PHYSICS

BOOKS - MTG-WBJEE PHYSICS (HINGLISH)

PARTICLE NATURE OF LIGHT AND WAVE PARTICLE DUALISM

Wb Jee Workout

1. What is the work function of a substance if photoelectrons are just ejected for a monochromatic light of wavelength

$\lambda = 3300$ Å (answer in eV) ?

A. 3.75

B. 3.25

C. 1.36

D. 0.75

Answer: A

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

A. 32.4×10^{11} m/s

B. 18×10^5 m/s

C. 16.2×10^5 m/s

D. 4.02×10^5 m/s

Answer: B

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3. If g_E and g_M are the acceleration due to gravity on the surfaces of the earth and the moon respectively and if Millikan's oil drop experiment could be performed on the two surfaces, one will find the ratio electronic charge on the moon/electronic charge on the earth to be

A. $g\frac{M}{g}E$

B. 1

C. 0

D. $g\frac{E}{g}M$

Answer: B

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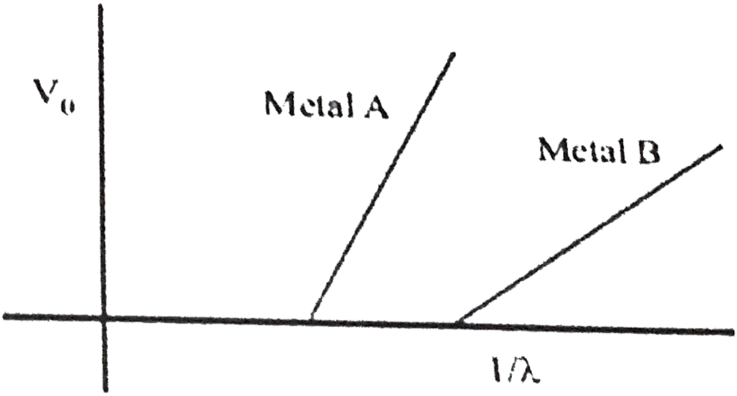
4. In an experiment on photoelectric effect, a student plots stopping potential V_0 against reciprocal of the wavelength λ of the incident light for two different metals A and B. These are shown in the figure



Looking at the graphs, you can most appropriately say that :

A. $V_2 < V_1$

B. $V_1 < V_2 < 2V_1$

C. $V_2 = 2V_1$

D. $V_2 > 2V_1$

Answer: D

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5. when a monochromatic point source of light is at a distance 0.2 m from a photoelectric cell, the saturation current and cut-off voltage are 12.0 mA and 0.5 V. If the same source is placed 0.4 m away from the photoelectric cell, then the saturation current and the stopping potential respectively are

A. 4mA and 1 V

B. 12 mA and 1V

C. 3 mA and 1 V

D. 3 mA and 0.5 V

Answer: D

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6. The photoelectric threshold wavelength for silver is λ_0. The energy of the electron ejected from the surface of silver by an incident wavelength $\lambda(\lambda < \lambda_0)$ will be

A. $hc(\lambda_0 - \lambda_0)$

B. $\dfrac{hc}{\lambda_0 - \lambda}$

C. $\dfrac{h}{c}\left(\dfrac{\lambda_0 - \lambda}{\lambda\lambda_0}\right)$

D. $hc\left(\dfrac{\lambda_0 - \lambda}{\lambda\lambda_0}\right)$

Answer: D

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7. A and B are two metals with threshold frequencies $1.8 \times 10^{14} Hz$ and $2.2 \times 10^{14} Hz$. Two identical photons of energy 0.825 eV each are incident on them. Then, photoelectrons are emitted by (Taking, $h = 6.6 \times 10^{-34} J - s$)

A. B alone

B. A alone

C. neither A nor B

D. both A and B

Answer: B

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8. Monochromatic light of frequency $6 \times 10^{14} Hz$ is produced by a laser. The power emitted is 2×10^{-3} W. The number of photons emitted per second is

$\left(\text{Given h} = 6.63 \times 10^{-34} Js\right)$

A. 6×10^{14}

B. 4×10^{15}

C. 2×10^{16}

D. 1×10^{17}

Answer: C

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9. A photon of energy hυ and momentum $h\upsilon$ /c collides with an electron at rest. After the collision, the scattered electron and the scattered photon each make an angle of 45° with the initial direction of motion. The ratio of frequency of scattered and incident photon is

A. $\sqrt{2}$

B. $\sqrt{2}-2$

C. 2

D. $\frac{1}{\sqrt{2}}$

Answer: D

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10. Consider the four gases hydrogen, oxygen, nitrogen and helium at the same temperature. Arrange them in the increasing order of the de Broglie wavelengths of their molecules.

