PHYSICS

BOOKS - NIKITA PHYSICS (HINGLISH)

ELECTRONS AND PHOTONS

Mcqs

1. The process , in which photoelectrons are emitted due to electromagnetic radiation , is called

A. primary emission

B. secondary emission

C. thermionic emission

D. photoelectric emission

Answer: D

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2. Work function of metal is

A. minimum energy required to free an electron from surface against coulomb forces

B. minimum energy required to free a nucleon

C. maximum energy required to eject an electron from electronic orbit

D. minimum energy to ionise an atom

Answer: A

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3. The work function for photoelectric effect

A. depends upon the frequency of incident light

B. is same for all metals

C. is different for different metals

D. none of these

Answer: C

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4. Photoelectrons emitted from a metallic surface are those which are

A. present inside the nucleus

B. are orbiting very near to nucleus

C. are generated by the decay of neutrons within the nucleus

D. free to move within interatomic spacing

Answer: D

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5. 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 impinge 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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6. Photo electric effect can be explained only by assuming that light

A. is a form of transverse waves

B. is a form of longitudinal waves

C. consists of quanta

D. can be polarised

Answer: B

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7. The photoelectric effect is based on the law of conservation of

A. energy

B. linear mass

C. linear momentum

D. angular momentum

Answer: A

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8. Photoelectric effect was successfully explained first by

A. Planck

B. Maxwell

C. Einstein

D. Bohr

Answer: C

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9. In photoelectric effect

A. light energy is converted into the heat energy

B. light is converted into electric energy

C. light energy is converted into the sound energy

D. electric energy is converted into light energy

Answer: B

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10. The momentum of a photon of wavelength λ is

A. $h\lambda$

B. h/λ

C. λ / h

D. $h / c\lambda$

Answer: B

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

A. Zero

B. $h / c\lambda$

C. h/λ

D. hc/λ

Answer: A

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12. In photoelectric effect, the number of photoelectrons emitted is proportional to :

A. intensity of incident beam

B. frequency of incident beam

C. velocity of incident beam

D. none of these

Answer: A

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13. A metallic surface ejects electrons when hit by green light but none when hit by yellow light .

Will the electrons be ejected if the same surface is hit by red light

A. yes

B. no

C. yes, if the red beam is sufficiently intense

D. yes , if the red beam is allowed to fall for sufficient duration

Answer: B

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14. Photoelectric effect supports quantum nature of light because :

A. there is minimum frequency of light below which no photoelectrons electrons are emitted

B. even when a metal surface is fairly illustrated , the photoelectrons leave the surface immediately

C. electric charge of photoelectrons is quantised

D. none of these

Answer: A

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15. The strength of the photoelectric current depends upon

A. frequency of incident radiation

B. intensity of incident radiation

C. angle of incident radiation

D. distance between anode and cathode

Answer: B

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16. The threshold wavelength for photoelectric emission from a material is 5200Å. Photoelectrons will be emitted when this material is

illuminated with monochromatic radiation from a

(a) 50 W infrared lamp

(b) 1 W infrared lamp

(c) 50 W ultraviolet lamp

(d) 1 W ultraviolet lamp

.

A. 50 watt infrared lamp

B. 1 watt infrared lamp

C. 1 watt ultraviolet lamp

D. none of these

Answer: C

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17. The frequency and the intensity of a beam of light falling on the surface of a photoelectric material are increased by a factor of two. This will

A. increase the maximum kinetic energy of the photoelectrons as well as photoelectric current by a factor of two

B. increase the maximum kinetic energy of photoelectrons and would increase the photoelectric current by a factor of two

C. increase the maximum kinetic energy of photoelectrons by a factor of two and will have no effect on photoelectric current

D. increase the photoelectric current by a factor of two but will have no effect in kinetic energy of emitted electrons

Answer: B

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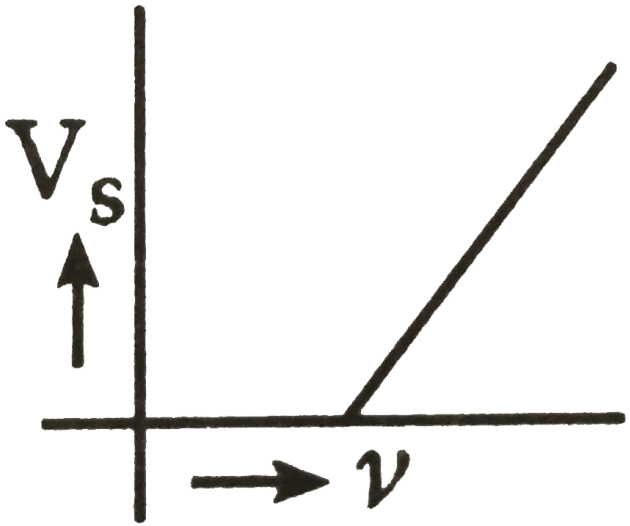
18. In photoelectric effect the slope of straight line graph between stopping potential (V_s)

and frequency of incident light (v) gives



A. charge on electrons

B. work function of emitter

C. Planck's constant

D. ratio of Planck's constant to charge on electron

Answer: D

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19. In photoelectric effect , photocurrent

