PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

ELECTRONS AND PHOTONS

Classical Thinking

1. Cathode rays are

A. a light beam of electrons produced from cathode.

B. electromagnetic waves.

C. a light beam of atoms moving towards negative electrodes.

D. an electron beam of negatively charged ions moving towards negative electrode.

Answer: A

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2. The pressure of gas in cathode ray tube is

A. $10^{-2}mm$

B. $10^{-3}mm$ of mercury

C. $10^{5}N/m^{2}$

D. 1 mm of mercury

Answer: B

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3. If an electron has an initial velocity in a direction different from that of an electric field, then the path of the electron is

A. a straight line

B. a circle

C. a parabola

D. an ellipse

Answer: A

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4. Photoelectric effect was discovered by _____ in 1887.

A. Hertz

B. Hallawachs

C. Geiter

D. J.J. Thomson

Answer: A

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5. Hallawachs and Lenard investigated the phenomenon of _____ .

A. α- emission

B. β-emission

C. photoelectric emission

D. γ- emission

Answer: C

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6. In photoelectric effect

A. electrons are emitted from the metals when

light rays (radiations) are reflected from it.

B. light of longer wavelength is more effective than light of shorter wavelength.

C. light of shorter wavelength is more effective than light of longer wavelength.

D. light is not used.

Answer: C

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7. The study of photoelectric effect is useful in understanding

A. quantisation of energy

B. quantisation of charge

C. conservation of charge

D. conservation of kinetic energy

Answer: A

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8. Assertion : X-rays show the phenomenon of photoelectric effect.

Reason : The energy of X-ray photon is quite large.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: A

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9. The photo electrons emitted from the surface of sodium metal are

A. of equal frequency.

B. of equal kinetic energy.

C. of equal de-Broglie wavelength.

D. having velocities which change from zero to a fixed maximum value.

Answer: D

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10. Photoelectric effect is not produced by which radiation?

A. Ultraviolet

B. X-rays

C. $\gamma - rays$

D. Radio waves

Answer: D

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11. Photoelectric effect supports quantum nature of light because :

A. there is a 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. electric charge of photoelectrons is quantized.

Answer: A

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12. When light is incident on a surface, photoelectrons are emitted. For photoelectrons,

A. the value of kinetic energy is same.

B. kinetic energy does not depend on the wavelength of incident light.

C. the value of kinetic energy is more than a certain minimum energy.

D. none of the above.

Answer: C

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13. A surface ejects electrons when illuminated by blue light but none with green light. Then photo emission is possible by light of which of the following colours?

A. violet

B. red

C. yellow

D. infrared

Answer: A

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14. In photoelectric effect, the electrons are ejected from metals if the incident light has a certain minimum.

A. wavelength

B. frequency

C. amplitude

D. angle of incidence

Answer: B

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15. The magnitude of stopping potential for the photoelectric effect is

A. directly proportional to the intensity of incident light.

B. inversely proportional to the intensity of incident light.

C. directly proportional to the frequency of incident light.

D. inversely proportional to the frequency of incident light.

Answer: C

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16. On reducing the intensity of radiation falling on the surface of a material, the

A. number of ejected electrons will decrease.

B. energy of ejected electrons will decrease.

C. momentum of ejected electron will decrease.

D. velocity of ejected electrons will decrease.

Answer: A

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17. Choose the INCORRECT statement.

A. The maximum velocity of photoelectrons increases with decrease in the wavelength of the light.

B. The number of photoelectrons emitted is proportional to the intensity of light.

C. The maximum velocity of photoelectrons increases with increase in the wavelength of the light.

D. The number of photoelectrons emitted is zero, if incident wavelength is greater than threshold wavelength.

Answer: C

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18. Photoelectrons emitted from a metallic surface are

A. Present inside the nucleus.

B. orbiting very close to nucleus.

C. generated by decay of neutrons within the nucleus.

D. free to move within interatomic spacing.

Answer: D

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19. The velocity of electrons given out by a photosensitive surface depends on

A. intensity

B. frequency

C. frequency and intensity.

D. neither frequency nor intensity of incident radiation.

Answer: B

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20. Photoelectric effect is described as the ejection of electrons from the surface of a metal when:

A. it is heated to a high temperature.

B. electrons of suitable velocity are incident on it.

C. light of suitable wavelength falls on it.

D. it is placed in a strong magnetic field.

Answer: C

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21. Increase in the frequency of the incident radiations increases the

A. rate of emission of photoelectrons

B. work function

C. kinetic energy of photoelectrons

D. threshold frequency.

Answer: C

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22. The magnitude of saturation photoelectric current depends upon

A. frequency of radiations

B. intensity of radiations

C. work function

D. stopping potential

Answer: B

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23. In photoelectric effect,

A. the emission of electron is the result of elastic collision between the incident photon and the electron.

B. absorption of photon is a gradual process.

C. the emission of electron is a result of inelastic collision between the photon and the electron.

D. at the threshold frequency, the kinetic energy of ejected electrons is maximum.

Answer: C

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24. In photoelectric effect, to eject four photoelectrons, minimum number of photons required is

A. 1

B. 2

C. 4

D. 6

Answer: C

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25. If a metal surface is exposed to electromagnetic radiation of frequency $V > V_0$, then

A. photoelectric emission will not take place.

B. photoelectric emission will take place.

C. thermionic emission will take place.

D. photons will be emitted from it .

Answer: B

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26. The minimum energy required to eject an electron from an atom is called

A. atomic energy

B. mechanical energy

C. electrical energy

D. work function

Answer: D

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27. At stopping potential, electrons moving with

A. all speeds are stopped.

B. very high speeds are stopped.

C. very low speeds are stopped.

D. speed $10^3 m / s$ are stopped.

Answer: A

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28. Assertion: Photoelectric effect shows both the wave like and particle like behaviour of light.