A. hydrogen, helium, nitrogen, oxygen

B. oxygen, nitrogen, hydrogen, helium

C. oxygen, nitrogen, helium, hydrogen

D. nitrogen, oxygen, helium, hydrogen

Answer: C

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11. An electron and proton have the same de-Broglie wavelength. Then the kinetic energy of the electron is

A. more than that of a proton

B. equal to that of a proton

C. zero

D. less than that of a proton

Answer: A

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12. A metallic surface is irradiated with monochromatic light of variable wavelength. Above a wavelength of 5000Å no photoelectrons are emitted from the surface. With an unknown wavelength, stopping potential fo 3V is necessary ot eliminate the photo current. Find the unknown wavelength.

A. 2262 nm

B. 2272 Å

C. 1240 Å

D. 4524 Å

Answer: B

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13. Electrons with de-Broglie wavelength λ fall on the target in an X-ray tube. The cut-off wavelength of the emitted X-ray is

A. $\lambda_0 = \frac{2mc\lambda^2}{h}$

B. $\lambda_0 = \frac{2h}{mc}$

C. $\lambda_0 = \frac{2m^2c^2\lambda^3}{h^2}$

D. $\lambda_0 = \lambda$

Answer: A

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14. Light described at a place by te equation

$$E = \left(100\frac{V}{m}\right)\left[\sin \times \left(10^{15}s^{-1}t\right) + \sin\left(8 \times 10^{15}s^{-1}t\right)\right]$$

falls on a metal surface having work function 2.0 eV. Calculate the maximum kinetic energy of the photoelectrons.

A. 5.27 eV

B. 31.28 eV

C. 3.28 eV

D. 15.5 eV

Answer: C

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15. Two identical photocathode receive light of frequencies f_1 and f_2. If the maximum velocities of the photoelectrons (of mass m) coming out are respectively v_1 and v_2 then:

A. $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$

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

C. $v_1^2 - v_2^2 = \frac{2h}{m}(f_1 - f_2)$

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

Answer: A

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16. The work function of a certain metal is $\frac{hC}{\lambda_0}$. When a monochromatic light of wavelength $\lambda < \lambda_0$ is incident such that the plate gains a total power P. If the efficiency of photoelectric emission is $\eta\%$ and all the emitted photoelectrons are captured by a hollow conducting sphere of radius R already charged to potential V, then neglecting any interaction of potential of the sphere at time t is:

A. $V + \frac{(100\eta\lambda)Pet}{4\pi\varepsilon_0 Rhc}$

B. $V - \frac{\eta\lambda Pet}{400\pi\varepsilon_0 Rhc}$

C. V

D. $\frac{\lambda \mathrm{pet}}{4\pi\varepsilon_0 \mathrm{Rhc}}$

Answer: B

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17. After absorbing a slowly moving neutrons of mass m_N (momentum ~0) a nucleus of mass M breaks into two nucleii of mass m_1 and $5m_1(6m_1 = M + m_N)$, respectively . If the de-Broglie wavelength of the nucleus with mass m_1 is λ, then de Broglie wavelength of the other nucleus will be

A. 5λ

B. $\lambda/5$

C. λ

D. 25λ

Answer: C

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18. A point source causes photoelectric effect from a small metal plate. Which of the curves in figure 8 may represent the saturation photo-current as a function of the distance between the source and the metal?