A. depends upon intensity of incident beam and not on the frequency of photons

B. depends upon intensity beam and not on the frequency of photons

C. increases with increase of frequency of the incident photons

D. decreases with increase of frequency of the incident photons

Answer: A

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20. The photoelectron emitted from a metal surface are such that their velocity

A. is zero for all

B. is same for all

C. lies between zero to infinity

D. lies between zero and a finite maximum

Answer: D

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21. By increasing the intensity of incident light on the surface of a metal

A. K.E. of photoelectrons increases

B. number of emitted electrons increases

C. kinetic energy and number of electrons increases

D. no effect

Answer: B

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22. When a given electromagnetic radiation illuminates the metal surface , the maximum kinetic energy of photoelectrons depends on

A. frequency of radiation

B. intensity of radiation

C. frequency and intensity of radiation

D. polarisation of radiation

Answer: A

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23. Photoelectrons are emitted by a metal surface only when

A. the frequency of incident light exceeds a certain minimum value

B. the wavelength of the incident light exceeds a certain minimum value

C. the light is incident at an angle greater than the critical angle

D. the metal is initially charged

Answer: A

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24. The electrons are emitted in a photoelectric effect from a metal surface

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

B. only if the temperature of surface is low

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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25. Photo electric effect is the phenomenon in which

A. photons come out of a metal when it is hit by a beam of electrons

B. photons come out of the nucleus of an atom under the action of an electric field

C. electrons come out of a metal with a constant velocity depends upon frequency and intensity of incident light

D. electrons come out of a metal with different velocities not greater than a certain value which depends only on the

frequency of the incident wave and not its intensity

Answer: D

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26. In the photoelectric effect the velocity of the ejected electrons depends upon the nature of the target and

A. the frequency of the incident light

B. the intensity of the incident light

C. the time for which the light has been incident

D. the polarization of the incident light

Answer: A

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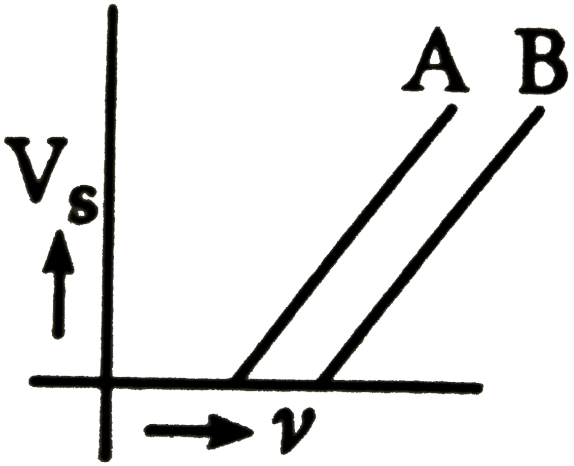
27. The stopping potential as a function of frequency of incident radiation is plotted for two different photoelectric surfaces A and B .

The graphs as shown in figure shows that , the work function of A is



A. greater than that of B

B. smaller than that of B

C. same as that of B

D. no comparison be made from given graphs

Answer: B

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28. Photoelectric effect is explained by

A. classical theory

B. quantum theory

C. theory of special relativity

D. all of these

Answer: B

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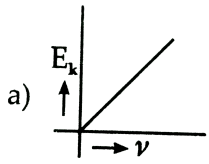
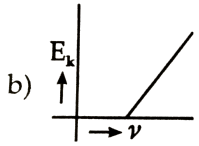
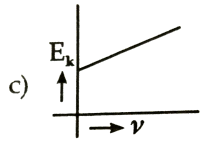
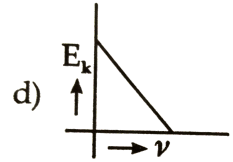
29. Maximum kinetic energy (E_k) of a photoelectron varies with the frequency (v) of the incident radiation as

A. 

B. 

C. 

D. 

Answer: B

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30. In order to increase the kinetic energy of ejected photoelectrons , there should be an

increase in

A. intensity of radiation

B. wavelength of radiation

C. frequency of radiation

D. both 'a' and 'b'

Answer: C

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31. The phenomenon of photoelectric emission was discovered in 1887 by

A. Hertz

B. Einstein

C. Lenard

D. Hallwach

Answer: A

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

A. v

B. $\sqrt{v}$

C. $1/v$

D. v^2

Answer: A

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

A. same as those coming from interior of metal

B. larger than those coming from interior of metal

C. less than those coming from interior of metal

D. none of these

Answer: B

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34. In photoelectric emission, the energy of the emitted electron is

A. less than that of incident photon

B. larger than that of incident photon

C. the same as that of incident photon

D. proportional to the intensity of incident light

Answer: A

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35. 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. $v < \phi / h$

B. $v = \phi / h$

C. $v > \phi / h$

D. $v \geq \phi / h$

Answer: A

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36. Which of the following is dependent on the intensity of incident radiation in a photoelectric experiment

A. Amount of photoelectric current

B. Work function of the metal surface

C. Threshold wavelength

D. Stopping potential to reduce photoelectric current to zero

Answer: D

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37. Photoelectric effect supports

A. Newton's corpuscular nature of the light

B. Huygen's wave theory of the light

C. Maxwell's electromagnetic theory of light

D. Einstein's quantum theory of light

Answer: A

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38. Threshold wavelength for photoelectric effect on sodium is 5000Å . Its work function is

A. 15 J

B. $16 \times 10^{-14} J$

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

D. $4 \times 10^{-18} J$

Answer: C

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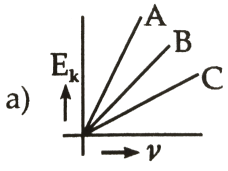
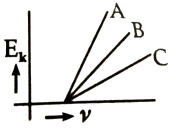
39. For three different metals A , B and C , photoemission is observed one by one and E_k V/s v is plotted . Which one of the following represent this curve correctly ?

