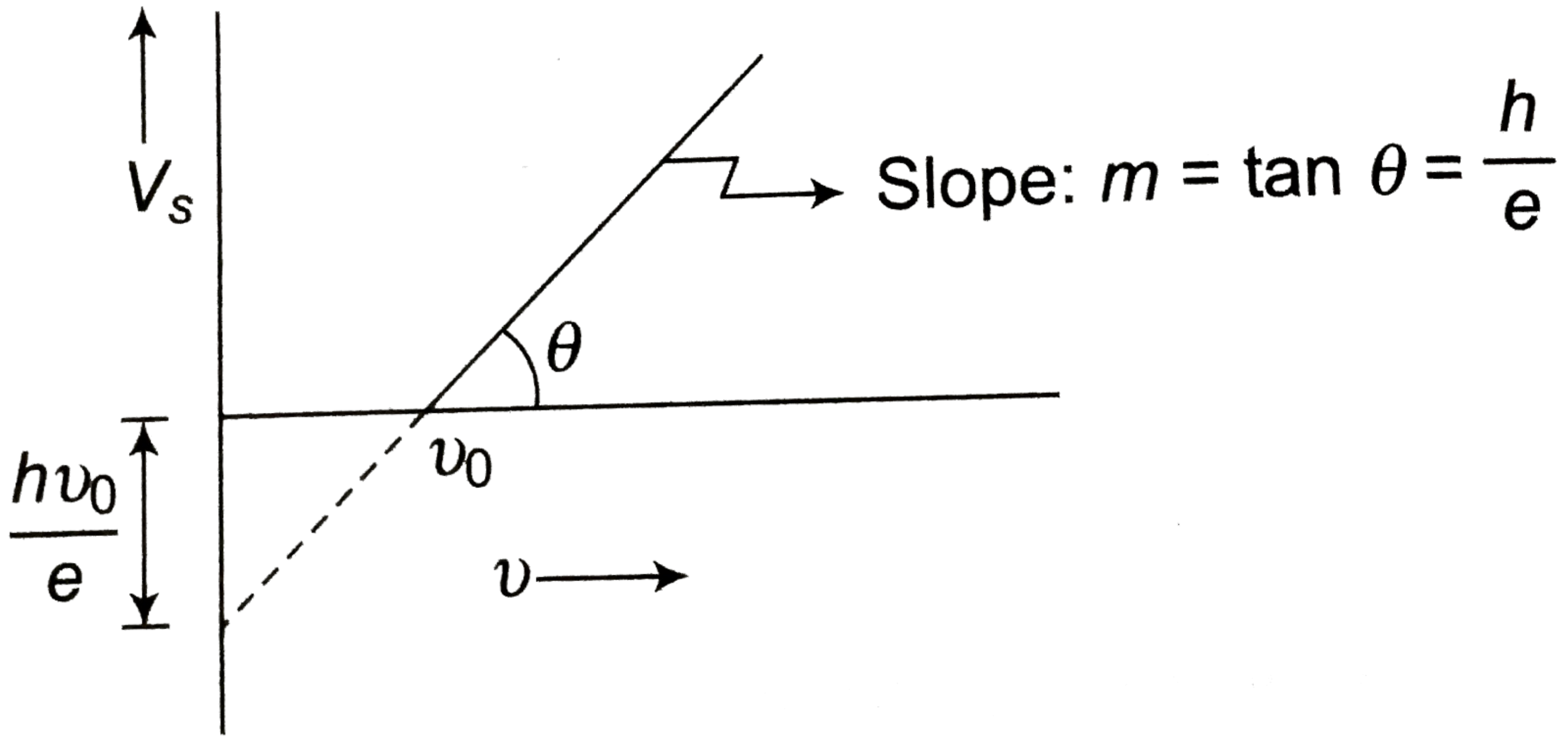
Q-31 - 13156950

Which of the following is correct regarding Einstein photo-electric effect equation?