A. A

B. B

C. C

D. D

Answer: D

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19. An electron of mass m and charge e initially at rest gets accelerated by a constant electric field E. The rate of change of de-Broglie wavelength of this electron at time t ignoring relativistic effects is

A. $-\frac{h}{eEt^2}$

B. $-\frac{2h}{eEt^2}$

C. $-\frac{3h}{eEt^2}$

D. $-\frac{4h}{eEt^2}$

Answer: A

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20. All electrons ejected from a surface by incident light of wavelength 200nm can be stopped before traveling 1m in the direction of a uniform electric field of $4NC^{-1}$. The work function of the surface is

A. 4e V

B. 3.2 eV

C. 6.2 eV

D. 2.2 eV

Answer: B

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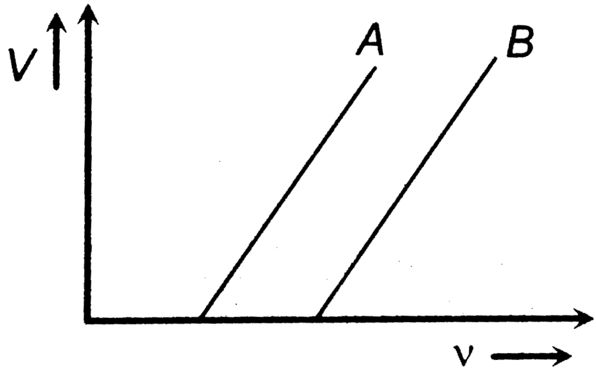
21. The stopping potential as a function of the frequency of the incident radiation is plotted for two different photoelectric surfaces A and B . The graphs show that work function of A is



A. $15.5 eV$

B. $17.8 eV$

C. $20.6 eV$

D. $24.5 eV$

Answer: C

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22. An AIR station is broadcasting the waves of wavelength $300 metres$. If the radiating power of the transmitter is $10 kW$, then the number of photons radiated per second is

A. 1.5×10^{25}

B. 1.5×10^{31}

C. 1.5×10^{33}

D. 1.5×10^{35}

Answer: B

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23. A source S_1 is producing 10^{15} photons/s of wavelength 5000Å Another source S_2 is producing 1.02×10^{15} photons per second of wavelength 5100Å. Then (power ofS_(2))/("power of" S_(1))` is equal to

A. 1

B. 1.1

C. 1.04

D. 0.98

Answer: A

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24. Radiations of frequencies 8×10^{15} Hz and 5×10^{15} Hz are incident one after the another on the same photosensitive surface. If is found that the kinetic energies of the photo electrons emitted from the surface are in the ratio of 2:1 . What is the threshold frequency for the surface ?

A. $1.5 \times 10^{15} Hz$

B. $2 \times 10^{15} Hz$

C. $2.5 \times 10^{15} Hz$

D. 3×10^{15}Hz

Answer: B

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25. The work function of lithium is 2.5 eV. what is the maximum wavelength of light that can cause the photoelectric effect in lithium?

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26. X-rays of frequency u were used to irradiate sodium and copper surfaces in two separate experiments and their stopping potentials were found to be Na and V' cu If the work function of $Cu >$ work function of Na, then

A. $V_{Na} > V_{Cu}$

B. $V_{Na} - V_{Cu}$

C. $V_{Na} < V_{Cu}$

D. $V_{Na}$and V_{Cu} are inversely proportional to ε

Answer: A

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27. There are N_1 photons of frequency v_1, in a beam of light, In another light beam of equal energy there are N_2 photons of frequency v_2. Then N_1 and N_2 are related as

A. $\frac{N_1}{N_2} = 1$

B. $\frac{N_1}{N_2} = \frac{v_1}{v_2}$

C. $\frac{N_1}{N_2} = \frac{v_2}{v_1}$

D. $\frac{N_1}{N_2} = \sqrt{\frac{v_2}{v_1}}$

Answer: C

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28. A dust particle of mass 2 mg is carried with a velocity of 100 cm/s. What is the de Broglie wavelength associated with the dust particle? $(h = 6.64 \times 10^{-34} J - s)$

A. 3.32×10^{-31} m

B. 6.64×10^{-30} m

C. 3.32×10^{-34} m

D. 3.32×10^{-28} m

Answer: D

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29. When the mkomentum of a proton is changed by an amount p_0, the corresponding change in the de-Broglie wavelength is found to be $0.25\,\%$. Then, the original momentum of the proton was

A. $400P_0$

B. P_0

C. $4P_0$

D. $100P_0$

Answer: A

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30. The de Broglie wavelength of an electron moving with a velocity c/2 (c=velocity of light in vacuum) is equal to the wavelength of a photon. The ratio of the kinetic energies of electron and photon is