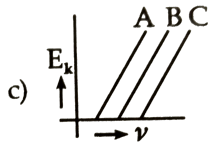
A.



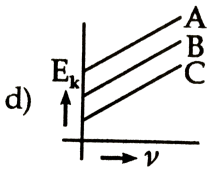
B.



C.



D.



Answer: C

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40. When light of wavelength $300nm$ (nanometre) falls on a photoelectric emitter , however light of $600nm$ wavelength is sufficient for creating photoemission . What is the ratio of the work functions of the two emitters ?

A. $1:2$

B. $2:1$

C. $4:1$

D. $1:4$

Answer: B

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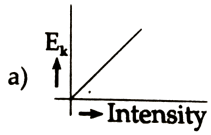
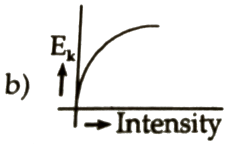
41. Which of the following graphs represents correctly the variations of $0.5mv_{\max}^2$ with the intensity of incident radiations of a constant frequency ?

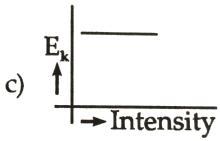
A.



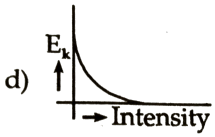
B.



C.



D.



Answer: C

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42. If the radiation is incident on the metallic surface of work function $1.32 \times 10^{-12} J$. The threshold frequency should be

A. 2×10^{21} Hz

B. 2×10^{-21} Hz

C. 20×10^{21} Hz

D. 20×10^{-21} Hz

Answer: A

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43. A metal surface is illuminated by a light of given intensity and frequency to cause photoemission. If the intensity of illumination is reduced to one-fourth of its original value, then the maximum KE of emitted photoelectrons will become.

A. uncharged

B. half of the original value

C. twice of the original value

D. four times of the original value

Answer: A

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

A. V_0

B. $2V_0$

C. $4V_0$

D. none of these

Answer: D

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45. Einsteins photoelectric equation is

A. $hv = hv_0 + \frac{1}{2}mv^2$

B. $hv_0 = hv + \frac{1}{2}mv^2$

C. $hv = \frac{1}{2}mv^2$

D. $2hv = hv_0 + mv^2$

Answer: A

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46. In photoelectric effect when photons of energy hv fall on a photosensitive surface (work function hv^) electrons are emitted from the metallic surface with a kinetic energy. It is possible to say that:

A. all ejected electrons have same kinetic energy equal to $hv - hv_0$

B. the ejected electrons have a distribution of kinetic energy from zero $(hv - hv_0)$

C. the most energetic electrons have kinetic energy equal to hv

D. all ejected electrons have kinetic energy hv_0

Answer: B

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47. Einstein's photoelectric equation states that $E_k = hv - \phi$. In this equation E_k refers to

A. kinetic energy of all ejected electrons

B. mean kinetic energy of emitted electrons

C. minimum kinetic energy of emitted electrons

D. maximum kinetic energy of the emitted electrons

Answer: D

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48. Radiations of two photon's energy, twice and ten times the work function of metal are incident on the metal surface successsively. The ratio of maximum velocities of photoelectrons emitted in two cases is

A. $1:1$

B. $1:2$

C. $1:3$

D. $1:4$

Answer: B

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49. If ultraviolet radiation of 6.2 eV falls of an aluminium surface , then kinetic energy of the fastest emitted electrons is (work function = 4.2 e V)

A. $3.2 \times 10^{-19} J$

B. $3.2 \times 10^{-21} J$

C. $7 \times 10^{-25} J$

D. $9 \times 10^{-31} J$

Answer: A

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50. Light of wavelength 3×10^{-7}m is incident on a photosensitive surface . The stopping potential for emitted photoelectrons is 2.5 V .

If the wavelength of incident light is reduced to 1.5×10^{-7} m , the stopping potential for emitted photoelectrons is

A. equal to 5 V

B. less than 5 V

C. more than 5 V

D. between 2.5 V and 5 V

Answer: C

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51. For a certain metal $v = 2v_0$ and the electrons come out with a maximum velocity of 4×10^6 m/s . If the value of $v = 5v_0$, then maximum velocity of the photoelectrons will be

A. 8×10^5 m/s

B. 2×10^6 m/s

C. 8×10^6 m/s

D. 2×10^7 m/s

Answer: C

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52. The energy of incident radiation, which emits the electrons with a velocity of 2.5×10^6 m/s and work function 1.8 e V , is

A. 1.937 eV

B. 2 e V

C. 19.57 e V

D. 20.1 eV

Answer: C

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53. An electron of work function 1.4 eV is emitted with a velocity 5×10^6 m/s . The wavelength of the incident radiation is

A. 0.017 Å

B. 1.7 Å

C. 17 Å

D. 170 Å

Answer: D

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54. The photoelectron of work function 3.1 eV is emitted with velocity 2.5×10^6 m/s . The frequency of incident radiation is

