PHYSICS

BOOKS - MTG GUIDE

DUAL NATURE OF MATTER AND RADIATION

Illustration

1. A beam of light has three wavelengths 4144Å, 4972Å and 6216Å with a total instensity of $3.6 \times 10^{-3} Wm^{-2}$ equally distributed amongst the three wavelengths. The beam falls normally on an area $1.0 cm^2$ of a clean metallic surface of work function 2.3 eV. Assume that there is no loss of light by reflection and that each energetically capable photon

ejects on electron. Calculate the number of photo electrons liberated in two seconds.

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2. The work function of cesium metal is 2.14 eV .When light of frequency 6×10^{14} Hz is incident on the metal surface.phtoemission of electrons occurs. What is the :

(a) maximum kinetic energy of the emitted electrons,

(b) stopping potential , and

(c) maximum speed of the emitted photo - electrons ?

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3. The sun gives light at the rate of $1400 W m^{-2}$ of area perpendicular to the direction of light. Assume $\lambda(sunlight) = 6000 A$. Calculate

A.the number of photons per second arriving at $1 m^2$ area at earth.

B. the number of photons emitted from the sun per second assuming the average radius of the Earth's orbit is 1.49×10^{11} m.

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Neet Cafe Topicwise Practice Questions Photoelectric Effect And Einstein S Photoelectric Equation

1. The work function for tungsten and sodium are $4.5eV$ and $2.3eV$ respectively . If the threshold wavelength λ for sodium is $5460Å$, the value of λ for tungsten is

A. $528Å$

B. $2791Å$

C. $5893Å$

D. $10683Å$

Answer: B

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2. If in a photoelectric cell , the wavelength of incident light is changed from 4000 Å to 3000 Å then change in stopping

potential will be

A. 0.66 V

B. 1.03V

C. 0.33 V

D. 0.49 V

Answer: B

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3. Ultraviolet beam of wavelength 280 nm is incident on lithium surface of work function 2.5 eV. The maximum velocity of electron emitted from metal surface is

A. $8.2 \times 10^5 m/s$

B. $10^6 m/s$

C. $7 \times 10^5 m/s$

D. $6 \times 10^5 m/s$

Answer: A

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4. When the electromagnetic radiations of frequencies $4 \times 10^{15} Hz$ and $6 \times 10^{15} Hz$ fall on the same metal, in different experiments, the ratio of maximum kinetic energy of electrons liberated is $1:3$. The threshold frequency for the metal is

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

B. $1 \times 10^{15} Hz$

C. $3 \times 10^{15} Hz$

D. $1.67 \times 10^{15} Hz$

Answer: C

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5. If K_1 and K_2 are maximum kinetic energies of photoelectrons emitted when light of wavelength λ_1 and λ_2 respectively are incident on a metallic surface. If $\lambda_1 = 3\lambda_2$ then

A. $K_1 > (K_2/3)$

B. $K_1 < (K_2/3)$

C. $K_1 = 3K_2$

D. $K_2 = 3K_1$

Answer: B

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6. Calculate the velocity of a photo-electron, if the work function of the target material is 1.24 eV and the wavelength of incident light is 4360Å. What retarding potential is necessary to stop the emission of the electrons?

A. 1.6 V

B. 1.2 V

C. 2.8 V

D. 13.2 V

Answer: A

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7. A metallic surface is irradiated by a monochromatic light of frequency v_1 and stopping potential is found to be V_1. If the light of frequency v_2 irradiates the surface, the stopping potential will be

A. $V_1 + \frac{h}{e}(v_1 + v_2)$

B. $V_1 + \frac{h}{e}(v_2 + v_1)$

C. $V_1 + \frac{h}{e}(v_2 - v_1)$

D. $V_1 - \frac{h}{e}(v_1 + v_2)$

Answer: B

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8. Light rays of wavelength $6000A^\circ$ and of photon intensity $39.6Wm^{-2}$ is incident on a metal surface. If only one percent of photons incident on the surface of electrons emitted per second unit area from the surface will be [Planck constant $=6.64 \times 10^{-34}J - S$,Velocity of light $= 3 \times 10^8 ms^{-1}$]

A. 12×10^{18}

B. 10×10^{18}

C. 12×10^7

D. 12×10^{16}

Answer: C

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9. A surface irradiated with light $\lambda = 480nm$ gives out electrons with maximum velocity v ms^{-1}, the cut off wavelength being 600 nm. The same surface would release electrons with maximum velocity $2vms^{-1}$ if it is irradiated by light of wavelength.

A. 325 nm

B. 360 nm

C. 384 nm

D. 300 nm

Answer: D

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10. 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 of 0.825 eV each are incident on them. Then photoelectrons are emitted in take $h = 6.6 \times 10^{-34} J/s$

A. B alone

B. A alone

C. neither A nor B

D. both A and B

Answer: B

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11. The figure shows stopping potential V_s and frequency υ for two different metallic surfaces A and B. The work function of A , as compared to that of B is

A. less

B. more

C. equal

D. nothing can be said

Answer: A

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12. In a photoelectric experiment , thte graph of frequency v of incident light (in Hz) and stopping potential V (in V) is as shown in the figure. From figure , the value of the Planck's constant is (e is the elementary charge)

A. $e\frac{ab}{cb}$

B. $e\frac{cb}{ab}$

C. $e\frac{ac}{bc}$

D. $e\frac{ac}{ab}$

Answer: A

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13. The phenomenon which is just opposite (reverse) to the photoelectric effect is

A. Compton effect

B. Raman effect

C. pair production

D. Production of X - rays

Answer: D

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14. For certain metal incident frequency ν is five times threshold frequency ν_0 and the maximum velocity of the photoelectrons is $8 \times 10^6 ms^{-1}$. If incident photon frequency is $2\nu_0$, the maximum velocity of photoelectrons will be

A. $4 \times 10^6 ms^{-1}$

B. $6 \times 10^6 ms^{-1}$

C. $8 \times 10^6 ms^{-1}$

D. $1 \times 10^6 ms^{-1}$

Answer: A

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15. An ultraviolet light of wavelength 2000 Å irradiates a photo cell made of molybdenum metal . If the stopping potential is -1.5V , what is the work function of the metal ?