A. $1:4$

B. $1:2$

C. $1:1$

D. $2:1$

Answer: A

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31. When a certain metal surface is illuminated wth light of frequency v, the stopping potential for photoelectric current is V_0. When the same surface is illumiinated by light of frequency $\frac{v}{2}$, the stopping potential is $\frac{V_0}{4}$. The threshold frequency ofr photoelectric emissiohn id

A. $\frac{\varepsilon}{6}$

B. $\frac{\varepsilon}{3}$

C. $\frac{2\varepsilon}{3}$

D. $\frac{4\varepsilon}{3}$

Answer: B

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32. Photoelectric effect experiments are performed using three different metal plates p, q and r having work function $\phi_p = 2.0eV$, $\phi_e = 2.5eV$ and $\phi_r = 3.0eV$ respectively A light beam containing wavelength of $550nm$, $450nm$ and $350nm$ with equal intensities illuminates each of the plates . The correct $I-V$ graph for the experiment is [Take hc = 1240 eV nm]

A.

B.

C.

D.

Answer: A

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33. A beam of 450 nm light is incident on a metal having work function 2eV and placed in a magnetic field

B. If the most energetic electrons emitted are bent into circular are of radius 0.2 m, find B.

A. 2.36×10^{-4}T

B. 1.46×10^{-5} T

C. $6.9 \times 10^{-5} T$

D. $9.2 \times 10^{-6} T$

Answer: B

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34. Figure represents a graph of kinetic energy of most energetc photoelectrons, $K_{\max}$ (in eV), and frequency

(ε) for a metal used as cathode in

Photoelectric experiment , The threshold frequency of light for the photoelectric emission from the metal is

A. 1×10^{14} Hz

B. 1.5×10^{14} Hz

C. $3.1 \times 10^{14} Hz$

D. 2.7×10^{14}Hz

Answer: D

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35. Radiation from a hydrogen discharge discharge tube is incident on the cathode ofa photocell having energy 3.4 eV .The work function of the cathode suface is 3.2 eV. To reduce the photocurrent to zero, the voltage (in volts) of th anode realtive to the cathode must be made

A. $+0.2$

B. $+3.2$

C. $+10.4$

D. $+13.6$

Answer: A

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

A. γ rays

B. X-rays

C. ultaviolet rays

D. microwaves

Answer: B

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37. When light of wavelength λ is incident on a metal surface, stopping potential is found to be x. When light of wavelength nλ is incident on the same metal surface, stopping potential is found to be $\frac{x}{n+1}$. Find the threshold wavelength of the metal.

A. $\frac{n}{\lambda}$

B. $\frac{n^2}{\lambda}$

C. $n\lambda$

D. $n^2\lambda$

Answer: D

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38. In an experiment on photoelctric effect, light of wavelength $800nm$ (less than threshold wavelength) is incident on a cessium plate at the rate of $5.0W$. The potential of the collector plate is made sufficiently positive with respect to the emitter so that the current reaches its saturation value. Assuming that on the average one of every 10^6 photons is able to eject a photoelectron, find photo current in the circuit.

A. $1.6\mu A$

B. $6.4\mu A$

C. $3.2\mu A$

D. $1.2\mu A$

Answer: C

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39. A silver of radius $1cm$ and work function $4.7eV$ is suspended from an insulating thread in freepace. It is under continuous illumination of $200nm$ wavelength light. As photoelectron are emitted the sphere gas charged and acquired a potential . The maximum number of photoelectron emitted from the sphere is $A \times 10^{e}(where 1 < A < 10)$ The value of z is

A. 2

B. 4

C. 6

D. 7

Answer: D

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40. A monochromatic light of frequency f is incident on two identical metal spheres of threshold frequency $\frac{f}{2}$ and $\frac{f}{3}$ respectively. After some time, emission of photoelectron will stop on both spheres . Now both metal spheres are connected through wire. (radius of spherhes is R) (a)What will be potential of spheres now ?

(b)how many electron will flow through wire ?

A. $\frac{7hf}{12e}$

B. $\frac{9hf}{12e}$

C. $\frac{29hf}{12e}$

D. $\frac{31hf}{12e}$

Answer: A

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41. A silver ball of radius 4.8 cn is suspended by a thread in a cacuum chamber, Ultraviolet light of wavelength 200nm is incident on the ball for some time during which a total light energy of $1.0 \times (10^{-7})$ J falls on the surface. Assuming that on the average one photon out of every ten thousand is able to eject a photoelectron, find the electric potential at the surface of the ball assuming zero potential at infinity. What is the potential at the centre of the ball?