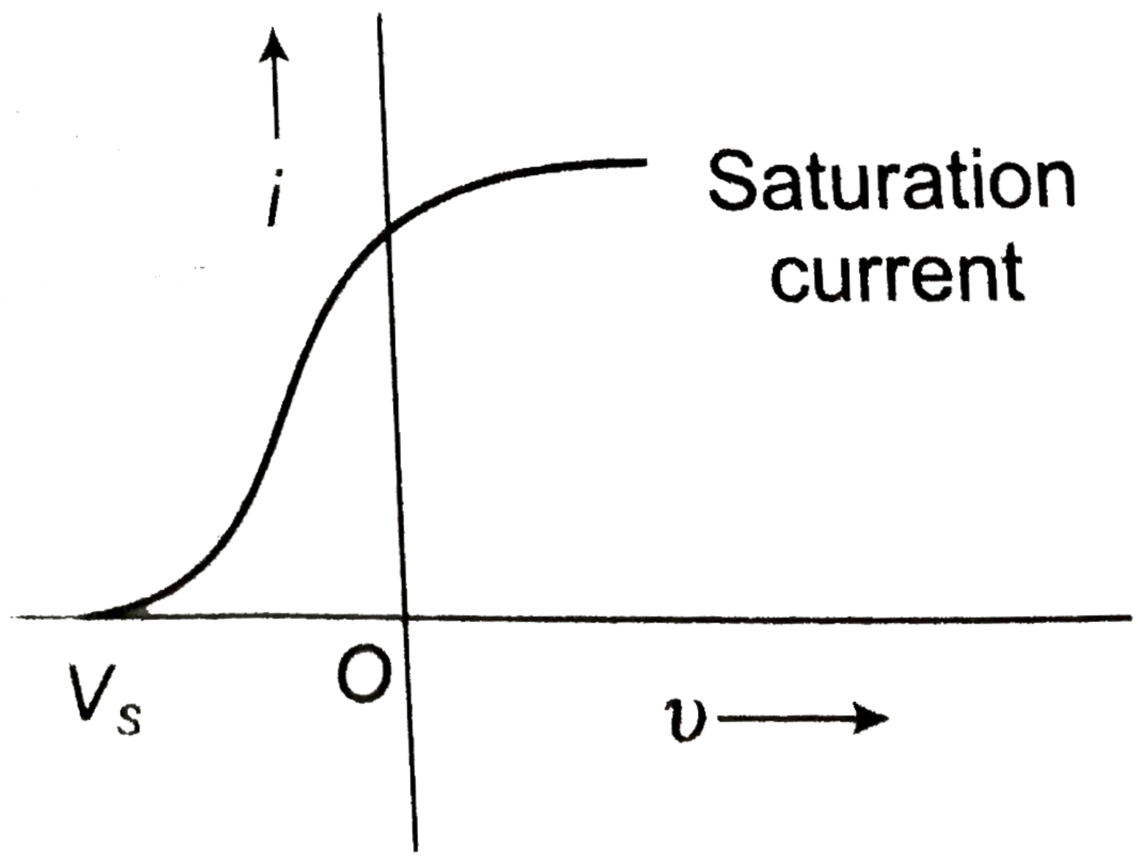
(i) The equation is

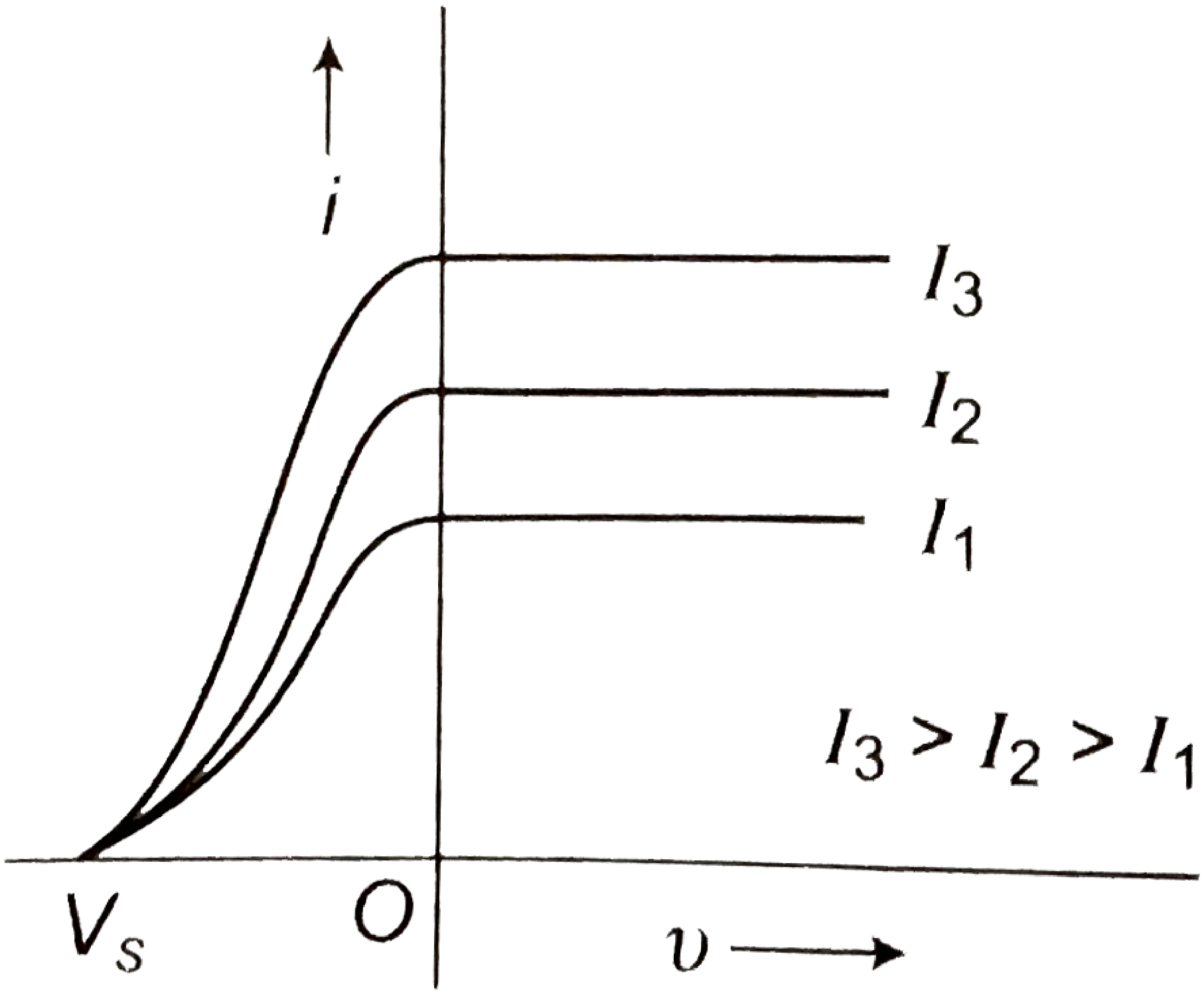
$hv = hv_0 + K_{\max} = hv_0 + eV_s$

(ii) The variation of V_s with v is

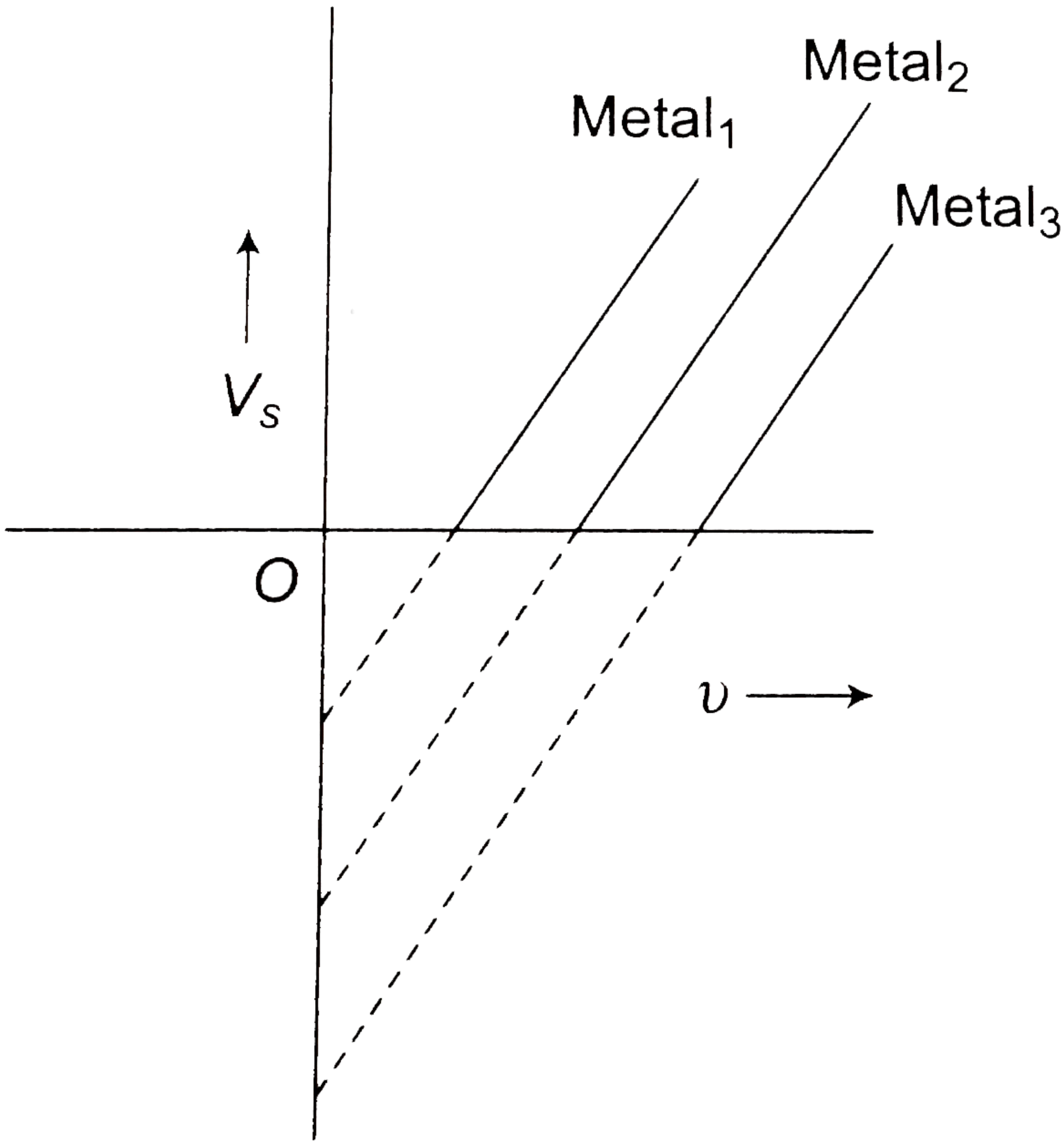


(iii) The variation of photo-current versus applied potential




i
I_3
I_2
I_1
$I_3 > I_2 > I_1$
V_s
O
υ

(iv)


Metal$_1$
Metal$_2$
Metal$_3$
V_s
O
υ

(A) (i),(ii),(iii)

(B) (ii),(iii),(iv)

(C) (i),(iii),(iv)