A. $2.5 \times 10^{-19} J$

B. $5.0 \times 10^{-19} J$

C. $7.5 \times 10^{-19} J$

D. $1 \times 10^{-18} J$

Answer: C

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16. 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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17. When radiation of wavelength λ is incident on a metallic surface , the stopping potential is 4.8volts . If the same surface is illuminated with radiation of double the wavelength , then the stopping potential becomes 1.6volts. Then the threshold wavelength for the surface is

A. 2λ

B. 4λ

C. 6λ

D. 8λ

Answer: B

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18. The figure shows the variation of photocurrent with anode potential for a photo - sensitive surface for three different radiations . Let I_a, I_b and I_c be the intensities and v_a, v_b and v_c be the frequencies for the curves a, b and c respectively . Then

A. $v_a = v_b$ and $I_a \neq I_b$

B. $v_a = v_c$ and $I_a = I_c$

C. $v_a = v_b$ and $I_a = I_b$

D. $v_b = v_c$ and $I_b = I_c$

Answer: A

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19. The work function of a substance is 4.0 eV. The longest wavelength of light that can cause photoelectron emission from this substance is approximately equal to

A. 540 nm

B. 400 nm

C. 310 nm

D. 220 nm

Answer: C

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20. Figure represents a graph of kinetic energy of most energetic photoelectrons $K_{\max}$ (in eV) and frequency υ for

a metal used as cathode in photoelectric experiment . The threshold frequency of light for the photoelectric emission from the metal is

A. $1 \times 10^{14} Hz$

B. $1.5 \times 10^{14} Hz$

C. $2.1 \times 10^{14} Hz$

D. $2.7 \times 10^{14} Hz$

Answer: D

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21. Two photons of energies twice and thrice the work function of a metal are incident on the metal surface. Then the ratio of maximum velocity of the photoelectrons emitted in the two cases respectively, is

A. $\sqrt{2}:1$

B. $\sqrt{3}:3$

C. $\sqrt{3}:\sqrt{3}$

D. $1:\sqrt{2}$

Answer: D

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22. One milliwatt of light of wavelength 4560 A is incident on a cesium surface. Calculate the photoelectric current liberated assuming a quantum efficiency of 0.5 %. Given Planck's constant $h = 6.62 \times 10^{-34} J - s$ and velocity of light $c = 3 \times 10^{8} m s^{-1}$.

A. $1.836 \times 10^{-6} A$

B. $1.836 \times 10^{-7} A$

C. $1.836 \times 10^{-5} A$

D. $1.836 \times 10^{-4} A$

Answer: A

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23. if e/m of electron is $1.76 \times 10^{11} C(kg)^{-1}$ andn stopping potential is 0.71 V, then the maximum velocity of the photoelectron is

A. $150 kms^{-1}$

B. $200 kms^{-1}$

C. $500 kms^{-1}$

D. $250 kms^{-1}$

Answer: C

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24. In a photoelectric experiment, if both the intensity and frequency of the incident light are doubled, then the

saturation photoelectric current

A. remains constant

B. is halved

C. is doubled

D. becomes four times

Answer: C

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25. Work function of potassium metal is 2.30 eV . When light of frequency 8×10^{14} Hz is incident on the metal surface, photoemission of electrons occurs. The stopping potential of the electrons will be equal to

A. 0.1 V

B. 1.0 V

C. 2.3 V

D. 3.3 V

Answer: B

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26. What is the work function of a substance if photoelectrons are just ejected for a monochromatic light of wavelength $\lambda = 3300\text{Å}$ (answer in eV) ?

A. 3.75

B. 3.25

C. 1.63

D. 0.75

Answer: A

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27. 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. $hc(\lambda_0 - \lambda)$

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

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

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

Answer: D

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28. According to Einstein's photoelectric equation, the plot of the maximum kinetic energy of the emitted photoelectrons from a metal versus frequency of the incident radiation gives a straight line whose slope

A. depends on the intensity of the incident radiation.

B. depends on the nature of the metal and also on the intensity of incident radiation.

C. is same for all metals and independent of the intensity of the incident radiation.

D. depends on the nature of the metal.

Answer: C

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29. Which of the following statements is correct regarding the photoelectric experiment ?

A. The photocurrent increases with increase in intensity of incident light

B. Stopping potential increases with increase in intensity of incident light,

C. The photocurrent increases with increase in frequency.

D. All of the above.

Answer: A

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30. The photoelectric work function for a metal surface is $4.125eV$. The cut - off wavelength for this surface is

A. $4500Å$

B. $1700Å$

C. $2800Å$

D. $3000Å$

Answer: D

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31. The photoelectric threshold frequency of a metal is v. When light of frequency 4v is incident on the metal . The maximum kinetic energy of the emitted photoelectrons is

A. $4hv$

B. $3hv$

C. $5hv$

D. $\frac{5hv}{2}$

Answer: B

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32. Light of frequency 10^{15} Hz falls on a metal surface of work function 2.5 eV. The stopping potential of photoelectrons in volts is

A. 1.6

B. 2.5

C. 4.1

D. 6.6

Answer: A

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33. Light of wavelength λ falls on metal having work functions hc/λ_0 . Photoelectric effect will take place only if

:

A. $\lambda \geq \lambda_0$

B. $\lambda \geq 2\lambda_0$

C. $\lambda \leq \lambda_0$

D. $\lambda = 4\lambda_0$

Answer: C

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34. Light of frequency v falls on meterial of threshold frequency v_0. Maximum kinetic energy of emitted electron is proportional to

A. $v - v_0$

B. v

C. $\sqrt{v - v_0}$

D. v_0

Answer: A

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35. 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. 5

B. 7

C. 8

D. 10

Answer: B

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36. The mass of a photoelectron is

A. $9.1 \times 10^{-27} kg$

B. $9.1 \times 10^{-29} kg$

C. $9.1 \times 10^{-31} kg$

D. $9.1 \times 10^{-34} kg$

Answer: C

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37. 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. $\frac{v}{6}$