A. 0.3

B. 3

C. 30

D. 0.03

Answer: A

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42. A hydrogen atom moving at a speed v absorbs a photon of wavelength 122 nm and stops. The value of v is (mass of hydrogen atom $= 1.67 \times 10^{-27}$ kg)

A. $6.15ms^{-1}$

B. $5.45ms^{-1}$

C. $2.95ms^{-1}$

D. $3.25ms^{-1}$

Answer: D

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43. In a photoelectric experiment it was found that the stopping potential decreases from 1.85 V to 0.82 V as the wavelength of the incident light is varied from 300 nm to 400 nm. Calculate the value of the Planck constant from these data.

A. 4.12×10^{-15} eVs

B. $2.5 \times 10^{10} eVs$

C. 5.2×10^{-15} eVs

D. 7.5×10^{-8} eVs

Answer: A

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44. A metal surface is illuminated by light of two different wavelengths 248 nm and 310 nm. The maximum speeds of the photoelectrons corresponding to these wavelengths are μ_1 and μ_2 respectively. If the ratio $u_1 : u_2 = 2:1$ and $hc = 1240 eV$, the work function of the metal is nearly.

(a)3.7 eV (b) 3.2 eV

(c) 2.8eV (d) 2.5eV.

A. 3.7 eV

B. 3.2 eV

C. 3.8 eV

D. 2.5 eV

Answer: A

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45. An image of the sun is formed by a lens, of the focal length of 30 cm, on the metal surface of a photoelectric cell and a photoelectric current I is produced. The lens forming the image is then replaced by another of the same diameter but of focal length 15 cm. The photoelectric current in this case is

A. $4I$

B. $2I$

C. $\frac{I}{2}$

D. I

Answer: A

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46. The maximum kinetic energy of the emitted photoelectrons against frequency ε of incident radiation is plotted as shown in figure. This graph help us in determining the following physical quantities

A. Work function of the cathode-metal

B. Threshold frequency

C. Planck's constant

D. Charge on an electron

Answer: A::B::C

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47. When a point light source, of power W, emitting monochromatic light of wavelength λ is kept at a distance a from a small photosensitive surface of work function ϕ and area S. Then

A. Number of photons striking the surface per unit time as $W\lambda S / 4\pi hca^2$

B. The maximum energy of the emitted photoelectrons as $\left(\frac{1}{\lambda}\right)(hc - \lambda\phi)$

C. The maximum potential needed to stop the most enegetic emitted photoelectrons as $(e/\lambda)(hc - \lambda\phi)$

D. Photo-emission only if λ lies in the range $0 \leq \lambda \leq (hc/\phi)$

Answer: A::B::D

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48. A photon collides with a stationary hydrogen atom in ground state inelastically. Energy of the colliding photon is 10.2 eV. After a time interval of the order of micro second another photon collides with same hydrogen atom inelastically with an energy of 15eV. What wil be observed by the detector?

(a) 2 photons of energy 10.2 eV

(b) 2 photons of energy 1.4 eV

(c) One photon of energy 10.2 eV and an electron of energy 1.4 eV

(d) One photon of energy 10.2 eV and another photon of energy 1.4 eV

A. One photon of energy 10.2 eV and an electron of energy 1.4 eV

B. Two photons of energy 1.4 eV

C. Two photons of energy 10.2 eV

D. One photon of energy 10.2 eV and another photon of 1.4 eV

Answer: B

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49. An electron in hydrogen atom first jumps from second excited state to first excited state and then from first excited state to ground state. Let the ratio of wavelength, momentum and energy of photons emitted in these two cases be a, b and c respectively, Then

A. $c = 1/a$

B. $a = 9/4$

C. $b = 5/27$

D. $c = 5/27$

Answer: A::C::D

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50. Photoelectric effect supports quantum nature of light because

(a) there is a minimum frequency of light below which no photo electrons are emitted

(b) the maximum kinetic energy of photo electrons depends only on the frequency of light and not on its intensity

(c) even when the metal surface is faintly illuminated, the photo electrons leave the surface immediately