(D) all

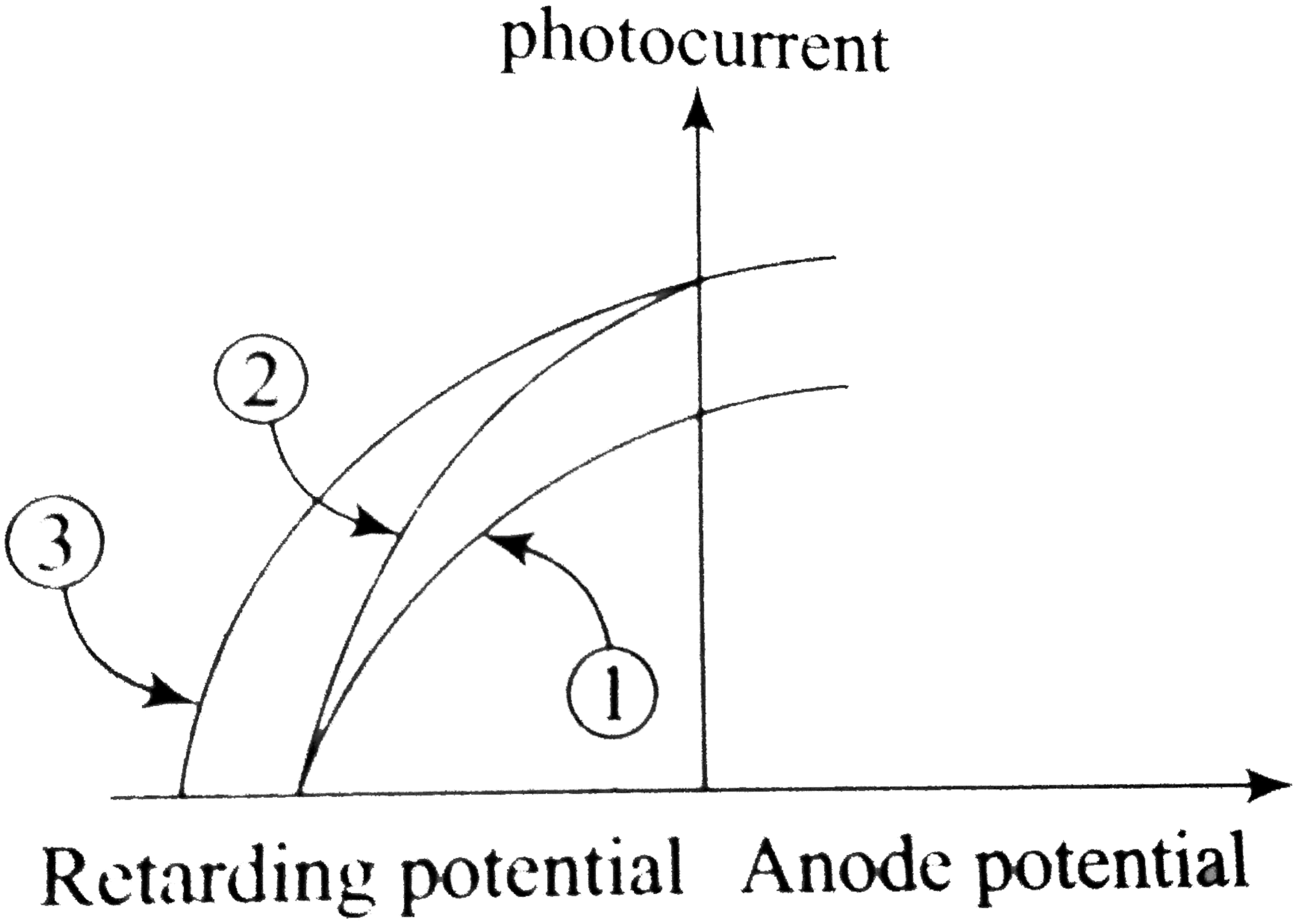
CORRECT ANSWER: D

SOLUTION:

NA

Q-32 - 11969763

The figure shows a plot of photo current versus anode potential for a photosensitive surface for three different radiations. Which one of the following is a correct statement ?



(A) Curves a and b represent incident radiations of different frequencies and different intensities

(B) Curves a and b represent incident radiations of the same frequency but no different intensities

(C) Curves b and c represent incident radiations of different frequencies and different intensities

(D) Curve b and c represent incident radiations of the same frequency having the same intensity

---

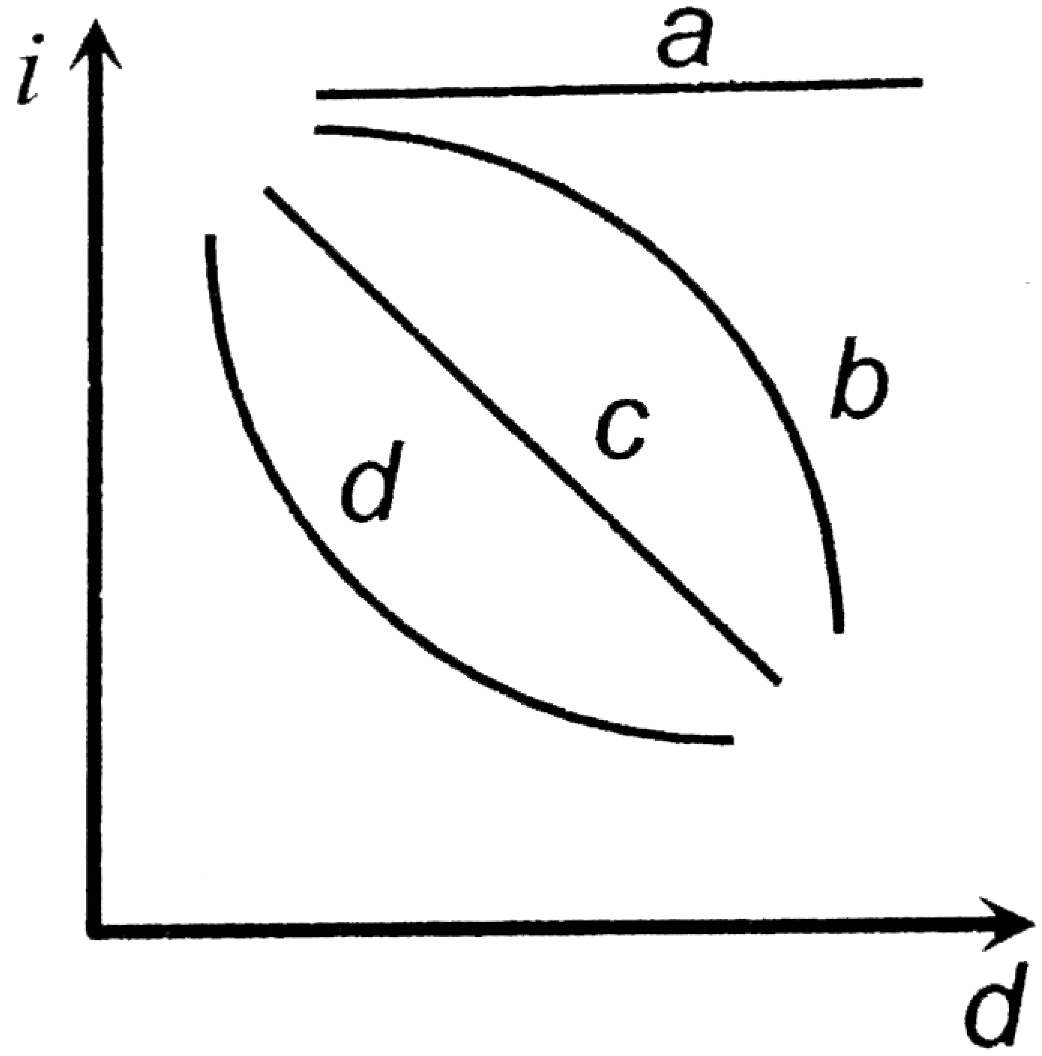
CORRECT ANSWER: B

SOLUTION:

From the two graphs we can conclude that for the graph in question curves a and b represent incident radiations of the same frequency but of different intensities.