A. 2.5×10^{14} H z

B. 5.25×10^{14} Hz

C. 5.1×10^{15} Hz

D. 10.5×10^{14} Hz

Answer: C

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55. When an inert gas is filled in the place vacuum in a photo cell , then

A. photo current will decrease

B. photo current will increase

C. photo current remains the same

D. photo current does not depend upon the filled gas

Answer: B

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56. In photoelectric cell ,the electrons leave the surface with maximum energy , which are

A. just on the surface

B. just below the surface

C. 2 mm above the surface

D. 2 mm below the surface

Answer: A

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57. The stopping potential for the photoelectrons , from a photocell , is proportional

A. directly on the intensity of incident light

B. inversely to the intensity of incident light

C. directly to the frequency of incident light

D. inversely to the frequency of incident light

Answer: C

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58. The maximum number of the photoelectrons , released in a photocell , is independent of

A. nature of the cathode surface

B. frequency of the incident light

C. intensity of the radiations

D. whether of the atmosphere

Answer: B

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59. The use of photoelectric cell in cinema depends upon the fact that the number of electrons produced is directly proportional to

A. charge of electrons

B. wavelength of light

C. intensity of light

D. all of these

Answer: C

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60. Photoelectric cell is a device in which the light energy is converted into

A. heat energy

B. mechanical energy

C. electric energy

D. kinetic energy

Answer: C

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61. The maximum energy of the electrons released in photocell is independent of -

A. frequency of incident light

B. intensity of incident light

C. nature of cathode surface

D. both 'a' and 'c'

Answer: B

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62. 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: C

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63. A milliammeter in the circuit of a photoelectric cell measures

A. the photon energy

B. the velocity of photoelectrons

C. the kinetic energy of photoelectrons

D. the number of electrons releases per second

Answer: D

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64. A lamp is placed at a distance of 16 cm, from a photocell and the current observed is 1 mA. If the distance from the lamp is reduced to 8 cm, the photocurrent now will be

A. 4 mA

B. 0.25 mA

C. 1m A

D. 0.125 mA

Answer: A

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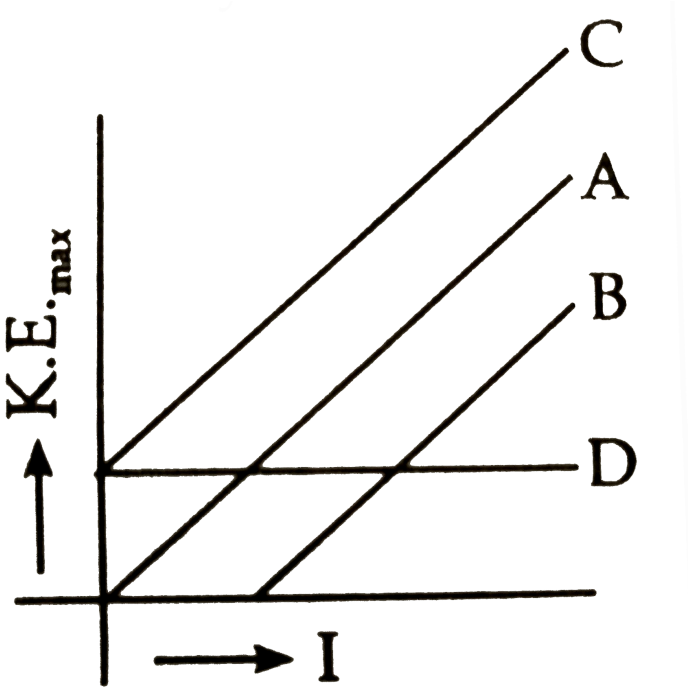
65. Which of the following graphs shows relation between maximum K.E. and intensity I of incident light of photocell ?



A. B

B. D

C. A

D. C

Answer: B

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66. Light from a hydrogen tube is incident on the cathode of a photoelectric cell the work function of the cathode surface is $4.2eV$. In order to reduce the photo - current to zero

the voltage of the anode relative to the cathode must be made

A. $-4.2V$

B. $-9.4V$

C. $-8.4V$

D. $-9.4V$

Answer: B

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67. A wave is associated with matter when it is

A. when it is stationary

B. when it is in motion with any velocity

C. when it is in motion with velocity of light

D. none of these

Answer: B

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68. The amount of energy radiated by a body depends upon

A. the area of the surface

B. the temperature of its surface

C. the nature of its surface

D. all of these

Answer: D

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69. The rest mass of the photon is

A. 9×10^{-31} kg

B. 1.76×10^{-35} kg

C. zero

D. one a.m.u

Answer: C

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70. If the energy of a photon is 10 eV , then its momentum is

A. 5.33×10^{-23} kg m/s

B. 5.33×10^{-25} kg m/s

C. 5.33×10^{-27} kg m/s

D. 5.33×10^{-29} kg m/s

Answer: C

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71. Of the following properties the photon does not possess

A. rest mass

B. energy

C. momentum

D. frequency

Answer: A

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72. A photon , an electron and a uranium nucleus all have the same wavelength . The one with the most energy

A. is the proton

B. is the electron

C. is the uranium nucleus

D. depends upon the wavelength and properties of the particles

Answer: A

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

A. radioactivity

B. thermionic emission

C. interference of light

D. thermal radiations of a black body

Answer: D

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74. A photon in motion has a mass