(d) electric charge of the photo electrons is quantised

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Answer: A::B::C

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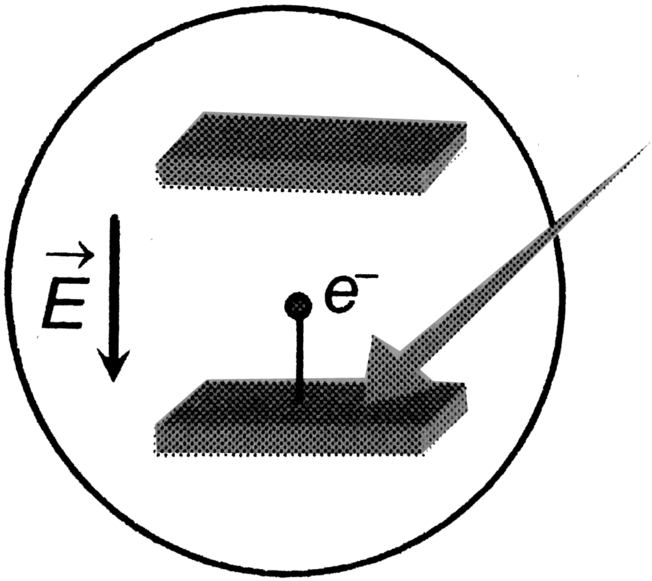
51. The collector plate in an experiment on photoelectric effect is kept vertically above the emitter plate . Light source is put on and a saturation photo current is recorded . An electric field is switched on which has a vertically downward direction . Then



A. the photoelectric current will increase

B. the kinetic energy of the electrons will increase

C. the threshold wavelength will increase

D. the stopping potential will decrease

Answer: B

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52. The graph between the stopping potential (V_0) and $\left(\frac{1}{\lambda}\right)$ is shown in the figure ϕ_1 , ϕ_2 and ϕ_3 are work functions. Which of the following is/are correct?

A. $\phi_1 : \phi_2 : \phi_3 = 1 : 2 : 4$

B. $\phi_1 : \phi_2 : \phi_3 = 4 : 2 : 1$

C. tan θ directly proportional $\frac{hc}{e}$, where h is Planck's constant and c is the speed of light

D. Ultra violet light can be used to emit photoelectrons from metal 2 and metal 3 only.

Answer: A::C

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53. The work function of a metal is $4.0eV$. If the metal is irradiated with radiation of wavelength 200 nm, then the maximum kinetic energy of the photoelectrons would be about.

A. $1:2$

B. $1:3$

C. $1:4$

D. $2:1$

Answer: A

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54. A proton has kinetic energy E = 100 keV which is equal to that of a photon. The wavelength of photon is λ_2 and that of proton is λ_1. The ratio of λ_2 / λ_1 is proportional to

A. E^2

B. $E^{1/2}$

C. E^{-1}

D. $E^{-1/2}$

Answer: D

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55. When the intensity of a light source is increased

A. the number of photons emitted by the source in unit time increases

B. the total energy of the photons emitted per unit time increases

C. more energetic photons are emitted

D. faster photons are emitted

Answer: A::B::D

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Wb Jee Previous Years Questions

1. The de Brogile wavelength of an electron (mass $= 1 \times 10^{-30}$ kg, charge $= 1.6 \times 10^{-19} C)$ with a kinetic energy of 200 eV is (Planck's constant $= 6.6 \times 10^{-34} Js$)

A. 9.60×10^{-11} m

B. 8.25×10^{-11} m

C. 6.25×10^{-11} m

D. 5.00×10^{-11} m

Answer: B

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2. The energy of gamma (γ) ray photon is E_γ and that of an X-rays photon is E_X. If the visible light photon has an energy of E_v, then we can say that

A. $E_x > E_\gamma > E_v$

B. $E_\gamma > E_v > E_x$

C. $E_\gamma > E_x > E_v$

D. $E_x > E_v > E_\gamma$

Answer: C

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3. The work function of a metal is in the range of 2 eV to 5 eV. Find which of the following wavelength of light cannot be used for photoelectric effect. (Consider, Planck's constant $= 4 \times 10^{-15}$ eV - s, velocity of light $= 3 \times 10^{8} ms^{-1}$)

A. 510 nm

B. 650 nm

C. 400 nm

D. 570 nm

Answer: B

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4. The potential difference V required for accelerating an electron to have the de-Broglie wavelength of 1Å is