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

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

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

Answer: B

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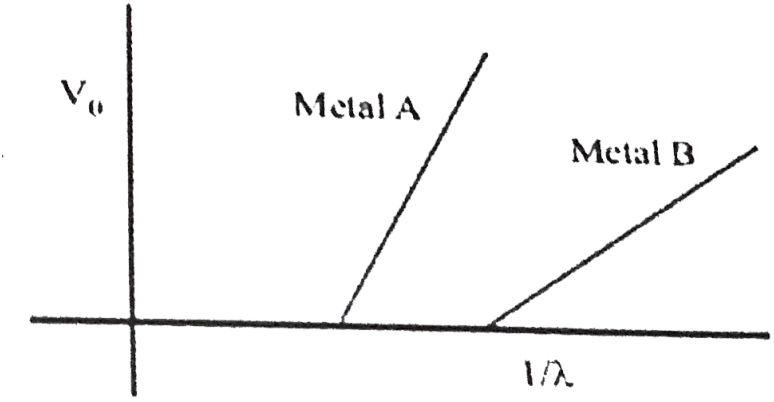
38. In an experiment on photoelectric effect, a student plots stopping potential V_0 against reciprocal of the wavelength λ of the incident light for two different metals A and B. These are shown in the figure



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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39. The maximum kinetic energy of emitted electrons in a photoelectric effect does not depend upon

A. Intensity

B. Work function

C. Wavelength

D. Frequency

Answer: A

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40. The graphs show the variation of current I (y-axis) in two photocell A and B as a function of the applied voltage V(x-axis) when light is incident on the cell. Which of the following is the correct conclusion drawn from the data?

A. Cathodes of the two cells are made from the same substance, the intensity of light used are different

B. Cathodes are made from different substances and the intensity of light is the same.

C. Cathode substances as well as intensity of light are different.

D. No conclusion can be drawn.

Answer: A

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41. Two identical photocathodes receive light of frequencies v_1 and v_2. If the velocities of the photoelectrons (of mass

m) coming out are respectively v_1 and v_2. then

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

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

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

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

Answer: A

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42. The time taken by a photoelectron to come out after the photon strikes is approximately

A. $10^{-1}s$

B. $10^{-4}s$

C. $10^{-10}s$

D. $10^{-16}s$

Answer: C

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Neet Cafe Topicwise Practice Questions Particle Nature Of Light The Photon

1. The number of photons of wavelength $540nm$ emitted per second by an electric bulb of power $100W$ is (taking $h = 6 \times 10^{-34}$ sec)

A. 100

B. 1000

C. 3×10^{20}

D. 3×10^{10}

Answer: B

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2. A small plate of a metal is placed at a distance of 2m from a monochromatic light source of wavelenght $4.8 \times 10^{-7} m$ and power 1.0 Watt. The light falls normally on the plate. Find the number of photons striking the metal plate per square metre per second.

A. 9.65×10^{18}

B. 9.65×10^{17}

C. 9.65×10^{16}

D. 9.65×10^{15}

Answer: A

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3. Which of the following pheniomeana exhibits particle nature of light ?

A. Photoelectric effect

B. Interference

C. Refraction

D. Polarization

Answer: A

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4. Photon of frequency v has a momentum associated with it. If c is the velocity of light, the momentum is:

A. $\frac{hv}{c}$

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

C. hvc

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

Answer: A

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5. The idea of the quantum nature of light has emerged in an attempt to explain

A. Photoelectric effect

B. black body radiation

C. thermionic emission

D. atomic spectra

Answer: B

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6. The minimum intensity of light to be detected by human eye is $10^{-10} W/m^2$. The number of photons of wavelength $5.6 \times 10^{-7} m$ entering the eye , with pupil area $10^{-6} m^2$, per second for vision will be nearly

A. 3×10^2

B. 3×10^3

C. 3×10^4

D. 3×10^5

Answer: A

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7. What is the momentum of a photon having frequency $1.5 \times 10^{13} Hz$?

A. $3.3 \times 10^{-29} kgm/s$

B. $3.3 \times 10^{-34} kgm/s$

C. $6.6 \times 10^{-34} kgm/s$

D. $6.6 \times 10^{-32} kgm/s$

Answer: A

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8. The rest mass of a photon of wavelength λ is

A. $\frac{hv}{c}$

B. $\frac{hv}{c^2}$

C. $\frac{hv}{\lambda}$

D. zero

Answer: D

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9. Wavelength of a $1keV$ photon is $1.24 \times 10^{-9}m$. What is the frequency of $1MeV$ photon ?

A. $1.24 \times 10^{15}Hz$

B. $2.4 \times 10^{20}Hz$

C. $1.24 \times 10^{18}Hz$

D. $2.4 \times 10^{24}Hz$

Answer: B

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10. A monochromatic source of light emits photons of frequency $6 \times 10^{14} Hz$. The power emitted by the source is 8 x 10^(-3)W. Calculate the number of photons emitted per second. (Take $h = 6.63 \times 10^{-34} Js$)

A. 6×10^{14}

B. 4×10^{15}

C. 2×10^{16}

D. 1×10^{17}

Answer: C

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11. The linear momentum of a 3 MeV photon is

A. 0.01 eV s/m

B. 0.02 eV s/m

C. 0.03 eV s/m

D. 0.04 eV s/m

Answer: A

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12. The energy of a photon of wavelength 390 nm is nearly

A. 6.6 eV

B. 3.2 eV

C. 5.5 eV

D. 1.2 eV

Answer: B

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13. According to photon theory of light which of the following physical quantities associated with a photon do not/does not change as it collides with an electron in vacuum

A. Speed and momentum

B. Speed only

C. Energy and momentum

D. Energy only

Answer: A

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14. If h is Plank's constant. Find the momentum of a photon of wavelength 0.01Å.