Reason : Wave nature of matter is not visible in our daily observations.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: D

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29. In Photoelectric emission, radiation consists of

A. electrons

B. protons

C. photons

D. neutrons

Answer: C

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30. Speed of photons in photoelectric emission is

A. same as light.

B. greater than light speed.

C. one third of light speed.

D. one-fourth of light speed.

Answer: A

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31. During collision of electrons and photons,

A. energy of photon is transferred to electron without time lag.

B. energy transfer does not take place.

C. energy of photon is transferred to electron for long interval of time.

D. none of these.

Answer: A

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32. Einstein's photoelectric equation states that $\frac{1}{2}mv^2 = hv - hv_0$. In this equation, v refers to

A. velocity of all ejected electrons.

B. mean velocity of emitted electrons.

C. minimum velocity of emitted electrons.

D. maximum velocity of emitted electrons.

Answer: D

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33. The dimensions of Planck's constant are

A. $\left[M^1L^2T^{-1}\right]$

B. $\left[M^1L^2T^{-2}\right]$

C. $\left[M^1L^1T^{-2}\right]$

D. being a constant it has no dimensions.

Answer: A

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34. Assertion : Alkali metals are most suitable for photoelectric effect.

Reason : The work function of alkali metals is small, so even the radiations of small energy are able to cause the photoelectric effect.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: A

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35. Assertion: If the intensity of incident radiation on a metal is doubled, then K.E. of photoelectrons emitted will be doubled.

Reason: $K.E. = \frac{1}{2}mv^2 = h(v - v_0)$,

where v is the velocity of photo electrons.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: D

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36. Threshold wavelength for a metal having work function w_0 is λ. Then the threshold wavelength for a metal having work function $2w_0$ is

A. 4λ

B. 2λ

C. $\lambda/2$

D. $\lambda/4$

Answer: C

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37. Photo cell is a device in which light energy is converted into

A. heat energy.

B. mechanical energy.

C. kinetic energy.

D. electric energy.

Answer: D

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38. The symbol for photocell is

A. 

B. 

C. 

D. 

Answer: A

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39. The cathode and anode in a photocell are

respectively.

A. semi cylindrical metal plate and square plate.

B. semi cylindrical metal plate and straight wire.

C. straight wire and semi-cylindrical metal plate.

D. a square plate and semi-cylindrical metal plate.

Answer: B

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40. Why is a photoelectric cell also called an electric eye?

A. Voltaic cell

B. electric brake

C. Daniel cell

D. secondary cell

Answer: A

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41. Photoelectric cell is NOT used in

A. burglar alarm.

B. exposure meter.

C. reproduction of sound from motion pictures.

D. measurement of temperature.

Answer: D

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42. Which of the following statements is NOT correct for saturation current in a photoelectric cell?

A. All the electrons emitted from the photosensitive plate reach the collector.

B. The potential difference between the emitter and collector should be equal to the stopping potential.

C. Collector is positive w.r.t. emitter.

D. It is the maximum current that can be set up in the photoelectric cell.

Answer: B

43. In burglar alarm, infrared beam of light is used instead of visible light, because

A. work function of infrared ligth is low.

B. infrared lamps are cheap.

C. infrared beam can be concealed from the burglar.

D. frequency of infrared light is higher than frequency of visible light.

Answer: C

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44. Select the WRONG statement.

Photocells are used in

A. exposure meter.

B. operating relay systems.

C. induction furnace.

D. reproduction of sound in films.

Answer: C

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45. The phenomenon which proves the particle nature of electromagnetic wave is

A. diffraction

B. polarisation

C. photoelectric effect

D. reflection and refraction.

Answer: C

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46. Which one of the following is INCORRECT statements about a photon?

A. Photons rest mass is zero.

B. Photons momentum is hv/c

C. Photons energy is hv

D. Photons exert no pressure

Answer: D

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47. A photon in motion has a mass

A. $\frac{h}{v}$

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

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

D. hv

Answer: B

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48. Photons are not deflected in electric and magnetic field as they are

A. positively charged

B. negatively charged

C. electrically neutral

D. affected by gravitational field

Answer: C

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49. The graph between stopping potential and intensity of light in photoelectric effect is

A. 

B. 

C. 

D. 

Answer: C

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50. At stopping potential, the photoelectrons have

A. K.E. = 0

B. P.E. = 0

C. K.E. = P.E.

D. K.E. = maximum

Answer: C

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51. Work function of a metal is minimum energy required to

A. free an electron from surface against coulomb's forces.

B. free a nucleon.

C. eject an electron electronic orbit.

D. ionize an atom.

Answer: A

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52. The photoelectric threshold frequency of a metal is v_0. When ligth of frequency $3v_0$ is incident on the metal, the maximum kinetic energy of emitted photoelectrons will be

A. hv_0

B. $2hv_0$

C. $3hv_0$

D. $\frac{1}{2}hv_0$

Answer: B

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53. Assertion: Photoelectric effect supports the quantum nature of light.

Reason : Electric charge of photoelectrons is quantised.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: B

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Critical Thinking

1. If the work function of a metal is $'\phi'$ and the frequency of the incident light is $'v'$, there is no emission of photoelectron if

A. $v < \frac{\phi}{h}$

B. $v = \frac{\phi}{h}$

C. $v > \frac{\phi}{h}$

D. $v \geq \frac{\phi}{h}$

Answer: A

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2. 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 speed of incident light.