A. c/hv

B. h/v

C. hv

D. hv/c^2

Answer: D

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75. The energy radiated from a source is in the form of

A. atoms

B. photons

C. deuterons

D. electrons

Answer: B

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76. A metal surface is illuminated by the protons of energy 5 eV and 2.5 eV respectively . The ratio of their wavelength is

A. $1:3$

B. $1:4$

C. $1:2$

D. $2:1$

Answer: C

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77. The energy of a photon of wavelength λ is given by

A. $hc\lambda$

B. hc/λ

C. λ/hc

D. $h\lambda/c$

Answer: B

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78. The work function of a substance is $1.6eV$. The longest wavelength of light that can produce photoemisson form the substance is

A. 2900 Å

B. 3867 Å

C. 5800 Å

D. 7734 Å

Answer: D

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79. The momentum of moving particle is p . The wavelength λ of the associated matter wave will be

A. h/p

B. hp

C. p/h

D. p

Answer: A

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80. Which of the following is incorrect statement regarding photon

A. Photon's energy is hv

B. Photons exert no pressure

C. Momentum of photon is hv/c

D. Photon's rest mass is zero

Answer: B

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81. What is the energy , in joule , associated with a photon of wavelength 4000 Å ?

A. 3.09 J

B. 3.09 eV

C. 4.97×10^{-19} eV

D. none of these

Answer: B

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82. If a photon has velocity c and frequency v , then which of the following represents its wavelength ?

A. $\frac{hc}{E}$

B. $\frac{hv}{E}$

C. $\frac{hc}{c^2}$

D. hv

Answer: A

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83. The kinetic mass of a photon is given by

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

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

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

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

Answer: A

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84. The number of photons required to give a definite energy W varies

A. inversely as the frequency

B. directly as the frequency

C. independent of the frequency

D. inversely as the wavelength

Answer: A

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85. A quantum of light energy is called

A. proton

B. photon

C. electron

D. neutron

Answer: B

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86. It is essential to consider light as a stream of photons to explain

A. reflection of light

B. photoelectric effect

C. refraction of light

D. diffraction of light

Answer: B

Watch Video Solution

87. What is the momentum of a photon of frequency v ?

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

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

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

D. h v c

Answer: B

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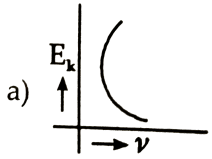
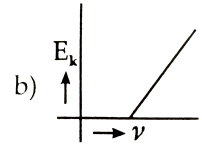
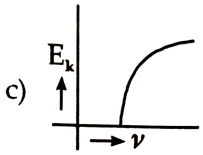
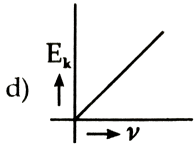
88. The kinetic energy (E_k) of a photoelectron varies with the frequency (v) of the incident radiation as which of the following graph ?

A. 

B. 

C. 

D. 

Answer: B

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89. 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. 1.11×10^{-19} J

B. 2.22×10^{-19} J

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

D. 4.98×10^{-19} J

Answer: D

Watch Video Solution

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

A. 1.24×10^{15} Hz

B. 2.4×10^{15} Hz

C. 1.24×10^{20} Hz

D. 2.4×10^{20} Hz

Answer: D

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91. The dual nature of matter was predicted by

A. Einstein

B. Compton

C. de Broglie

D. Thomson

Answer: C

Watch Video Solution

92. The wavelength of an electron , moving with the velocity 3×10^3 m/s , is nearly equal to

A. 2×10^{-12}m

B. 6×10^{-13} m

C. 2.5×10^{-7} m

D. 8×10^{-10}m

Answer: A

Watch Video Solution

93. If we consider electrons and photons of same wavelength , then they will have same

A. energy

B. velocity

C. momentum

D. angular momentum

Answer: C

Watch Video Solution

94. The photoelectrons emitted from a given cathode , on the incidence of a given monochromatic beam of light have

A. an energy spread with a lower limit

B. an energy spread with an upper limit

C. an energy spread with no sharp limit

D. a definite energy only

Answer: B

Watch Video Solution

95. An electron behaves as a

A. particle

B. wave

C. neither 'a' nor 'b'

D. both 'a' and 'b'

Answer: D

 Watch Video Solution

96. The photons are incident on a metallic surface of frequency n . If the frequency of the radiation becomes double , the momentum of the photon

A. becomes half

B. remains the same

C. becomes double

D. becomes four times

Answer: C

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97. An electron moving with a kinetic energy of 1.5×10^3 eV enters in a region of uniform magnetic field of induction $4 \times 10^{-3} Wb/m^2$

at right angles to the direction of motion of the electron . The radius of circular path of the electron in the magnetic field is

A. 5.3 cm

B. 3.3 cm

C. 3.8 cm

D. 8.5 cm

Answer: B

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98. An electron performs uniform circular motion in a region of magnetic field of induction $3 \times 10^{-3} Wb/m^2$. If the radius of the circular path of the electron is 2 cm , then the momentum of the electron will be

A. 9.6×10^{-24} kg m/s

B. 6.9×10^{-24} kg m/s

C. 9.6×10^{24} kg m/s

D. 6.9×10^{7} kg m/s

Answer: A

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99. An electron of velocity 2.652×10^7 m/s enters a uniform magnetic field of direction of motion . The radius of its path is