Q-33 - 11969567

A point source of light is used in an experiment on photoelectric effect . Which of the following curves best represents the variation of photo current (i) with distance (d) of the source from the emitter ?



(A) a

(B) b

(C) c

(D) d

CORRECT ANSWER: D

SOLUTION:

$I \propto \frac{I}{d^2}$ and photo current $i \propto I \Rightarrow I \propto \frac{1}{d^2}$

Q-34 - 13156955

When stopping potential is applied in an experiment on photoelectric effect, no photo current is observed. This means that

(A) the emission of photoelectrons is stopped

(B) the photoelectrons are emitted but are re-absorbed by the emitter metal

(C) the photoelectrons are accumulated near the collector plate

(D) the photoelectrons are dispersed from the sides of the apparatus

CORRECT ANSWER: B

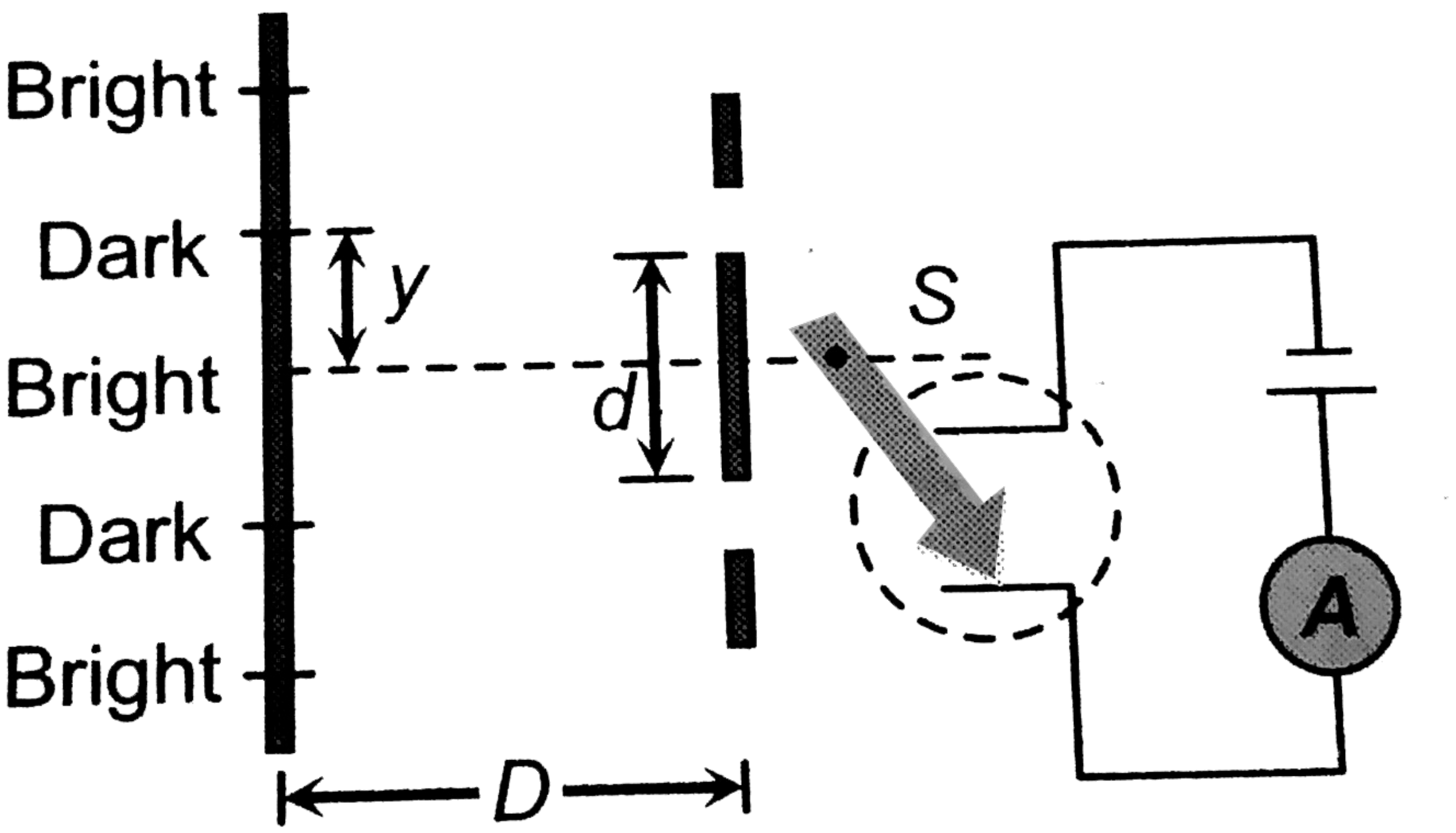
SOLUTION:

NA

Watch Video Solution On Doubtnut App

Q-35 - 11969707

In the following arrangement $y = 1.0mm, d = 0.24mm$ and $D = 1.2m$. The work function of the material of the emitter is $2.2eV$. The stopping potential V needed to stop the photo current will be



(A) $0.9V$

(B) $0.5V$

(C) $0.4V$

(D) $0.1V$

CORRECT ANSWER: A

SOLUTION:

As we know in Young's double slit experiment fringe

width = separation between two consecutive fringe or

dark fringes $= b = \frac{\lambda D}{d}$

Here

$$\beta = 2y \Rightarrow \frac{\lambda D}{d} \Rightarrow \lambda = \frac{2yd}{D}$$

$$\Rightarrow \lambda = \frac{2 \times 1 \times 10^{-3} \times 0.24 \times 10^{-3}}{1.2} = 4 \times 10^{-7} m = 4000$$

Energy of light incident on photo plate

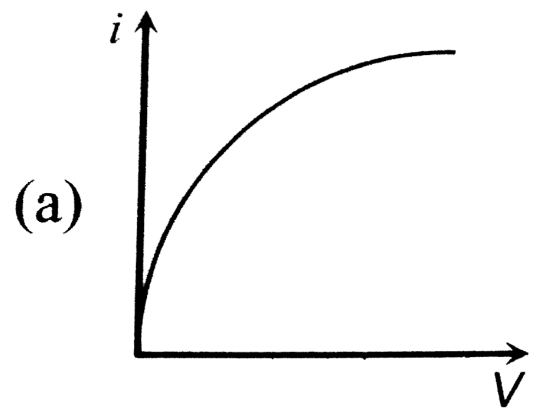
$$E(eV) = \frac{12375}{4000}$$
$$= 3.1eV$$

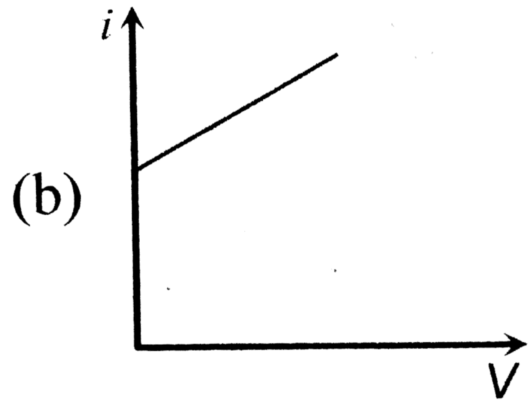
According to Einstein photoelectric equation ,

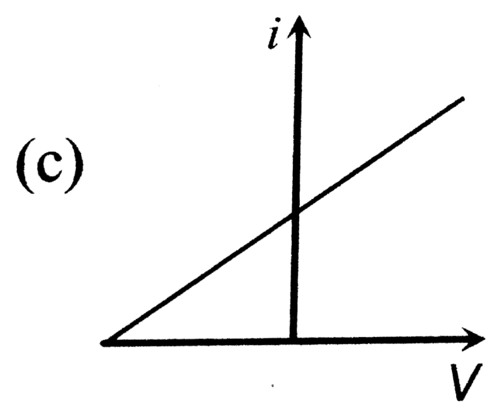
$$E = W_0 + eV_0 \Rightarrow V_0$$
$$= \frac{(E - W_0)}{e}$$
$$= \frac{(3 + 2.2)}{e} ev$$
$$\approx 0.9V$$

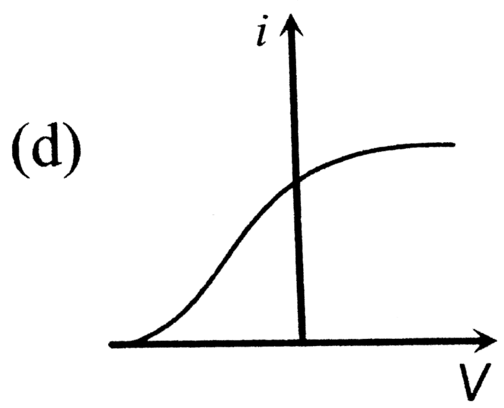
Q-36 - 11969712

The curve between current (i) and potential difference (V) for a photo cell will be

(A) 

(B) 

(C) 

(D) 

CORRECT ANSWER: D

SOLUTION:

In photocell , at a particular negative potential (stopping potential V_0) of anode , photoelectric current is zero , At the potential difference between cathode and anode increases current through the circuit increases but after some time constant current (saturation current)flows through the circuit even if potential difference still increasing.

Watch Video Solution On Doubtnut App

Q-37 - 13079072

The best suitable metal for photo electric effect is

(A) Iron

(B) Steel

(C) Aluminium

(D) Cesium

CORRECT ANSWER: D

Q-38 - 11969565

The retarding potential for having zero photo - electron current

(A) Is proportional to the wavelength of incident light

(B) Increases uniformly with the increase in the wavelength of incident light

(C) Is proportional to the frequency of incident light

(D) Increases uniformly with the increase in the frequency of incident light wave