D. increases uniformly with the increase in the frequency of incident light wave.

Answer: D

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3. Light of frequency 1.5 times the threshold frequency is incident on a photo-sensitive material. If the frequency is halved and the intensity is doubled, the photoelectric current becomes

A. quadrupled

B. doubled

C. halved

D. zero

Answer: D

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4. The threshold wavelength for lithium is 5250 Å. For photoemission to take place, the wavelength of the incident light must be

A. more than 5250 Å

B. exactly equal to 5250 Å

C. equal to or more than 5250 Å

D. equal to or less than 5250 Å

Answer: D

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5. Photons of energy $6eV$ are incident on a metal surface whose work function is $4eV$. The minimum kinetic energy of the emitted photo - electrons will be

A. 0 eV

B. 1 eV

C. 2 eV

D. 10 eV

Answer: A

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6. In photoelectric emission, the velocity of electrons ejected from near the surface is

A. larger than those coming from interior of metal.

B. less than those coming from interior of metal.

C. same as those coming from interior of metal

D. equal to velocity of light.

Answer: A

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7. The stopping potential for photoelectrons ejected from a photosensitive material of work function 1.6 ev, when photons of energy 2.4 eV are incident on it, is

A. 0.8 V

B. 2.0 V

C. 4.0 V

D. 8.0 V

Answer: A

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8. What is the stopping potential when the metal with work function $0.6eV$ is illuminated with the light of $2eV$?

A. 2.6 V

B. 3.6 V

C. 0.8 V

D. 1.4 V

Answer: D

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9. The photoelectric threshould wavelength for a metal surface is 6600 Å. The work function for this is

A. $1.4 \times 10^{-19} J$

B. $2 \times 10^{-19} J$

C. $3 \times 10^{-19} J$

D. $4 \times 10^{-19} J$

Answer: C

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10. Assertion: Work function of a metal is 5 eV. The maximum wavelength of photons required to emit electrons from its surface is 2480 $\mathring{A}$.

Reason: Work function, $\phi_0 = \frac{hc}{\lambda_{max}}$.

A. Assertion is True, Reason is True,

Reason is a correct explanation for

Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for

Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: A

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11. Work function of a metal is 2 eV. The maximum wavelength of photons required to emit electrons from its surface is

A. 6215 Å

B. 6500 Å

C. 5700 Å

D. 5900 Å

Answer: A

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12. The work function of a photoelectric material is 3.3 eV. The thershold frequency will be equal to

A. $8 \times 10^{14} Hz$

B. $8 \times 10^{10} Hz$

C. $4 \times 10^{14} Hz$

D. $5 \times 10^{20} Hz$

Answer: A

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13. The work function for a metal whose threshold wavelength is 5000 $\mathring{A}$ is

A. 2.48 eV

B. 3.22 eV

C. 1.98 eV

D. 2.0 eV

Answer: A

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14. A photon of energy $8eV$ is incident on metal surface of threshold frequency $1.6 \times 10^{15} Hz$, The maximum kinetic energy of the photoelectrons emitted (in eV) (Take $h = 6 \times 10^{-34} Js$).

A. 6.63

B. 1.6

C. 1.2

D. 1.37

Answer: D

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15. The work function of a metal is 2.5 eV. Light of wavelength 3600 $\mathring{A}$ is incident on this metal surface. The velocity of emitted photoelectrons will be

A. $3.8 \times 10^6 m/s$

B. $5.2 \times 10^4 m/s$

C. $4 \times 10^4 m/s$

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

Answer: D

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16. Light of wavelength λ strikes a photo - sensitive surface and electrons are ejected with kinetic energy is to be increased to $2E$, the wavelength must be changed to λ' where

A. $\lambda' = \frac{\lambda}{2}$

B. $\lambda' = 2\lambda$

C. $\frac{\lambda}{2} < \lambda'$

D. $\lambda' > \lambda$

Answer: C

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17. The I-V curve for a photocell is best represented by the figure.

A. 

B. 

C. 

D. 

Answer: C

View Text Solution

18. If V_1 and V_2 are stopping potentials for incident photons of wavelengths λ_1 and λ_2 for same cathode material, then Planck's constant is given by [e = charge on electron, c = speed of light]

A. $\frac{e}{c}(V_2 - V_1)\frac{\lambda_1\lambda_2}{\lambda_1 - \lambda_2}$

B. $\frac{e}{c}(\lambda_1 - \lambda_2)\frac{V_1V_2}{V_1 - V_2}$

C. $\frac{e}{c}\frac{V_2V_1}{\lambda_1\lambda_2}$

D. $\frac{e}{c}\frac{(\lambda_1 + \lambda_2)}{(V_1 + V_2)}$

Answer: A

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19. Ultraviolet radiation of 6.2 eV falls on an aluminium surface (work - function = 4.2 eV). The kinetic energy in joule of the fastest electrons emitted is

A. 3×10^{-21}

B. 8×10^{-19}

C. 4×10^{-17}

D. 3×10^{-15}

Answer: B

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20. Choose the graph showing the correct relationship between the stopping potential V_0 and the frequency v of light for potassium and tungsten.

A. 

B. 

C. 

D. 