A. 5.3 mm

B. 3.5 mm

C. 0.3 mm

D. 3.0 mm

Answer: C

Watch Video Solution

100. In an experiment to measure the charge on an electrons , the electrons travelling at a speed of 1.825×10^7 m/s are subjected to a deflecting electric field 3.2×10^4 V/m . The intensity of magnetic field applied so that the beam remains undeflected is

A. $1.7 \times 10^{-3} Wb/m^2$

B. $7.1 \times 10^{-3} Wb/m^2$

C. $1.7 \times 10^3 Wb/m^2$

D. $7.1 \times 10^3 Wb/m^2$

Answer: A

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101. An electron moving horizontally enters in a uniform electric field of intensity 100 V/m directed vertically downwards . The upward displacement of the electron at the end of 0.02 μ s is

A. 3.0 mm

B. 6.5 mm

C. 3.5 mm

D. 5.3 mm

Answer: C

Watch Video Solution

102. The potential difference through which an electron should be accelerated from rest so that it acquires a speed of 2×10^7 m/s is

A. 3117 V

B. 1137 V

C. 3711 V

D. 7311 V

Answer: B

Watch Video Solution

103. In a velocity selector , the intensity of the electric field is 3×10^4 V/m and the strength of the magnetic field is $0.015 Wb/m^2$. The

speed of the charged particles which pass undeflected through the velocity selector is

A. 2×10^{6} m/s

B. 2×10^{-6} m/s

C. 5×10^{6} m/s

D. 5×10^{-6} m/s

Answer: A

Watch Video Solution

104. In J.J. Thomson's experiment a potential difference of 600 V is applied and deflection of spot is obtained on fluorescent screen . The spot was brought to its original position by applying uniform magnetic induction . The velocity of the beam of electron was found to be 4×10^7 m/s . The value of magnetic induction if distance between the plates is 0.3 cm is

A. $7 \times 10^3 T$

B. 5×10^3 T

C. $7 \times 10^{-3} T$

D. 5×10^{-3} T

Answer: D

View Text Solution

105. The threshold wavelength for tungsten is 2730 Å . The work function of tungsten is

A. 4.5eV

B. 5.4 eV

C. 5.0 eV

D. 4.0 eV

Answer: A

Watch Video Solution

106. The wave number corresponding to threshold wavelength of a given metal is $3 \times 10^6 m^{-1}$. The work function of the metal is

A. 5.5 eV

B. 3.7 eV

C. 4.5 e V

D. 7.3 eV

Answer: B

 Watch Video Solution

107. The frequency and wavelength of radiation which has energy of 5 eV is

A. 1.2×10^{15} Hz , 2848 Å

B. 1.2×10^{13} Hz , 2488 Å

C. $1.2 \times 10^{15} Hz,$ 2488Å

D. 2.1×10^{15} Hz , 2488 Å

Answer: C

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108. The photoelectric work function of a metal is 3 eV . The maximum kinetic energy of

the emitted electrons when light of wavelength 3000 Å falls on it is

A. 1.14 eV

B. 11.4 eV

C. 4.14 eV

D. 1.44 eV

Answer: A

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109. The threshold wavelength for a metal is 5000 Å . The maximum K.E. of the photoelectrons emitted when ultraviolet ligh of wavelength 2500 Å falls on it is

A. 8.28 eV

B. 4.28 e V

C. 2.48 eV

D. 24. 8 e V

Answer: C

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110. When the ultraviolet light of wavelength 1.8×10^{-7} m falls on certain metal , electrons with maximum K.E. of 1.51 eV are emitted . The work function of the metal is

A. 5.0 eV

B. 5.4 eV

C. 4.5 eV

D. 4.0 eV

Answer: B

Watch Video Solution

111. The light radiation of wavelength 6000 Å falls on a metal . The threshold frequency of a metal surface is 4×10^{14} Hz . The maximum velocity of the emitted photoelectrons is

A. 3.0×10^{5} m/s

B. 3.8×10^{-5} m/s

C. 3.8×10^{5} m/s

D. 8.3×10^5 m/s

Answer: C

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112. When light of wavelength 2000 Å is incident on tungsten the maximum velocity of photoelectrons ejected is observed to be 8×10^5 m/s . The threshold wavelength for tungsten is

A. 8822 Å

B. 2828 Å

C. 2882 Å

D. 2288 Å

Answer: B

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113. A photon of energy 12 V falls on metal surface whose work function is 4.15 eV . The stopping potential is

A. 7.85 V

B. 8.75 V

C. 7.00 V

D. 5.50 V

Answer: A

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114. The photoelectric work function of the emitter of a photocell is 3.63 eV . The

frequency of incident light radiation if the stopping potential of the emitter is 3 volt , is

A. 1.1×10^{15} Hz

B. 6.6×10^{15} Hz

C. 1.6×10^{15} Hz

D. 6.1×10^{15} Hz

Answer: C

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115. The threshold wavelength of a metal is 230 nm . The maximum K.E. of the electrons ejected from the metal surface by the radiation of wavelength 180 nanometer is