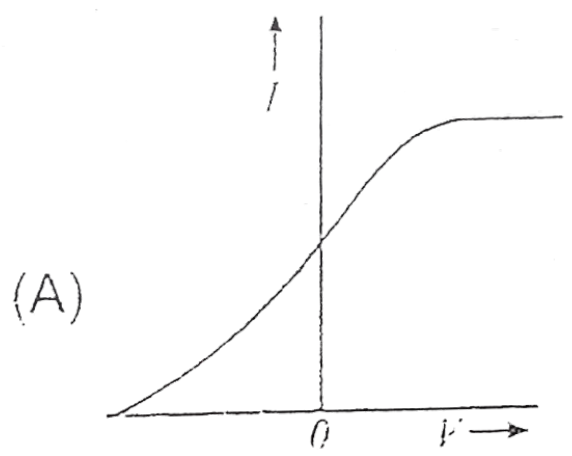
CORRECT ANSWER: D

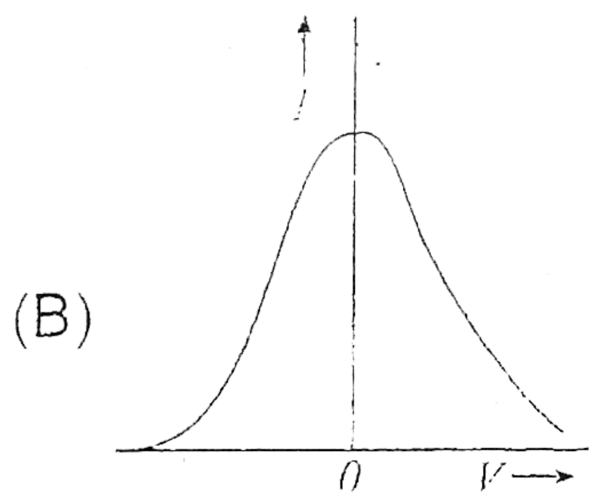
SOLUTION:

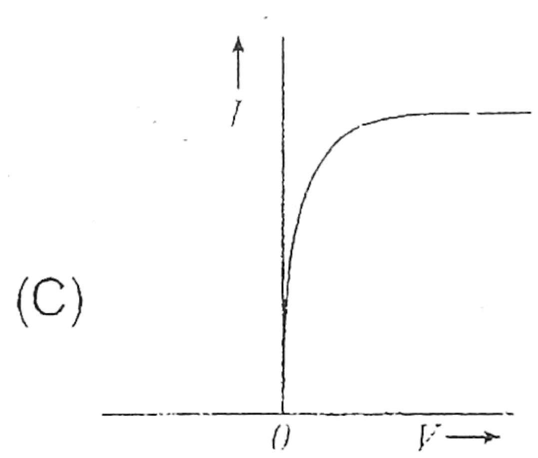
Retarding potential $V_0 = \frac{h}{e}(v - v_0)$

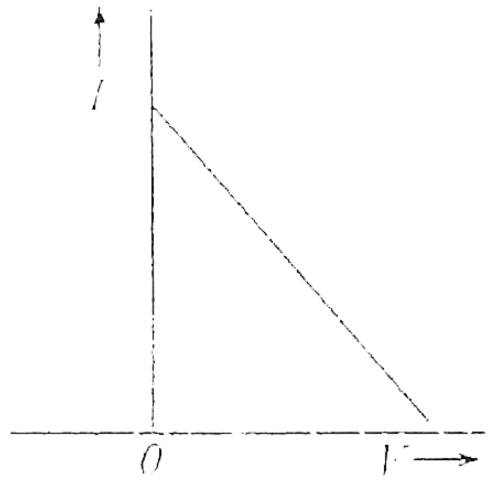
Q-39 - 14530893

Which one of the following graphs in figure shows the variation of photoelectric current (I) with voltage (V) between the electrodes in a photoelectric cell?

(A) 

(B) 

(C) 

(D) 

(D)

CORRECT ANSWER: A

SOLUTION:

Experimental observation.

Watch Video Solution On Doubtnut App

Q-40 - 12015963

Assertion: Light of frequency 1.5 times the threshold frequency is incident on photo-senstive material. If the frequency is halved and intensity is doubled, the photo current remains unchanged.

Reason: The photo electric current varies directely with the intensity of light and frequncy of light.

(A) If both, Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

(B) If both, Assertion and Reason are true but Reason is not a correct explanation of the Assertion.

(C) If Assertion is true but the Reason is false.

(D) If both Assertion and Reason are false.

CORRECT ANSWER: D

SOLUTION:

When incident light is of frequency

$$= \frac{1}{2} \times (1.5v_0)$$
$$= 0.75v_0$$

i.e, less than threshold frequency no photo electric emission takes place. Hence current becomes zero.

Thus, Assertion is wrong. Here Reason is also wrong.

Q-41 - 10060546

Two identical photocathodes receive light of frequency f_1 and f_2 if the velocites of the photo electrons (of mass m) coming out are repectively v_1 and v_2 then

(A) $v_1^2 -$ v_(2) ^(2)= (2h)/(m) (f_(1) - f_(2))`

(B)

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

(C) $v_1^2 +$ v_(2) ^(2)= (2h)/(m) (f_(1) + f_(2))`

(D)

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

CORRECT ANSWER: A

SOLUTION:

For one photocathode

$$hf_1 - W = \frac{1}{2}m\nu_1^2$$.(i)

$$f \text{ or } a \neg herpho$$
$$\rightarrow cathode$$

(hf_(2) - W = (1)/(2) m nu _(2)^(2)

$$.(ii)sobtract$$
$$\in g(ii)om(i)we \geq t$$

(hf_(1) - W) -(hf_(2) - W) = (1)/(2) m nu _(1)^(2) - (1)/(2)m nu _(2)^(2) h(f_(1) - (f_(2) = (m)/(2)(nu _(1)^(2) - nu _(2)^(2)) :. (nu _(1)^(2) - nu _(2)^(2)) = (2b)/(m) (f_(1) - (f_(2))`

Watch Video Solution On Doubtnut App

Q-42 - 11969694

Photoelectric emission is observed from a metallic surface for frequencies v_1 and v_2 of the incident light rays $(v_1 > v_2)$. If the maximum values of kinetic energy of the photoelectrons emitted in the two cases are in the ratio of $1:k$, then the threshold frequency of the metallic surface is

(A) $\frac{v_1 - v_2}{k - 1}$

(B) $\frac{kv_1 - v_2}{k - 1}$

(C) $\frac{kv_2 - v_1}{k - 1}$

(D) $\frac{v_2 - v_1}{k}$

CORRECT ANSWER: B

SOLUTION:

By using $hv - hv_0 = K_{\text{max}}$

$\Rightarrow h(v_1 - v_0) = K_1$ ..(i)

And $h(v_2 - v_0) = K_2$.(ii)

$$\Rightarrow \frac{v_1 - v_0}{v_2 - v_0} = \frac{K_1}{K_2}$$

$$= \frac{1}{K}$$

, Hence $v_0 = \frac{Kv_1 - v_2}{K - 1}$.