Answer: C

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21. Two identical photo-cathodes receive light of frequencies v and $\frac{v}{2}$. If the velocities of the photo electrons (of mass m) coming out are respectively V_1 and V_2 then

A. $V_1 - V_2 = \left[\frac{2hv}{m}\right]^{1/2}$

B. $V_1^2 - V_2^2 = \frac{hv}{m}$

C. $V_1 + V_2 = \frac{2hv}{m}$

D. $V_1^2 + V_2^2 = \frac{2h}{m}(V_1 + V_2)$

Answer: B

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22. Assertion: If the maximum kinetic energy of electrons emitted by a photo cell is 5 eV, then the stopping potential is 5 V.

Reason: Stopping potential for fastest photoelectrons is numerically equal to their kinetic energy.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False but, Reason is True.

Answer: A

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Competitive Thinking

1. The electrons are emitted in the photoelectricm effect from a metal surface

A. Only if the frequency of radiation is above a certain threshold value.

B. Only if the temperature of the surface is high.

C. at a rate that is independent of the nature of metal

D. with a maximum velocity proportional to the frequency of incident radiation.

Answer: A

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2. One moving electron when comes closer to other stationary electron, then its kinetic energy and potential energy respectvely.....and.....

A. increases, decreases

B. increases, increases

C. decreases, increases

D. decreases, decreases

Answer: C

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3. In photoelectric effect, stopping potential depends on

A. the intensity of light.

B. the nature of surface of the metal.

C. both the intensity of light and nature of surface of metal.

D. both the frequency of incident light and nature of surface of metal.

Answer: D

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4. The number of photo - electrons emitted per second from a metal surface increases when

A. the energy of incident photons increases.

B. the frequency of incident light increases.

C. the wavelength of the incident light increases.

D. the intensity of the incident light increases.

Answer: D

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5. When the light source is kept 20 cm away from a photo cell, stopping potential 0.6 V is obtained.

When source is kept 40 cm away, the stopping potential will be

A. 0.3 V

B. 0.6 V

C. 1.2 V

D. 2.4 V

Answer: B

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6. As the intensity of incident light increases

A. Photoelectric current increases.

B. Photoelectric current decreases.

C. Kinetic energy of emitted photoelectrons increases.

D. Kinetic energy of emitted photoelectrons decreases.

Answer: A

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7. Threshold wavelength for lithium metal is 6250 Å. For photo emission, the wavelength of the incidennt light must be

A. more than 6250 Å

B. exactly equal to 6250 Å

C. equal to or more than 6250 Å

D. eaual to or less than 6250 Å

Answer: D

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8. When yellow light is incident on a surface , no electrons are emitted while green light can emit. If red light is incident on the surface , then

A. no electrons are emitted.

B. photons are emitted.

C. electrons of higher energy are emitted.

D. electrons of lower energy are emitted.

Answer: A

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9. The work function of metals 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 $= 3 \times 10^{8} m/s$)

A. 510 nm

B. 650 nm

C. 400 nm

D. 570 nm

Answer: B

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10. 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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11. An electron is accelerated through a potential difference of 1000 volt. Its velocity is nearly

A. $3.8 \times 10^7 m/s$

B. $1.9 \times 10^6 m/s$

C. $1.9 \times 10^7 m/s$

D. $5.7 \times 10^7 m/s$

Answer: C

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12. The frequency of incident light falling on a photosensitive metal plate is doubled, the K.E of the emitted photo-electrons is

A. remains constant

B. becomes two times its initial value.

C. becomes more than two times its initial value.

D. becomes less than two times its initial value.

Answer: C

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13. In an X-ray tube , electrons bombarding the anode produce X-rays of wavelength 1 Å . The energy of an electron , when it hits the anode is

A. $19.8 \times 10^{-16} J$

B. $16.3 \times 10^{-16} J$

C. $13.7 \times 10^{-15} J$

D. $9.8 \times 10^{-16} J$

Answer: A

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14. When potential difference of 9V is applied between the two plates, electron accelerate between the plates with velocity

A. $1.8 \times 10^4 m/s$

B. $1.8 \times 10^6 m/s$

C. $1.8 \times 10^{-4} m/s$

D. $1.8 \times 10^{-6} m/s$

Answer: B

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

A. 

B. 

C. 

D. 

Answer: D

View Text Solution

16. The maximum kinetic energy of photoelectrons emitted from a surface when photons of energy $6eV$ fall on it is $4eV$. The stopping potential , in volt is

A. 2

B. 4

C. 6

D. 10

Answer: B

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17. The maximum kinetic energy of the photoelectrons depends only on

A. Potential

B. frequency

C. incident angle

D. pressure

Answer: B

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18. Einstein's photoelectric equation states that $E_k = hv - W$. In this equation E_k refers to

A. kinetic energy of all the emitted electrons

B. mean kinetic energy of the emitted electrons

C. maximum kinetic energy of the emitted electrons

D. minimum kinetic energy of the emitted electrons.

Answer: C

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19. 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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20. According to Einstein's photoelectric equation , the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is

A. 

B. 

C. 

D. 