A. $10^{-2}h$

B. h

C. $10^{2}h$

D. $10^{12}h$

Answer: D

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15. n' photons of wavelength $'\lambda'$ are absorbed by a black body of mass 'm'. The momentum gained by the body is

A. $\frac{h}{m\lambda}$

B. $\frac{mnh}{\lambda}$

C. $\frac{nh}{m\lambda}$

D. $\frac{nh}{\lambda}$

Answer: D

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16. Photons cannot escape from the surface of a

A. white dwarf

B. red giant

C. pulsar

D. black hole

Answer: D

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17. A photon of wavelength $4400Å$ is passing through vaccum. The effective mass and momentum of the photon are respectively

A. $5 \times 10^{-36} kg$, $1.5 \times 10^{-27} kg$ m/s

B. $5 \times 10^{-35} kg$, $1.5 \times 10^{-26} kg$ m/s

C. zero, 1.5×10^{-26} kg m/s

D. $5 \times 10^{-36} kg$, $1.67 \times 10^{-43} kgm/s$

Answer: A

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Neet Cafe Topicwise Practice Questions Matter Waves And De Broglie Relation

1. Protons and α-particles have the same de Broglie wavelength. What is same for both of them?

A. Time period

B. Energy

C. Frequency

D. Momentum

Answer: D

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2. When the velocity of an electron increases, its de Broglie wavelength

A. increases

B. decrease

C. remains same

D. may increase or decrease

Answer: B

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3. The ratio of de - Broglie wavelength of α- particle to that of a proton being subjected to the same magnetic field so that the radii of their path are equal to each other assuming the field induction vector $\overrightarrow{B}$ is perpendicular to the velocity vectors of the α - particle and the proton is

A. 1

B. $1/4$

C. $1/2$

D. 2

Answer: C

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4. The speed of an electron having a wavelength of $10^{-10}m$ is

A. $7.25 \times 10^6 m/s$

B. $6.26 \times 10^6 m/s$

C. $5.25 \times 10^6 m/s$

D. $4.24 \times 10^6 m/s$

Answer: A

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5. The wavelength associated with an electron accelerated through a potential difference of $100V$ is nearly

A. 0.123 nm

B. 0.133 nm

C. 0.143 nm

D. 0.153 nm

Answer: A

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6. The de - Broglie wavelength of a particle moving with a velocity $2.25 \times 10^8 m/s$ is equal to the wavelength of photon. The ratio of kinetic energy of the particle to the energy of the photon is (velocity of light is $3 \times 10^8 m/s$

A. $\frac{1}{8}$

B. $\frac{3}{8}$

C. $\frac{5}{8}$

D. $\frac{7}{8}$

Answer: B

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7. If a proton and electron have the same de Broglie wavelength, then

A. both have same kinetic energies

B. proton has more kinetic energy than electron

C. electron has more kinetic energy than proton

D. both have same velocity

Answer: C

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8. An electron of mass m when accelerated through a potential difference V, has de Broglie wavelength λ. The de

Broglie wavelength associated with a proton of mass M accelerated through the same potential difference, will be :-

A. $\frac{\lambda m}{M}$

B. $\lambda\sqrt{\frac{m}{M}}$

C. $\frac{\lambda m}{m}$

D. $\lambda\sqrt{\frac{M}{m}}$

Answer: B

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9. Which phenomenon best supports the theory that matter has a wave nature?

A. Electron momentum

B. Electron diffraction

C. Photon momentum

D. Photon diffraction

Answer: B

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10. Find the ratio of de Broglie wavelength of a proton and as α-particle which have been accelerated through same potential difference.

A. $2\sqrt{3}$

B. $3\sqrt{2}$

C. $2\sqrt{2}$

D. $3\sqrt{3}$

Answer: C

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11. An elementary particle is moving three times as fast as an electron. The ratio of the de broglie wavelengths of the particle and electron is 1.813×10^{-4} . What is the mass of the particle ? (Mass of electron $= 9.1 \times 10^{-31} kg$)

A. $1.67 \times 10^{-27} kg$

B. $1.67 \times 10^{-31} kg$

C. $1.67 \times 10^{-30} kg$

D. $1.67 \times 10^{-32} kg$

Answer: A

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12. An electron with speed v and a photon with speed c have the same de-Broglic wavelength. If the kinetic energy and momentum of electron is E_e and P_e and that of photon is E_{ph} and P_{ph} respectively, then correct statement is -

A. $\frac{E_e}{E_{ph}} = \frac{2c}{v}$

B. $\frac{E_e}{E_{ph}} = \frac{v}{2c}$

C. $\frac{P_e}{P_{ph}} = \frac{2c}{v}$

D. $\frac{P_e}{P_{ph}} = \frac{v}{2c}$

Answer: B

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13. The de-Broglie wavelength of proton $\left(\text{ charge} = 1.6 \times 10^{-19} C, \text{mass} = 1.6 \times 10^{-27} Kg \right)$ accelerated through a potential difference of 1kV is

A. $600 Å$

B. 0.9 pm

C. $7 Å$

D. $0.9 Å$

Answer: B

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14. Which of the following has the largest de Broglie wavelength (all have eual velocity)?

A. Neutron

B. Proton

C. α -particle

D. β -particle

Answer: D

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15. 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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16. λ_p and λ_α be the wavelengths of proton and α -particle of equal kinetic energy, then

A. $\lambda_p = \frac{\lambda_\alpha}{4}$

B. $\lambda_p = \frac{\lambda_\alpha}{2}$

C. $\lambda_p = \lambda_\alpha$

D. $\lambda_p = 2\lambda_\alpha$

Answer: D

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17. Which of the following figure represents the variation of particle momentum and the associated de - Broglie wavelength ?

A. 

B. 

C. 

D. 

Answer: D

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18. The ratio of wavelength of deutron and proton accelerated through the same potential difference will be -

A. $1:2$

B. $2:1$

C. $\sqrt{2}:1$

D. $1:\sqrt{2}$

Answer: C

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19. The kinetic energy of an electron gets tripled, then the de-Broglie wavelength associated with it changes by a factor

A. $\frac{1}{3}$

B. $\sqrt{3}$

C. $\frac{1}{\sqrt{3}}$

D. 3

Answer: C

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20. λ_e, λ_p and λ_α are the de-Broglie wavelength of electron, proton and α particle. If all the accelerated by same potential, then

A. $\lambda_e < \lambda_p < \lambda_\alpha$

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

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

D. $\lambda_e > \lambda_p > \lambda_\alpha$

Answer: D

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21. The wavelength of the matter wave is independent of

A. mass

B. velocity

C. momentum

D. charge

Answer: D

Watch Video Solution

22. A praticle of mass M at rest decays into two particle of masses m_1 and m_2, having non-zero velocities. The ratio of the de Broglie wavelength of the particles $\frac{\lambda_1}{\lambda_2}$ is