Q-43 - 12015888

Photoelectric emission is observed from a metallic surface for frequencies v_1 and v_2 of the incident light. If the maximum value of kinetic energies of the photoelectrons emitted in the two cases are in the ratio $n : 1$ then the threshold frequency of the metallic surface is

(A) $\frac{v_2 - v_1}{n - 1}$

(B) $\frac{nv_2 - v_1}{n - 1}$

(C) $\frac{nv_1 - v_2}{n - 1}$

(D) $\frac{v_2 - v_1}{n}$

CORRECT ANSWER: B

SOLUTION:

$$\frac{E_1}{E_2} = \frac{h(v_1 - v_0)}{h(v_2 - v_0)}$$
$$= \frac{n}{1}$$

On solving, $v_0 = \frac{nv_2 - v_1}{n - 1}$

Q-44 - 13156979

When monochromatic radiation of intensity I falls on a metal surface, the number of photoelectrons and their maximum kinetic are N and T respectively. If the intensity of radiation is 2 I, the number of emitted electrons and their maximum kinetic energy are respectively.

(A) N and 2T

(B) 2N and T

(C) 2N and 2T

(D) N and T

CORRECT ANSWER: B

SOLUTION:

Number of electrons $\propto$ intensity

$K_{\max}$ does not depends on intensity

Q-45 - 17242068

Radiation corresponding to the transition n=4 to n=2 in hydrogen atoms falls on a certain metal (work function=2.5 eV). The maximum kinetic energy of the photo-electrons will be:

(A) 0.55 eV

(B) 2.55 eV

(C) 4.45 eV

(D) None of these

Watch Video Solution On Doubtnut App

Q-46 - 11749584

The wavelength of maximum intensity of emission of solar radiation is $\lambda_m = 4753$ and from moon it is $14mm$. The surface temperature of sun and moon are: (Given $b = 2.898 \times 10^{-3}\text{metre}/\text{Kelvin})$

(A) $6097K, 207K$

(B) $8097K, 307K$

(C) $10000K, 400K$

(D) $3000K, 100K$

CORRECT ANSWER: A

SOLUTION:

Wein's equation

$\lambda_m \cdot T = b$

Which gives , $T_1 = 8097K$ and $T_2 = 207K$.

Q-47 - 10060567

A photocell is illuminated buy asmall bright source places 1 m away when the same source oh light is placed `(1)/(2) m away. The number of electron emitted by photocathode would

(A) increase by a factor of 4

(B) decrease by a factor of 4

(C) increase by a factor of 2

(D) decrease by a factor of 4

CORRECT ANSWER: A

SOLUTION:

1 prop (1)/(r^(2)), (1_(1))/(1_(2)) = ((r_(2))/(r_(1)))^(2) = (1)/(4)I_(2) rarr 4 times I_(1)$When \int esitybecome$4

times

$, noofpho \to e$

$\leq ctronsemiedwo\underline{d}$

$\in creasesby$

4 time`, since number of electrons emitted per second is directly proportional to intensity

Watch Video Solution On Doubtnut App

Q-48 - 11969546

A caesium photocell , with a steady potential difference of $60V$ across , is alluminated by a bright point source of light $50cm$ away. When the same light is placed $1m$ 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

CORRECT ANSWER: A

SOLUTION:

Number of photo electrons

$(N) \propto Intensity$

$$\propto \frac{1}{d^2} \Rightarrow \frac{N_1}{N_2}$$

$$= \left(\frac{d_2}{d_1}\right)^2$$

$$\Rightarrow \frac{N_1}{N_2} = \left(\frac{100}{50}\right)^2$$

$$= \frac{4}{1} \Rightarrow N_2 = \frac{N_1}{4}$$

.

Q-49 - 11969560

The cathode of a photoelectric cell is changed such that the work function changes from $(W_1 \to W_2(W_2 > W_1)$. If the current before and after change are I_1 and I_2, all other conditions remaining unchanged , then (assuming $hv > W_2$)

(A) $I_1 = I_2$

(B) $I_1 < I_2$

(C) $I_1 > I_2$

(D) $I_1 < I_2 < 2I_1$

CORRECT ANSWER: A

SOLUTION:

The work function has no current so long as $hv > W_0$.

The photoelectric current is proportional to the intensity of light . Since there is no change in the intensity of light , therefore $I_1 - I_2$.

Q-50 - 13157002

A beam of light of wavelength λ is incident on a metal having work function ϕ and placed on a metal having work function ϕ and placed in a magnetic field B. The most energetic electrons emitted perpendicular to the field are bent in circular arcs of radius R. Then

(A) $B = \frac{mv}{eR}$, where $\frac{hc}{\lambda} = \phi + \frac{1}{2}mv^2$

(B) $B = \frac{mR}{eV}$, where $\frac{hc}{\lambda} = \phi + \frac{1}{2}mv^2$

(C) $B = \frac{mv}{eR}$, where $\frac{hc}{\lambda} + \phi = \frac{1}{2}mv^2$

(D) none

CORRECT ANSWER: A

SOLUTION:

NA


Apne doubts ka Instant video solution paayein
Abhi Doubtnut try karein!
GET IT ON
Google Play
Whatsapp your doubts on
8400400400
Crop only one question at a time
Illustration 4.32 If √x + √y = 4, then find dx/dy at y = 1.
Sol. Differentiating both sides of the given equation w.r.t.
we get
Forum
Profile
doubtnut