Answer: D

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21. Light of wavelength A which is less than threshold wavelength is incident on a photosensitive material. If incident wavelength is decreased so that emitted photoelectrons are moving with same velocity, then stopping potential will

A. increase

B. decrease

C. be zero

D. become exactly half

Answer: A

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22. In aphotocell frequency of incident radiation is increased by keeping other factors constant $(v > v_0)$, the stopping potential

A. decreases.

B. increases.

C. becomes zero.

D. first decreases and then increases.

Answer: B

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23. The radiation of wavelength 332 nm is incident on a metal of work function 1.70 eV. The value of the stopping potential will be

A. 0.70 eV

B. 1.14 eV

C. 1.68 eV

D. 2.06 eV

Answer: D

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24. The work function of a metal is $4.2eV$, its threshold wavelength will be

A. 4000 $\mathring{A}$

B. 3500 $\mathring{A}$

C. 2959 $\mathring{A}$

D. 2500 $\mathring{A}$

Answer: C

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25. Ultraviolet radiation of 6.2 eV falls on an aluminium surface (work - function = 4.2 eV). The kinetic energy in joule of the fastest electrons emitted is

A. 3.2×10^{-21}

B. 3.2×10^{-19}

C. 3.2×10^{-17}

D. 3.2×10^{-15}

Answer: B

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26. 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. 0.65 eV

B. 1.0 eV

C. 1.3 eV

D. 1.5 eV

Answer: B

Watch Video Solution

27. A radio transmitter operates at a frequency of $880kHz$ and a power of $10kW$. The number of photons emitted per second are

A. 1.72×10^{31}

B. 1327×10^{34}

C. 13.27×10^{34}

D. 0.075×10^{-34}

Answer: A

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28. A radiation of 3300 Å falls on a metal to eject electrons with a maximum velocity of $0.4 \times 10^6 m/s$, the value of the work function of metal is nearly

$\left(h = 6.6 \times 10^{-34} J - s, m_e = 9.1 \times 10^{-31} kg\right)$

A. $5.3 \times 10^{-18} J$

B. $5.3 \times 10^{-21} J$

C. $5.3 \times 10^{-19} J$

D. $5.3 \times 10^{-16} J$

Answer: C

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29. The work function of a metallic surface is 5.01 eV. The photoelectrons are emitted when light of wavelength $2000 A$ falls on it. The potential difference applied to stop the fastes photoelectrons is $\left[h = 4.14 \times 10^{-15} eVs\right]$

A. 1.2 volts

B. 2.24 volts

C. 3.6 volts

D. 4.8 volts

Answer: A

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30. In a photoelectric experiment for 4000 Å incident radiation, the potential difference to stop the ejection is 2 V . If the incident light is

changed to 3000 Å , then the potential required to stop the ejection of electrons will be

A. 2 V

B. less than 2 V

C. zero

D. greater than 2 V

Answer: D

 Watch Video Solution

31. Light of wavelength 5000Å falls on a sensitive plate with photoelectric work function of $1.9eV$. The kinetic energy of the photoelectron emitted will be

A. 0.58 eV

B. 2.48 eV

C. 1.24 eV

D. 1.16 eV

Answer: A

Watch Video Solution

32. Lights of two different frequencies whose photons have energies 1 and 2.5 eV, respectively, successively illuminate a metal whose work function is 0.5 eV. The ratio of the maximum speeds of the emitted electrons

A. $1:2$

B. $1:5$

C. $1:1$

D. $1:4$

Answer: A

Watch Video Solution

33. 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

Watch Video Solution

34. Maximum velocity of photoelectrons emitted by a metal surface is $1.2 \times 10^6 m/s$. Assuming the specific charge of the electrons to be $1.8 \times 10^{11} C/kg$ the value of stopping potential in volt will be:

A. 2

B. 3

C. 4

D. 6

Answer: C

Watch Video Solution

35. The cathode of a photoelectric cell is changed such that the work function changes from $(W_1 \rightarrow W_2(W_2 > W_1)$. 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. $I_1 < I_2 < 2I_1$

Answer: A

Watch Video Solution

36. The threshold frequency of a certain metal is $3.3 \times 10^{14} Hz$. If light of frequency $8.2 \times 10^{14} Hz$ is incident on the metal, predict the cut off voltage for photoelectric emission. Given Planck's constant, $h = 6.62 \times 10^{-34} Js$.

A. 4.9 V

B. 3.0 V

C. 2.0 V

D. 1.0 V

Answer: C

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37. When monochromatic light of wavelength λ is incident on a metallic surface the stopping potential for photoelectric current is $3V_0$ when same surface is illuminated with light of waelength 2λ the stopping potential is V_0

The threshold wavelength for this surface when photoelectric effect takes place is

A. λ

B. 2λ

C. 3λ

D. 4λ

Answer: D

Watch Video Solution

38. When light of wavelength λ is incident on photosensitive surface, the stopping potential is V. When light of wavelength 3λ is incident on same surface, the stopping potential is $\frac{V}{6}$ Thereshould wave length for the surface is

A. 2λ

B. 3λ

C. 4λ

D. 5λ

Answer: D

Watch Video Solution

39. 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 surface is :

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

B. 3λ

C. 4λ

D. 5λ

Answer: B

Watch Video Solution

40. If 5% of the energy supplied to a bulb is irradiated as visible light, how many quanta are emitted per second by a 100 W lamp? (Assume, wavelength of visible light as $5.6 \times 10^{-5} cm$)

A. 1.4×10^{19}

B. 3×10^{3}

C. 1.4×10^{-19}

D. 3×10^{4}

Answer: A

Watch Video Solution

41. 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

42. When light of 2.5 eV falls on a metal surface, maximum kinetic energy of electron is T. If incident radiation of 4 eV falls on same metal surface, maximum kinetic energy of electrons is doubled. The work function of metal is

A. 1 eV

B. 4 eV

C. 1 .5 eV

D. 0 .5 eV

Answer: A

Watch Video Solution

43. On a photosensitive material, when frequency of incident radiation is increased by 30% kinetic energy of emitted photoelectrons increases from $0.4eV$ to $0.9eV$. The work function of the surface is