A. 1.5 eV

B. 5.1 eV

C. 5.5 e V

D. 1.0 eV

Answer: A

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Watch video solution

116. The photoelectric work function for potassium is 2 eV . The light of wavelength 3.6×10^{-7} m falls on potassium . The stopping potential is

A. 5.45 volt

B. 1.45 volt

C. 14.5 volt

D. 4.45 volt

Answer: B

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117. If the photoelectric work function of a metal is 5 eV , the threshold frequency of the metal is

A. 2.2×10^{15} Hz

B. 1.2×10^{15} Hz

C. 1.5×10^{15} Hz

D. 5.1×10^{15} Hz

Answer: B

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118. A charged water drop of weight 4×10^{-18} kg and charge 1.6×10^{-19} C is stable in an electric field . What is the intensity of electric field

A. $150 Vm^{-1}$

B. $200 Vm^{-1}$

C. $250 Vm^{-1}$

D. $50Vm^{-1}$

Answer: C

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119. 10^{20} photons of wavelength 660 nm are emitted per second from a lamp . What is the wattage of the lamp ?

A. 30 W

B. 60 W

C. 100 W

D. 500 W

Answer: A

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120. A radio station operates at a frequency of 108.7 MHz with power out put of 250 kW . The rate of emission of quanta from the station is

A. 2.0×10^{30} quanta/s

B. 3.4×10^{30} quanta/s

C. 3.4×10^{20} quanta/s

D. 4.3×10^{30} quanta /s

Answer: B

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121. Work function of tungsten and sodium are 4.4 eV and 2.3 eV respectively . If threshold wavelength of sodium is 5460 Å , then the threshold wavelength of tungsten is

A. 2854 Å

B. 4840 Å

C. 5460 Å

D. 2730 Å

Answer: A

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122. 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. 2.5×10^{-19} J

B. 5×10^{-19} J

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

D. 1×10^{-19} J

Answer: C

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123. 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. $4:1$

B. $1:4$

C. $1:2$

D. $2:1$

Answer: B

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124. Light of wavelength 2200 Å falls on a metal surface . If 4.1 eV energy is required to remove the electron , find the stopping potential .

A. 5.63 V

B. 1.53 V

C. 6.04 V

D. 6.63 V

Answer: B

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125. Light of wavelength 5000 Å and intensity of $3.96 \times 10^{-3} wa / cm^2$ is incident on the surface of photo metal . If 1% of the incident photons only emit photo electrons , then the number of electrons emitted per unit area per second from the surface will be

A. $9.82 \times 10^{17} m^{-2} / 2$

B. $9.82 \times 10^{13} m^{-2} / s$

C. $9.82 m^{-2} / s$

D. `none of these

Answer: A

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126. 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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127. 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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128. Light of waelength 4000Å is incident on a metal plate with work function 2eV. The max. K.E. of the photoelectrons is

A. 2 eV

B. 1.5eV

C. 1.1 eV

D. 1.47 eV

Answer: C

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129. The ratio of energy of photon of a wavelength 10^{-10} m that of photon of wavelength 5×10^{-8} m is

A. $50:1$

B. $200:1$

C. $500:1$

D. $100:1$

Answer: C

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130. The $\frac{e}{m}$ value of electron is

A. 1.76×10^{11} C/kg

B. 3.62×10^{11} C /kg

C. 6.62×10^{11} C/kg

D. 9.1×10^{11} C/kg

Answer: A

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131. 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. 13.7×10^{-16} J

D. 9.8×10^{-16} J

Answer: A

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132. Number of electrons emitted by a surface exposed to light is directly proportional to

A. velocity of light

B. intensity of light

C. frequency of light

D. wavelength of light

Answer: B

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133. As the intensity of incident light increases

A. photoelectric current increases

B. photoelectric current decreases

C. kinetic energy of photoelectric increases

D. kinetic energy of photoelectrons decreases

Answer: A

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134. The radius of circular path of an electron when subjected to a perpendicular magnetic field is

A. Be/mv

B. mE/B

C. me/B

D. mv/Be

Answer: D

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135. A charged particle is projected in a chamber with velocity v . It moves undeflected . What can be definitely said about the field ?

A. only $\overrightarrow{E}$ present

B. only $\overrightarrow{B}$ present

C. both $\overrightarrow{E}$ and $\overrightarrow{B}$ present

D. none of these

Answer: C

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136. An electron moving at the speed of 10^7 m/s , enters a magnetic field of induction 0.1 T at right angle to the velocity of electron . The radius of circular path followed by the electron is

A. 0.57 cm

B. 5.7 cm

C. 0.57 mm

D. 0.27 mm

Answer: C

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137. An electron experiences a force equal to its weight, when placed in an electric field. The intensity of the field will be

A. 1.7×10^{-11} N/C

B. 5×10^{-11} N/C

C. 17×10^{-11} N/C

D. 50×10^{-11} N/C

Answer: B

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138. Mutually perpendicular electric and magnetic fields are given by E = 1500 V/m and B = 0.04 T . Then velocity is given by

A. 60 m/s

B. 3.75×10^6 m/s

C. 3.75×10^4 m/s

D. 60×10^4 m/s

Answer: C

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139. 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 e V

C. 1.5 eV

D. 0.5 eV

Answer: A

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140. Electron moves in uniform magnetic field perpendicular to direction of field . The magnitude of field is $35.21 \times 10^{-6} T$. Calculate the time in which it will perform one

revolution .