A. $\frac{m_1}{m_2}$

B. $\frac{m_2}{m_1}$

C. $1:1$

D. $\sqrt{\frac{m_1}{m_2}}$

Answer: C

Watch Video Solution

23. If the kinetic energy of a particle is increased by 10 times, the percentage change in the de Broglie wavelength of the particle is

A. $25\ \%$

B. $75\ \%$

C. $60\ \%$

D. $50\ \%$

Answer: B

Watch Video Solution

24. If m is the mass of an electron and c the speed of light, the ratio of the wavelength of a photon of energy E to that of the electron of the same energy is

A. $c\sqrt{\frac{2m}{E}}$

B. $\sqrt{\frac{2m}{E}}$

C. $\sqrt{\frac{2m}{cE}}$

D. $\sqrt{\frac{m}{E}}$

Answer: a

Watch Video Solution

25. If a proton and electron have the same de Broglie wavelength, then

A. kinetic energy of electron $<$ kinetic energy of proton

B. kinetic energy of electron = kinetic energy of proton

C. momentum of electron = momentum of proton

D. momentum of electron $<$ momentum of proton

Answer: C

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26. The ratio of the de-Broglie wavelengths of an electron of energy 10 eV to that of a person of mass 66kg traveling with a speed of $100km/h$ is of the order of

A. 10^{34}

B. 10^{27}

C. 10^{17}

D. 10^{10}

Answer: B

Watch Video Solution

27. The de Broglie wavelength is given by

A. $p = \frac{2\pi h}{\lambda}$

B. $p = \frac{h}{2\lambda}$

C. $p = \frac{2\pi}{h\lambda}$

D. $p = \frac{2\pi}{\lambda}$

Answer: A

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28. The linear momentum of an electron, initially at rest, accelerated through a potential difference of 100 V is

A. $9.1 \times 10^{-24} kgms^{-1}$

B. $6.5 \times 10^{-24} kgms^{-1}$

C. $5.4 \times 10^{-24} kgms^{-1}$

D. $1.6 \times 10^{-24} kgms^{-1}$

Answer: C

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29. The de - Broglie wavelength of a ball of mass 120 g moving at a speed of $20\,\mathrm{m\,s^{-1}}$ is (Planck's constant $h = 6.6 \times 10^{-34} Js$)

A. $3.5 \times 10^{-34} m$

B. $2.8 \times 10^{-34} m$

C. $1.2 \times 10^{-34} m$

D. $2.1 \times 10^{-34} m$

Answer: B

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30. An electron of mass m_e and a proton of mass m_p are moving with the same speed. The ratio of their de-Broglie wavelength λ_e / λ_p is

A. 1

B. 1836

C. $\frac{1}{1836}$

D. 918

Answer: B

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31. If the kinetic energy of a moving particle is E , then the de-Broglie wavelength is

A. $\lambda = \frac{h}{\sqrt{mK}}$

B. $\lambda = \frac{2h}{\sqrt{mK}}$

C. $\lambda = -\frac{h}{2\sqrt{mK}}$

D. $\lambda = \frac{h}{\sqrt{2mK}}$

Answer: D

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32. The de Broglie wavelength λ of an electron accelerated through a potential V in volts is

A. $\frac{1.227}{\sqrt{V}}nm$

B. $\frac{0.227}{\sqrt{V}}nm$

C. $\frac{0.01227}{\sqrt{V}}nm$

D. $\frac{0.1227}{\sqrt{V}}\text{Å}$

Answer: A

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33. An electron, an α-particle, and a photon have the same kinetic energy. Which of these particles has the shortest, de -broglie wavelenght?

A. Deuteron

B. Cl-particle

C. Proton

D. Electron

Answer: B

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34. The energy that should be added to an electron to reduce its de - Broglie wavelength from one $nm \rightarrow 0.5nm$ is

A. four times the initial energy

B. equal to the initial energy

C. twice the initial energy

D. thrice the initial energy.

Answer: D

Watch Video Solution

35. If alpha particle, proton and electron move with the same momentum, them their respective de Broglie wavelengths $\lambda_\alpha, \lambda_p, \lambda_e$ are related as

A. $\lambda_\alpha = \lambda_p = \lambda_e$

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

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

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

Answer: A

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36. The de Broglie wavelength and kinetic energy of a particle is 2000Å and $1eV$ respectively. If its kinetic energy becomes 1 MeV, then its de Broglie wavelength becomes

A. 1Å

B. 2Å

C. 5Å

D. 10Å

Answer: B

Watch Video Solution

37. 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, heliuin

C. Oxygen, nitrogen, helium, hydrogen

D. Nitrogen, oxygen, helium, hydrogen

Answer: C

 Watch Video Solution

38. What is the (a) momentum (b) speed and (c) de-Broglie wavelength of an electron with kinetic energy of 120 eV. Given

$h = 6.6 \times 10^{-34} Js, m_e = 9 \times 10^{-31} kg, 1eV = 1.6 \times 10^{-19} J$

.

A. 725 pm

B. 500 pm

C. 322 pm

D. 112 pm

Answer: D

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39. If the mass of a microscopic particle as well as its speed are halved, the de Broglie wavelength associated with the particle will

A. increase by a factor more than 2

B. increase by a factor of 2

C. decrease by a factor of 2

D. decrease by a factor more than 2.

Answer: A

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1. G.P Thomson experimentally confirmed the existence of matter waves by the phenomena

A. diffraction

B. refraction

C. polarization

D. scattering

Answer: A

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2. Crystal diffraction experiments can be performed using X-rays, or electrons accelerated through appropriate voltage. Which probe has greater energy? An X-ray photon or the

electron? (For quantitative comparison, take the wavelength of the probe equal to 1Å, which is of the order of interatomic spacing in the lattice), $m_e = 9.11 \times 10^{-31} kg$.

A. X-ray

B. Electron

C. both have same energy

D. cannot be determined by crystal diffraction.

Answer: A

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Check Your Neet Vitals

1. For what kinetic energy of a proton, will the associated de-Broglie wavelength be 16.5 nm?

A. $5.2 \times 10^{-34} J$

B. $5.2 \times 10^{-20} J$

C. $4.8 \times 10^{-25} J$

D. $4.8 \times 10^{-30} J$

Answer: C

Watch Video Solution

2. In photoelectric effect

A. depends both on intensity and frequency of the incident light.

B. does not depend on the frequency of incident light but depends on the intensity of the incident light.

C. decreases with increase in frequency of incident light.

D. increases with increase in frequency of incident light.

Answer: B

Watch Video Solution

3. Radiations of frequencies v_1 and v_2 are made to fall in turn, on a photosensitive surface. The stopping potential

required for stopping the most energetic photoelectrons in the two cases are V_1 and V_2 respectively. Obtain a formula for determining the threshold frequency in terms of these parameters.