A. 1 eV

B. 1 .267 eV

C. 1 .4 eV

D. 1 .8 eV

Answer: B

Watch Video Solution

44. 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. $-3V$

B. $+3V$

C. $+4V$

D. $-1V$

Answer: A

Watch Video Solution

45. When photons of energy hv fall on an aluminium plate (of work function E_0), photoelectrons of maximum kinetic energy K are ejected . If the frequency of the radiation is doubled , the maximum kinetic energy of the ejected photoelectrons will be

A. K

B. K + hv

C. $K + E_0$

D. 2K

Answer: B

Watch Video Solution

46. Assuming photoemission to take place , the factor by which the maximum velocity of the emitted photoelectrons changes when the wavelength of the incident radiation is increased four times , is

A. 4

B. $\frac{1}{4}$

C. 2

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

Answer: D

Watch Video Solution

47. 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. $\sqrt{\frac{hv}{(2m)}}$

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

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

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

Answer: C

Watch Video Solution

48. Radiation of wavelength λ in indent on a photocell . The fastest emitted electron has speed v if the wavelength is changed to $\frac{3\lambda}{4}$, then speed of the fastest emitted electron will be

A. $< V\left(\frac{4}{3}\right)^{\frac{1}{2}}$

B. $= V\left(\frac{4}{3}\right)^{\frac{1}{2}}$

C. $= V\left(\frac{3}{4}\right)^{\frac{1}{2}}$

D. $> V\left(\frac{4}{3}\right)^{\frac{1}{2}}$

Answer: D

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49. 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

$\left(Givenh = 4.14 \times 10^{6} ms^{-1} eVs \quad \text{and} \right.$

$\left. c = 3 \times 10^{8} ms^{-1} \right)$

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

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

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

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

Answer: A

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50. 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. $\dfrac{W_0(v_2 + v_1)}{v_1V_2 + v_2V_1}$

B. $\dfrac{W_0(v_2 + v_1)}{v_1V_1 + v_2V_2}$

C. $\dfrac{W_0(v_2 - v_1)}{v_1V_2 - v_2V_1}$

D. $\dfrac{W_0(v_2 - v_1)}{v_2V_2 - v_1V_1}$

Answer: C

Watch Video Solution

51. When light falls on a metal surface , the maximum kinetic energy of the emitted photo - electrons depends upon

A. the time for which light falls on the metal

B. frequency of the incident light.

C. intensity of the incident light.

D. velocity of the incident light.

Answer: B

Watch Video Solution

52. The velocity of photon is proportional to (where v is frequency)

A. $\frac{v^2}{2}$

B. $\frac{1}{\sqrt{v}}$

C. $\sqrt{v}$

D. v

Answer: D

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53. Which of the following statements is not correct?

A. Photographic plates are sensitive to infrared rays.

B. Photographic plates are sensitive to ultraviolet rays.

C. Infra-red rays are invisible but can cast shadows like visible light.

D. Infrared photons have more energy than photons of visible light.

Answer: D

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54. If E and P are the energy and the momentum of a photon respectively,then on reducing the wavelength of photon

A. both P and E will decrease

B. both P and E will increase

C. p will increase but E will decrease

D. p will decrease but E will increase.

Answer: B

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55. _____ is the wavelength of photon of energy 35 ke V.

A. $35 \times 10^{-12} m$

B. 35 Å

C. 3.5 nm

D. 3.5 Å

Answer: A

Watch Video Solution

56. The maximum wavelength of radiation that can produce photoelectric effect in a certain metal is 200 nm . The maximum kinetic energy acquired by electron due to radiation of wavelength 100 nm will be

A. 12.4 eV

B. 6.2 eV

C. 100 eV

D. 200 eV

Answer: B

Watch Video Solution

57. The momentum of a photon is 3.3×10^{-29}kg-m/s. Its frequency will be

A. $3 \times 10^{3} Hz$

B. $6 \times 10^{3} Hz$

C. $7.5 \times 10^{12} Hz$

D. $1.5 \times 10^{13} Hz$

Answer: D

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58. 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. $zero, 1.5 \times 10^{-26} kg - m/s$

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

Answer: A

Watch Video Solution

59. The momentum of a photon is $2 \times 10^{-16} gm - cm/\text{sec}$. Its energy is

A. $0.61 \times 10^{-26} erg$

B. $2.0 \times 10^{-26} erg$

C. $6 \times 10^{-6} erg$

D. $6 \times 10^{-8} erg$

Answer: C

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60. If the energy of a photon corresponding to a wavelength of $6000 Å is 3.32 \times 10^{-19} J$, the photon energy for a wavelength of $4000 Å$ will be

A. $4.44 \times 10^{-19} J$

B. $2.22 \times 10^{-19} J$

C. $1.11 \times 10^{-19} J$

D. $4.80 \times 10^{-19} J$

Answer: D

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61. If we express the energy of a photon in KeV and the wavelength in angstroms , then energy of a photon can be calculated from the relation

A. E = 12.4 hv

B. $E = 12.4h / \lambda$

C. $E = 12.4 / \lambda$

D. E = hv

Answer: C

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62. A metal surface of work function $1.07eV$ is irradiated with light of wavelength $332nm$. The retarding potential required to stop the escape of photo - electrons is

A. 4.81 V

B. 3.74 V

C. 2.66 V

D. 1.07 V

Answer: C

Watch Video Solution

63. The work function of metal is $1eV$. Light of wavelength 3000Å is incident on this metal surface . The velocity of emitted photo - electrons will be

A. $10m/s$

B. $1 \times 10^3 m/s$

C. $1 \times 10^4 m/s$

D. $1 \times 10^6 m/s$

Answer: D

Watch Video Solution

64. Energy from the sun is recived on earth at the rate of 2 cal per cm^2 per min. If avergae wavelength of solar light be taken at $5500A$ then how many photons are recived on the earth per

cm^2 per min ?