A. 100 V

B. 125 V

C. 150 V

D. 200 V

Answer: C

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5. The work function of cesium is 2.27 eV. The cut-off voltage wich stops the emission of electrons from a cesium cathode irradiated with light of 600 nm wavelength is

A. 0.5 V

B. $-0.2V$

C. $-0.5V$

D. $0.2V$

Answer:

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6. When light of frequency v_1 incident on a metal with work function W_0 (where $hv_1 > W_0$), the photocurrent falls to zero at a stopping potential of V_1. If the frequency of light is increased to v_2, the stopping potential changes to V_2. Therefore, the charge of an electron is given by

A. $\dfrac{W(v_2 + v_1)}{v_1 V_2 + v_1 V_1}$

B. $\dfrac{W(v_2 + v_1)}{v_1 V_1 + v_2 V_2}$

C. $\dfrac{W(v_2 - v_1)}{v_1 V_2 - v_2 V_1}$

D. $\dfrac{W(v_2 - v_1)}{v_1 V_2 - v_1 V_1}$

Answer: C

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7. The de-Broglie wavelength of an electron is 0.4×10^{-10} m when its kinetic energy is 1.0 keV. Its wavelength will be 1.0×10^{-10}m, When its kinetic energy is

A. 0.2 keV

B. 0.8 keV

C. 0.63 keV

D. 0.16 keV

Answer: D

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8. An electron accelerated through a potential of 10,000 V from rest has a de-Broglie wavelength λ. What should be the accelerating potential so that the wavelength is doubled?

A. 20,000 V

B. 40,000 V

C. 5,000 V

D. 2,500 V

Answer: D

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9. A proton and an electron initially at rest are accelerated by the same potential difference. Assuming that a proton is 2000 times heavier than an electron, what will be the relation between the de Broglie wavelength of the proton (λ_p) and that of electron (λ_e)

A. $\lambda_p = 2000\lambda_e$

B. $\lambda_p = \frac{\lambda_e}{2000}$

C. $\lambda_p = 20\sqrt{5}\lambda_e$

D. $\lambda_p = \frac{\lambda_e}{20\sqrt{5}}$

Answer: D

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10. The stopping potential for photoelectrons from a metal surface is V_1 when monochromatic light of frequency υ_1 is incident on it. The stopping potential becomes V_2 when monochromatic light of another frequency is incident on the same metal surface. If h be the Planck's constant and e be the charge of an electron, then the frequency of light in the second case is:

A. $\upsilon_1 \frac{e}{h}(V_2 + V_1)$

B. $\upsilon + \frac{e}{h}(V_1 + V_1)$

C. $\upsilon_1 - \frac{e}{h}(V_2 - V_1)$

D. $\upsilon_1 + \frac{e}{h}(V_2 - V_1)$

Answer: D

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11. The de-Broglie wavelength of an electron is the same as that of a 50 ke X-ray photon. The ratio of the energy of the photon to the kinetic energy of the electron is (the energy equivalent of electron mass of 0.5 MeV)

A. $1:50$

B. $1:20$

C. $20:1$

D. $50:1$

Answer: C

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12. Select correct statement(s) about photoelectric effect.

A. There is no significant time delay between the absorption of a suitable radiation and the emission of electrons.

B. Einstein analysis gives a threshold frequency above which no electron can be einitted

C. The maximum kinetic energy of the emitted photoelectrons is proportional to the frequency of incident radiation.

D. The maximuin kinetic energy of electrons does not depend on the intensity of radiation.

Answer: A::D

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13. In which of the following situations, the heavier of the two particles has smaller de broglie wavelength ? The two particle

A. Both have a free fall through the same height

B. Both move with the same kinetic energy

C. Both move with the same linear momentum

D. Both move with the same speed

Answer: A::B::D

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14. The distance between a light source and photoelectric cell is d. If the distance is decreased to $\frac{d}{2}$ then

A. The emission of electron per second will be four times.

B. Maximum kinetic energy of photoelectrons will be four times.

C. Stopping potential will remain same

D. The emission of electrons per second will be doubled

Answer: A::C

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15. Electrons are emitted with kinetic energy T from a metal plate by an irradiation of light of intensity J and frequency υ Then which of the following will be true?

A. $T \propto J$

B. T linearly increasing with υ

C. $T \propto$ time of irradiation

D. Number of electrons emitted $\propto$ J

Answer: B::D

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