A. $\frac{e(V_1 + V_2)}{\upsilon_1 + \upsilon_2}$

B. $\frac{e(V_1 - V_2)}{\upsilon_1 + \upsilon_2}$

C. $\frac{e(V_2 - V_1)}{\upsilon_2 - \upsilon_1}$

D. $\frac{e(V_1 - V_2)}{e(\upsilon_2 - \upsilon_1)}$

Answer: C

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4. A particle moves in a closed orbit around the origin, due to a force which is directed towards the origin. The de-broglie wavelength of the particles varies cyclically between two values $\lambda_1, \lambda_2 with \lambda_1 > \lambda_2$. Which of the following statements are true?

A. The particle could be moving in a circular orbit with origin as centre.

B. The particle could be moving in an elliptic orbit with origin as its focus.

C. When the de Broglie wavelength is λ_1 the particle is nearer the origin than when its value is λ_2

D. Both (a) and (c)

Answer: B

Watch Video Solution

5. A praticle of mass M at rest decays into two particle of masses m_1 and m_2, having non-zero velocities. The ratio of the de Broglie wavelength of the particles $\frac{\lambda_1}{\lambda_2}$ is

A. $1:1$

B. $1:2$

C. $2:1$

D. $1:4$

Answer: A

Watch Video Solution

6. Photoelectric effect supports quantum nature of light because :

A. there is minimum frequency of light below which no photoelectrons 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 photoelectrons leave the surface immediately

D. all of these.

Answer: D

Watch Video Solution

7. The threshold frequency for a metallic surface corresponds to an energy of $6.2eV$ and the stopping potential for a radiation incident on this surface is $5V$. The incident radiation lies in

A. ultraviolet region

B. infrared region

C. visible region

D. X-ray region

Answer: A

Watch Video Solution

8. The work function of a substance is 3.68 eV. The longest wavelength of light that can cause photoelectrons emission from this substance is approximately

A. $337nm$

B. $400nm$

C. $310nm$

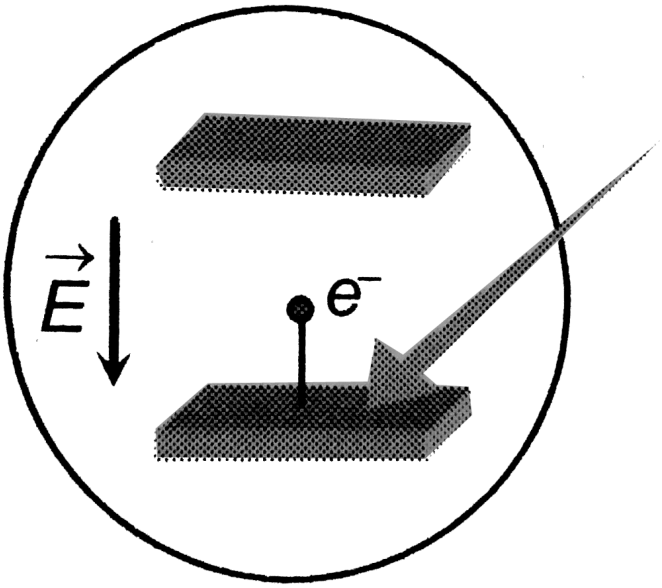
D. $220nm$

Answer: A

Watch Video Solution

9. 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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10. If K_1 and K_2 are maximum kinetic energies of photoelectrons emitted when light of wavelength λ_1 and λ_2 respectively are incident on a metallic surface. If $\lambda_1 = 3\lambda_2$ then

A. $K_1 > \left(\frac{K_2}{5}\right)$

B. $K_1 < \left(\frac{K_2}{5}\right)$

C. $K_1 = 3K_2$

D. $K_2 = 3K_1$

Answer: B

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11. An e-m wave of wavelength λ is incident on a photo sensitive surface of negligible work function. If the photoelectrons emitted from this surface have the de-Broglie wavelength λ_1. Find relation between $'\lambda'$ and $'\lambda_1$'-

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

B. $\lambda = \frac{mc}{h}\lambda'$

C. $\lambda = \frac{2mc}{h}\lambda'^2$

D. $\lambda = \frac{mc}{2h}\lambda'^2$

Answer: C

Watch Video Solution

12. If the kinetic energy of a particle is increased by 10 times, the percentage change in the de Broglie wavelength of the particle is

A. $25\ \%$

B. $75\ \%$

C. $60\ \%$

D. $50\ \%$

Answer: D

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13. Light of frequency $7.21 \times 10^{14} Hz$ is incident on a metal surface. Electrons with a maximum speed of

$6.0 \times 10^5 ms^{-1}$ are ejected from the surface. What is the threshold frequency for photoemission of electrons? $h = 6.63 \times 10^{-34} Js, m_e = 9.1 \times 10^{-31} kg.$

A. $2 \times 10^{12} Hz$

B. $2 \times 10^{14} Hz$

C. $5 \times 10^{12} Hz$

D. $5 \times 10^{14} Hz$

Answer: D

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14. When a monochromatic point source of light is at a distance of 0.2 m from a photoelectric cell, the cut off

voltage and the saturation current are respectively $0.6V$ and $18.0mA$ if the same source is placed $0.6m$ away from the photoelectric cell , then

A. the stopping potential will be 0.2 V

B. the stopping potential will be 0.6 V

C. the saturation current will be 4 mA

D. both (a) and (c)

Answer: B

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15. 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. K^2

B. $K^{1/2}$

C. K^{-1}

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

Answer: D

Watch Video Solution

16. Consider a metal exposed to light of wavelength 600nm. The maximum energy of the electrons doubles when light of wavelength 400nm is used. Find the work function in eV.