$\left(h = 6.6 \times 10^{-34} J - s, 1cal = 4.2J\right)$

A. 1.5×10^{13}

B. 2.9×10^{13}

C. 2.3×10^{19}

D. 1.75×10^{19}

Answer: C

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65. 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. 4 mA and 1 V

B. 12 mA and 1 V

C. 3 mA and 0.5 V

D. 12 mA and 0.5 V

Answer: C

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66. When a metal surface is illuminated by light wavelengths $400nm$ and $250nm$, the maximum velocities of the photoelectrons ejected are v and $2v$ respectively . The work function of the metal is $(h = \text{Planck's constant}, c = \text{velocity of light in air})$

A. $2hc \times 10^6 J$

B. $1.5hc \times 10^6 J$

C. $hc \times 10^6 J$

D. $0.5hc \times 10^6 J$

Answer: A

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67. The velocity of the most energetic electrons emitted from a metallic surface is doubled when the frequency ν of incident radiation is double. The work function of this metal is

A. 0

B. $hv/3$

C. $hv/2$

D. $2hv/3$

Answer: D

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68. 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

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69. Ultraviolet light of wavelength 300nn and intensity $1.0 Wm^{-2}$ falls on the surface of a photosensitive material. If one per cent of the

incident photons produce photoelectrons, then the number of photoelectrons emitted per second from an area of 1.0 cm^2 of the surface is nearly

A. 9.61×10^{14} Per second

B. 4.12×10^{13} Per second

C. 1.51×10^{12} Per second

D. 2.13×10^{11} Per second

Answer: C

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70. The number of photons falling per second on a completely darkened plate to produce a force of $6.62 \times 10^{-5} N$ is 'n'. If the wavelength of the light falling is 5×10^{-7}m, then n= _____ $\times 10^{22}$. $\left(h = 6.62 \times 10^{-34} J - s\right)$

A. 1

B. 5

C. 0.2

D. 3.3

Answer: B

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71. 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. $\frac{v_2 - v_1}{K}$

Answer: B

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

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

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

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

Answer: B

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73. Two identical photo-cathodes receive light of frequencies v_1 and v_2. If the velocities of the

photoelectrons (of mass m) coming out are v_1 and v_2 respectively, then

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

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

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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74. 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 $hc = 1240eV$, 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. 2.8 eV

D. 2.5 eV

Answer: A

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75. 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. $\sqrt{\frac{2m(E-W_0)}{eB}}$

B. $\sqrt{2m(E-W_0)eB}$

C. $\sqrt{\frac{2e(E-W_0)}{mB}}$

D. $\sqrt{\frac{2m(E-W_0)}{eB}}$

Answer: D

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76. Light of wavelength λ_A and λ_B falls on two identical metal plates A and B respectively . The maximum kinetic energy of photoelectrons in K_A

and K_B respectively , then which one of the following relations is true ? $(\lambda_A = 2\lambda_B)$

A. $K_A < \frac{K_B}{2}$

B. $2K_A = K_B$

C. $K_A = 2K_B$

D. $K_A > 2K_B$

Answer: A

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77. The energy of the electromagetic wave is of the order of 15 keV. To which part of the spectrum dose it belong?

A. $\gamma - rays$

B. $X - rays$

C. Infra-red rays

D. Ultraviolet rays

Answer: B

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78. The photoelectric work function of a surface is 2.2 eV. The maximum kinetic energy of photoelectrons emitted when light of wavelength 6200 Å is incident on the surface, is

A. 0.4 eV

B. 1.2 eV

C. 1.6 eV

D. Photoelectrons are not emitted.

Answer: D

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Evaluation Test

1. Relation between the stopping potential V_0 of a metal and the maximum velocity of the photoelectrons is

A. $V_0 \propto \frac{1}{v}$

B. $V_0 \propto \frac{1}{v^2}$

C. $V_0 \propto v^2$

D. $V_0 = v$

Answer: C

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2. Radiation of wavelength 120 nm ejects photoelectrons from a plate whose work function is 3.0 eV. If a magnetic field of flux density 4.0×10^{-5} T is applied parallel to the plate, then the radius of the path followed by electrons ejected normally from the plate with maximum energy will be

A. 0.12 m

B. 0.23 m

C. 0.35 m

D. 0.46 m

Answer: B

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3. A surface receives light of wavelength $\lambda_1 = 450$ nm, causing the ejection of photo-electrons for which the stopping potential is $V_{S_1} = 0.2V$. If the radiations of wavelength $\lambda_2 = 120$ nm are now incident on the surface, the threshold frequency for the surface is

A. $2.4 \times 10^{13} Hz$

B. $4.3 \times 10^{13} Hz$

C. $6.2 \times 10^{14} Hz$

D. $8.5 \times 10^{14} Hz$

Answer: C

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4. Assertion: Photons can exist at rest.

Reason: Rest mass $m_0 = m\sqrt{\left(\frac{1 - v^2}{c^2}\right)}$

$\because$ v = c (speed of light) $\therefore$ $m_0 = 0$

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False, Reason is True.