(e/m = 1.76×10^{11} C/kg)

A. $1\ \mu s$

B. $0.5 \mu s$

C. $2 \mu s$

D. $1.5 \mu s$

Answer: A

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141. Photoelectric emission takes place

A. when incident wavelength is greater than threshold wavelength

B. when incident wavelength is less than threshold wavelength

C. when incident frequency is greater than threshold frequency

D. at any frequency

Answer: C

Watch Video Solution

142. An electron is accelerated from rest to potential V. the final velocity of electron is

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

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

C. $\sqrt{\frac{4eV}{m}}$

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

Answer: D

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143. An electron is projected in a perpendicular uniform magnetic field of 3×10^{-3} T . If electron moves in circle of radius 4 mm , then linear momentum of electron is

A. 1.92×10^{-21} kg m/s

B. 1.92×10^{-24} kg m/s

C. 1.2×10^{-21} kg m/s

D. 3.2×10^{-21} kg m/s

Answer: B

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144. The stopping potential of a given photoelectric device is depended on

A. intensity

B. frequency

C. velocity of photon

D. work function

Answer: B

Watch Video Solution

145. The radiations of 1 eV and 2.5 eV are incident on a metal having a work function of 0.5 eV . The ratio of their maximum velocities is

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

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

C. $\frac{2}{5}$

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

Answer: A

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146. When temperature of a metal increases ,

A. K.E. of the electrons increases

B. K.E. of the electrons decreases

C. all the electrons are ejected from the atom

D. all the atoms are ionised

Answer: A

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147. An electron is fired through a region of crossed electric and magnetic field (0.05 T) . The electric field is formed between two plates separated by a distance of 2 mm having a P.D. of 125 V . The speed of the electron is

A. 12.5×10^6 m/s

B. 1250 K m/s

C. 125 K m/s

D. 1.25×10^7 m/s

Answer: B

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148. A charge q , and mass m , is fired perpendicular to a magnetic field (B) with a velocity v . The frequency of revolution of the charge is

A. 2π /Bq

B. 2π Bq/m

C. $2\pi m$ /Bq

D. Bq/$2\pi m$

Answer: D

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

A. 1.8×10^6 m/s

B. 1.8×10^5 m/s

C. 2.1×10^5 m/s

D. 1.8×10^4 m/s

Answer: B

Watch Video Solution

150. An electron enters in a magnetic held of induction 2 m T with velocity of 1.8×10^7 m/s . The radius of circular path is

A. 5.1 cm

B. 5.1 mm

C. 5 km

D. 2.1 cm

Answer: A

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151. Speed of an electron passing undeviated through a region of cross electric and magnetic fields of magnitude 4×10^5 V/m and

$0.02Wb/m^2$ respectively in meter per second

is

A. 2×10^6

B. 8×10^7

C. 8×10^6

D. 2×10^7

Answer: D

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152. In photoelectric effect if the intensity of light is doubled then maximum kinetic energy of photoelectrons will become

A. double

B. half

C. four time

D. no change

Answer: D

Watch Video Solution

153. Calcium plate has maximum possible radiation of wavelength 1 of 400 nm to eject electrons . It's work function is

A. 2.3 eV

B. 3.1 eV

C. 4.5 eV

D. 1.8 eV

Answer: B

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154. Two particles of equal charges after being accelerated through the same potential difference enter in a uniform transverse magnetic field and describe circular paths of radii R_1 and R_2. Then the ratio of their respective masses (M_1 / M_2) is

A. $r_1 : r_2$

B. $r_2^2 : r_1^2$

C. $r_2 : r_1$

D. $r_1^2 : r_2^2$

Answer: D

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155. If the wavelength λ of photon decreases then momentum and energy of photon

A. both increases

B. both decreases

C. momentum increases and energy decreases

D. momentum decreases and energy increases

Answer: A

 Watch Video Solution

156. In Milikan's experiment , an oil drop having charge q, mass m , gets accelerated by applying a potential difference V in between two plates separated by a distance 'd' . The acceleration is

A. q V d

B. $q\frac{d}{V}$

C. $\frac{qm}{Vd}$

D. $\frac{qV}{md}$

Answer: D

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157. If a charge particle of charge q , mass m , moves in a circular path in magnetic field of

induction B , under a potential of V volts then radius of circular path is

A. $\sqrt{\frac{2mV}{q}}$

B. $\frac{B}{1}\sqrt{\frac{2mV}{q}}$

C. $\frac{1}{B}\sqrt{\frac{2mV}{q}}$

D. $\frac{1}{B^2}\sqrt{\frac{2mV}{q}}$

Answer: C

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158. In photoelectric effect, stopping potential for a light of frequency n_1 is V_1. If light is replaced by another having a frequency n_2 then its stopping potential will be

A. $V_1 - \frac{h}{e}(n_2 - n_1)$

B. $V_1 + \frac{h}{e}(n_2 + n_1)$

C. $V_1 + \frac{h}{e}(n_2 - 2n_1)$

D. $V_1 + \frac{h}{e}(n_2 - n_1)$

Answer: D

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159. 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. $\sqrt{hv/m}$

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

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

D. $\sqrt{hv/(2m)}$

Answer: C

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

A. $\lambda_p \propto \lambda_e$

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

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

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

Answer: D

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161. 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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162. 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

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