A. 1 eV

B. 2 eV

C. 3 eV

D. 4 eV

Answer: A

Watch Video Solution

17. Photoelectric emission occurs only when the incident light has more than a certain minimum

A. frequency

B. Power

C. wavelength

D. intensity

Answer: A

Watch Video Solution

18. In the Davisson and Germer experiment , the velocity of electrons emitted from the electron gun can be increased by

A. decreasing the potential difference between the anode and filament.

B. increasing the potential difference between the anode and filament.

C. increasing the filament current

D. decreasing the filament current

Answer: B

Watch Video Solution

19. According to Einstein's photoelectric equation, the plot of the maximum kinetic energy of the emitted photoelectrons from a metal versus frequency of the incident radiation gives a straight line whose slope

A. depends on the intensity of the incident radiation.

B. depends on the nature of the metal and also on the intensity of incident radiation.

C. is same for all metals and independent of the intensity of the incident radiation

D. depends on the nature of the metal.

Answer: C

Watch Video Solution

20. A photo-cell is illuminated by a source of light which is placed at a distance d from the cell . If the distance become d/2 . Then number of electrons emitted per seconed will be

A. same

B. four times

C. two times

D. one-fourth

Answer: B

Watch Video Solution

21. A photon of energy E ejects a photoelectron from a metel surface whose work function is ϕ_0. If this electron enters into a unifrom magnetic field of induction B in a direction perpendicular to the field and describes a circular path of radius r, then the radius r, is given by, (in the usual notation)

A. $\sqrt{\frac{2m(E-\phi_0)}{eB}}$

B. $\sqrt{(2m(E-\phi_0)eB)}$

C. $\sqrt{\frac{2e(E-\phi_0)}{mB}}$

D. $\frac{\sqrt{2m(E-\phi_0)}}{eB}$

Answer: D

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22. In a photon-electron collision ..... .

A. total energy is conserved

B. total momentum is conserved

C. number of photons is conserved

D. both (a) and (b)

Answer: D

Watch Video Solution

23. Consider a beam of electrons (each electron with energy E_0) incident on a metal surface kept in an evacuated chamber. Then

A. no electrons will be emitted as only photons can emit electrons

B. electrons can be emitted but all with an energy E_0

C. electrons can be emitted with any energy , with a maximum of $E_0 - \phi$ (is the work function)

D. electron can be emitted with any energy , with a maximum of E_0

Answer: D

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24. A proton, a neutron, an electron and an α-particle have same energy. Then their de-Broglie wavelengths compare as

A. $\lambda_p = \lambda_n > \lambda_e > \lambda_\alpha$

B. $\lambda_\alpha < \lambda_p = \lambda_n < \lambda_\alpha$

C. $\lambda_e < \lambda_p = \lambda_n < \lambda_\alpha$

D. $\lambda_e < \lambda_p = \lambda_n < \lambda_\alpha$

Answer: B

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25. A beam of cathode rays is subjected to crossed electric (E) and magnetic fields (B). The fields are adjusted such that the beam is not deflected. The specific charge of the cathode rays is given by

A. $\frac{B^2}{2VE^2}$

B. $\frac{2VB^2}{E^2}$

C. $\frac{(2VE)^2}{B^2}$

D. $\frac{E^2}{2VB^2}$

Answer: D

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26. 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 $(\text{power of}$ S_(2))/("power of" S_(1))` is equal to

A. 1.00

B. 1.02

C. 1.04

D. 0.98

Answer: A

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27. The potential difference that must be applied to stop the fastest photoelectrons emitted by a nickel surface , having work function $5.01eV$, when ultraviolet light of $200nm$ falls on it , must be

A. 2.4 V

B. $-1.2V$

C. $-2.4V$

D. $1.2V$

Answer: B

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Aipmt Neet Mcqs

1. 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 27

B. 2N and T

C. 2N and 27

D. N and T

Answer: B

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2. The electron in the hydrogen atom jumps from excited state (n=3) to its ground state (n=1) and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 5.1eV, the stopping potential is estimated to be: (The energy of the electron in nth state is $E_n = -13.6/n^2 eV$)

A. 5.1 V

B. 12.1V

C. 17.2V

D. 7V

Answer: D

Watch Video Solution

3. Photoelectric emission occurs only when the incident light has more than a certain minimum

A. power

B. wavelength

C. intensity

D. frequency

Answer: D

Watch Video Solution

4. In the Davisson and Germer experiment , the velocity of electrons emitted from the electron gun can be increased by

A. increasing the potential difference between the anode and filament

B. increasing the filament current

C. decreasing the filament current

D. decreasing the potential difference between the anode and filament

Answer: A

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5. Light of two different frequencies whose photons have energies 1eV and 2.5 eV respectively illuminate a metallic

surface whose work function is 0.5 eV successively. Ratio of maximum kinetic energy of emitted electrons will be:

A. $1:4$

B. $1:2$

C. $1:1$

D. $1:5$

Answer: B

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6. Electrons used in an electron microscope are accelerated by a voltage of 25 kV. If the voltage is increased to 100 kV

then the de Broglie wavelength associated with the electrons would

A. increase by 2 times

B. decrease by 2 times

C. decrease by 4 times

D. increase by 4 times

Answer: B

 Watch Video Solution

7. In photoelectric emission process from a metal of work function $1.8eV$, the kinetic energy of most energetic electrons is $0.5eV$. The corresponding stopping potential is

A. 1.8 V

B. 1.3 V

C. 0.5 V

D. 2.3 V

Answer:

Watch Video Solution

8. The threshold frequency for a certain metal is $3.3 \times 10^{14} Hz$. If light of frequency 8.2×10^{1} Hz (hertz) is incident on the metal , find the cut - off voltage for photoelectric emission . Given Planck's constant $h = 6.625 \times 10^{-34}$ Js (joule second) . Charge of electron $e = 1.6 \times 10^{-19}$ C (coulomb).