Answer: D

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5. When a monochromatic point source of light is at a distance of 0.2 m from a photoelectric cell, the cut-offf voltage and the saturation current are respectively 0.4 V and 12 mA. If the same source is placed 0.4 m 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 4.0 mA

D. the saturation current will be 3 mA

Answer: D

View Text Solution

6. Assertion: Work function of a metal is 4 eV. The maximum wavelength of photons required to emit electrons from its surface is about 3100 Å.

Reason: Work function, $\phi_0 = hc/\lambda_{\max}$

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for

Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False, Reason is True.

Answer: A

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7. Eye of an experimenter detects the green light $(\lambda = 4000\text{Å})$ at 5×10^4 photons per square meter per second and ear can detect 10^{-13} watt per square metre. The eye is sensitive as a power detector in comparison to the ear by a factor of

A. 2 times

B. 3 times

C. 4 times

D. 5 times

Answer: D

View Text Solution

8. Photon having wavelength $\lambda = 3.5 \times 10^{-7} m$ and $\lambda = 5.4 \times 10^{-7} m$ incident on a metal surface successively, let in both cases the ration

of their stopping potential is 2 : 1, find work function :

A. 0.98 eV

B. 2.05 eV

C. 3.05 eV

D. 5.05 eV

Answer: A

Watch Video Solution

9. Illuminating a metal surface alternately with wavelengths λ_1 and λ_2, when $\lambda_1 < \lambda_2$, it is observed that corresponding ratio of maximum velocities of electrons is equal to n. Then work function of metal is

A. $\frac{hc}{n\lambda}\frac{\left(\frac{1+\lambda_2}{\lambda_1}\right)}{(n^2+1)}$

B. $\frac{hc\left(1-\frac{\lambda_2}{\lambda_1}\right)}{n^2\lambda_2(n^2-1)}$

C. $\frac{hc\left(n^2-\frac{\lambda_2}{\lambda_1}\right)}{\lambda_2(n^2-1)}$

D. $\frac{hcn\left(1-\frac{\lambda_2}{\lambda_1}\right)}{\lambda_2(n-1)}$

Answer: C

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10. A proton when accelerated through a potential difference of V volt has a wavelength λ associated with it. An alpha-particle in order to have the same λ must be accelerated through a potential difference of

A. V volt

B. 4V volt

C. 2V volt

D. $\frac{V}{8}$ volt

Answer: D

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11. The work function for the following metals is given Na: 2.75 eV, K:2.30 eV , Mo: 4.17 eV , Ni: 515 eV.

Which of these metals will not give photoelectric emission for a radiation of wavelength 3300 A from a $He - Cd$ laser placed 1m away from the

photocell? What happens if the laser is brought nearer and placed 50 cm away?

A. Na only

B. Na and K only

C. Na, K & Mo only

D. in all of them

Answer: B

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12. Assertion: Work function of a metal is proportional to maximum wavelength of the photons incident.

Reason: Work function is given by the relation, $\phi_0 = hc/\lambda \max$.

A. Assertion is True, Reason is True,

Reason is a correct explanation for Assertion.

B. Assertion is True, Reason is True,

Reason is not a correct explanation for Assertion.

C. Assertion is True, Reason is False.

D. Assertion is False, Reason is True.

Answer: D

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13. The retarding potential for having zero photo - electron current

A. is inversely proportional to the wavelength of incident light.

B. decreases uniformly with the increase in the wavelength of incident light.

C. is proportional to the frequency of incident light.

D. decreases uniformly with the increases in the frequency of incident light wave.

Answer: C

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14. A proton and an α-particle are accelerated through same potential difference. Find the ratio of their de-Brogile wavelength.

A. $2:1$

B. $1:1$

C. $1:2$

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

Answer: D

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15. Light of wavelength 3000 $\mathring{A}$ falls on a sensitive surface. If the surface has received 10^{-7} J of energy, then number of photons just falling on the surface area

A. 1.5×10^{6}

B. 1.5×10^{11}

C. 1.5×10^{3}

D. 2.5×10^{11}

Answer: B

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16. The work function for aluminium is 4.125 eV. The cut-off wavelength for photoelectric effect for aluminium will be

A. 420 nm

B. 150 nm

C. 300 nm

D. 200 nm

Answer: C

Watch Video Solution

17. Two metallic plates P(collector) and Q (emitter) are separated by a distance of 0.2 m. These are connected through an 0.2 m. These are connected through an ammeter without any cell. A magnetic field B exists parallel to the plates. Light of wavelengths between 2000 $\mathring{A}$ and 3000 $\mathring{A}$ fall of the plate Q whose work function is 2.22 eV.

The minimum value of B for which the current registered with ammeter is zero, is

A. $3.8 \times 10^{-5} T$

B. $4.7 \times 10^{-5} T$

C. $6.7 \times 10^{-5} T$

D. $8.6 \times 10^{-5} T$

Answer: C

View Text Solution

18. Lights of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively illuminate successively a metal surface whose work function is 0.6 eV. The ratio of the maximum speeds of the emitted electrons will have

A. $1:2$

B. $1:3$

C. $1:4$

D. $1:5$

Answer: c

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19. When a metal surface is illuminated by a monochromatic light of wave-length λ, then the potential difference required to stop the ejection

of electrons is $3V$. When the same surface is illuminated by the light of wavelength 2λ, then the potential difference required to stop the ejection of electrons is V. Then for photoelectric effect, the threshold wavelength for the metal surface will be

A. 6λ

B. $4\lambda/3$

C. 4λ

D. 8λ

Answer: C

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