A. 1 V

B. 2 V

C. 3 V

D. 5 V

Answer: B

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

A. 1.5×10^{20}

B. 6×10^{18}

C. 62×10^{20}

D. 3×10^{19}

Answer: A

Watch Video Solution

10. Monochromatic radiation emitted when electron on hydrogen atom jumps from first excited to the ground state irradiates a photosensitive material. The stopping potential is measured to be $3.57V$. The threshold frequency of the material is

A. $4 \times 10^{15} Hz$

B. $5 \times 10^{15} Hz$

C. $1.6 \times 10^{15} Hz$

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

Answer: C

Watch Video Solution

11. A α -parhticle moves in a circular path of radius $0.83cm$ in the presence of a magnetic field of $0.25Wb/m^2$. The de-Broglie wavelength assocaiated with the particle will be

A. $1Å$

B. $0.1Å$

C. $10Å$

D. 0.01Å

Answer: D

Watch Video Solution

12. If the momentum of an electron is changed by p, then the de - Broglie wavelength associated with it changes by $0.5\ \%$. The initial momentum of electron will be

A. 200 P

B. 400 P

C. $\frac{P}{200}$

D. $100P$

Answer: A

Watch Video Solution

13. Two radiation of photons energy 3eV and 4.5 eV successively illuminate a photosensitive metallic surface of work function 2.5 eV the ratio of the maximum speeds of the emitted electrons is :-

A. $1:4$

B. $1:2$

C. $1:1$

D. $1:5$

Answer: B

Watch Video Solution

14. The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by

A. $\lambda_p \propto \sqrt{\lambda_e}$

B. $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$

C. $\lambda_p \propto \lambda_e^2$

D. $\lambda_p \propto \lambda_e$

Answer: C

Watch Video Solution

15. For photoelectric emission from certain metal the cut - off frequency is v. If radiation of frequency $2v$ incident on the metal plate , the maximum possible velocity of the emitted electron will be (m is the electron mass).

A. $\sqrt{\frac{2hv}{m}}$

B. $2\sqrt{\frac{hv}{m}}$

C. $\sqrt{\frac{hv}{2m}}$

D. $\sqrt{\frac{hv}{m}}$

Answer: A

Watch Video Solution

16. 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. $1.5eV$

Answer: B

Watch Video Solution

17. If the kinetic energy of the particle is increased to 16 times its previous value , the percentage change in the de - Broglie wavelength of the particle is

A. 25

B. 75

C. 60

D. 50

Answer: B

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18. Which of the following figure represents the variation of particle momentum and the associated de - Broglie

wavelength ?

A. 

B. 

C. 

D. 

Answer: D

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19. A certain metallic surface is illuminated with monochromatic light of wavelength λ . The stopping potential for photoelectric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ

, the stopping potential is V_0 . The threshold wavelength for this surface for photoelectric effect is

A. $\frac{\lambda}{4}$

B. $\frac{\lambda}{6}$

C. 6λ

D. 4λ

Answer: D

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20. A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and $\frac{\lambda}{2}$. If the maximum kinetic energy of the emitted photoelectrons in

the second case is 3 times than in the first case , the work function of the surface of the material is

(h = Plank's constant , c = speed of light)

A. $\frac{2hc}{\lambda}$

B. $\frac{hc}{3\lambda}$

C. $\frac{hc}{2\lambda}$

D. $\frac{hc}{\lambda}$

Answer: C

Watch Video Solution

21. Light of wavelength $500nm$ is incident on a metal with work function $2.28eV$. The de Broglie wavelength of the

emitted electron is

A. $\geq 2.8 \times 10^{-9} m$

B. $\leq 2.8 \times 10^{-12} m$

C. $\leq 2.8 \times 10^{-10} m$

D. $\leq 2.8 \times 10^{-9} m$

Answer: A

Watch Video Solution

22. An electron of mass m and a photon have same energy E. The ratio of de - Broglie wavelengths associated with them is :

A. $c(2mE)^{\frac{1}{2}}$

B. $\frac{1}{c}\left(\frac{2m}{E}\right)^{\frac{1}{2}}$

C. $\frac{1}{c}\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

D. $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

Answer: C

Watch Video Solution

23. When a metallic surface is illuminated with radiation of wavelength λ , the stopping potential is V . If the same surface is illuminated with radiation of wavelength 2λ , the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is

A. $\frac{5}{2}\lambda$

B. 3λ

C. 4λ

D. 5λ

Answer: B

Watch Video Solution

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

Watch Video Solution

25. 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. $+3$

B. $+4$

C. $-1V$

D. $-3V$

Answer: D

Watch Video Solution

26. The de - Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature $T(\text{kelvin})$ and mass m, is

A. $\frac{h}{\sqrt{3mkT}}$

B. $\frac{2h}{\sqrt{3mkT}}$

C. $\frac{2h}{\sqrt{mkT}}$

D. $\frac{h}{\sqrt{mkT}}$

Answer: A

Watch Video Solution

27. The photoelectric threshold wavelength of silver is $3250 \times 10^{-10} m$. The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength $2536 \times 10^{-10} m$ is

$\left(Given h = 4.14 \times 10^{6} ms^{-1} eVs \text{ and } c = 3 \times 10^{8} ms^{-1}\right)$

A. $\approx 0.6 \times 10^{6} ms^{-1}$

B. $\approx 61 \times 10^{3} ms^{-1}$

C. $\approx 0.3 \times 10^{6} ms^{-1}$

D. $\approx 6 \times 10^{5} ms^{-1}$

Answer: A::D

Watch Video Solution

28. An electron of mass m with an initial velocity $\vec{v} = v_0 \hat{}(\text{i})\ (v_0 > 0)$ enters an electric field $\vec{E} = -E_0 \hat{i}\ (E_0 = cons\tan t > 0)$ at $t = 0$. If λ_0 is its de - Broglie wavelength initially, then its de - Broglie wavelength at time t is

A. $\dfrac{\lambda_0}{\left(1 + \frac{eE_0}{mv_0}t\right)}$

B. $\lambda_0\left(1 + \dfrac{eE_0}{mv_0}t\right)$

C. $\lambda_0 t$

D. λ_0

Answer: A

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29. When the light of frequency $2v_0$ (where v_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5v_0$, the maximum velocity of electrons emitted from the same plate is v_2. the ratio of v_1 to v_2 is

A. $1:2$

B. $1:4$

C. $4:1$

D. $2:1$

Answer: A

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30. An electron is accelerated through a potential difference of $10,000V$. Its de Broglie wavelength is, (nearly): $(me = 9 \times 10^{-31} kg)$

A. 12.2 nm

B. $12.2 \times 10^{-13} m$

C. $12.2 \times 10^{-12} m$

D. $12.2 \times 10^{-14} m$

Answer: C

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