PHYSICS

BOOKS - BINA LIBRARY PHYSICS (ASSAMESE ENGLISH)

DUAL NATURE OF MATTER AND RADIATION

Example

1. Calculate the pressure produced by a force of 800N acting on an area of 2 m^2

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2. The work function of Al is 4.2 eV. Find the W.L . Of the incident light if the photo current is brought to zero by a stopping potential of 0.80 eV.

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3. Calculate the energy of a photon of wavelength 6×10^{-5} cm.

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4. Calculate the frequency of a radiation whose photon has energy has energy 10 eV.

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5. Calculate the number of photons emitted in 10 hours by a 60 W sodium lamp $(\lambda = 6000\text{Å})$

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6. The surface of a potassium metal is irradiated with ultraviolet rays of W.L. 300 nanometer. Work function of the potassium is 2 eV. Find the maximum K.E. of the emitted photoelectrons.

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7. Work function of nickel is 5.01 eV. When ultraviolet radiation of wavelength 200 Å is incident on it, electrons are emitted. What will be the maximum velocity of emitted electrons?

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8. What is the magnification of plane mirror ?

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9. A 100 watt sodium lamp is emitting light of W.L 5890Å . Calculate the rate of emission of photons.

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10. Light of wavelength 3500 Å is incident on two metal surface A and B . Will both the metal surface yield photoelectrons, if their work function are 4.2 eV and 1.9 eV respectively? What is the kinetic energy of the fastest electron?

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11. The work function of a metallic surface is 2.5 eV. Ultraviolet light of wavelength 2000Å is allowed to be incident on the metallic surface. Calculate

Stopping potential. (Given Planck's constant h $=6.63 \times 10^{-34} J - s$, electronic charge e = 1.6×10^{-19} C, electron mass m = 9.1×10^{-31} kg

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14. The work function of a metal is 3.45 eV. Calculate what should be the maximum wave length of a photon that can eject photo - electron from the metal.

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15. Calculate the threshold frequency of photons which can remove photoelectrons from

i) Cesium. (Work function of Cs = 1.8 eV).

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16. Calculate the threshold frequency of photons which can remove photoelectrons from

ii) Nickel surface (Work function of Ni = 5.9 eV).

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17. Calculate the de - Broglie wavelength associated with an electron having speed

$10^7 ms^{-1}$

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18. What will be the de - Broglie wavelength of an electron having K.E of 500 eV?

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19. The average K.E. of the thermal neutrons are similar to that of molecules of a real gas. Find the wavelength of thermal neutrons at

27°C (mass of neutron = 1.0086 amu, k = 1.38×10^{-23} J /K.

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20. Name the mirror used by dentist.

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21. Name the mirror used for rear view mirror.

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

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23. An electron and a photon each have a W.L. of 2Å . What are their momenta?

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24. A photon and an electron both have energy 100 eV. Compare their de- Broglie wavelengths.

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Exercise

1. What is photoelectric emission?

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2. What is secondary emission?

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3. What is meant by work function?

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4. Does work function depend on the frequency of incident radiation?

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5. Define one electron volt.

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6. An electron is accelerated through a potential difference of 1000 V. What is value of kinetic energy in joule.

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7. Find the dimestion of Planck's constant.

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8. What is thresold frequency?

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9. What is cut-off or stopping potential?

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10. What is the momentum of a photon of frequency f and wavelength λ?

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11. What is rest mass of photon?

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12. On what factor does the energy carried by a photon of light depend?

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13. If maximum K.E. of electron emitted by a photo cell is 4 eV, what is the stopping potential?

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14. In what way de - Broglie wavelength $\lambda$of a particle is related to K.E?

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15. How does the maximum K.E. of electron emitted vary with work function of the metal?

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16. Does work function depend on the frequency of incident radiation?

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17. How does stopping potential vary on increasing the intensity of incident radiation?

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18. What is the frequency of radiation whose photon has energy 20 eV?

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19. The work function of a metal is 3.45 eV. Calculate what should be the maximum wave length of a photon that can eject photo - electron from the metal.

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20. A 100 watt sodium lamp is emitting light of W.L 5890Å . Calculate the rate of emission of photons.

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21. Express wavelength of matter wave as $\lambda = \frac{h}{\sqrt{2mE_k}}$

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22. Find momentum of a photon of energy 1 Mev.

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23. What is mutual inductance.

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24. Can by increasing the intensity of incident radiation, velocity of emitted electron be increased?

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25. How can you increase the velocity of photoelectrons? by increasing

A. intensity

B. frequency

C. both

D. none

Answer:

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26. What is photoelectric effect? Why is photo electric current proportional to the intesity of incident radiation?

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27. Explain Einstein's photo electric equation.

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28. Explain Einstein's photo electric equation.

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29. Write down Einstein's photo electric equation and explain each of its terms.

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30. What is photoelectric effect? Why is photo electric current proportional to the intesity of incident radiation?

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31. Difine ther terms

Work function with reference to photoelectric effectd.

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32. What is threshold frequency in the photoelectric effect?

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33. Define the term

Stopping potential with reference to photoelectric effect.

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34. Explain the functioning of a photo cell. Give its two uses.

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35. Express wavelength of matter wave as $\lambda = \frac{h}{\sqrt{2mE_k}}$

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36. Derive the expression for de Broglie wavelength of an electron moving under a potential difference of V volts.

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37. Describe Davisson and Germer experiment to establish the wave nature of electron. Draw labelled diagram of the apparatus used.

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38. Which law in classical physics is used in Einstein's photoelectric equation?

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39. Explain why radio waves can not produce photoelectrons from metals, while ultraviolet rays can.

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40. Two metals X and Y have work functions 2eV and 5eV respectively. Which metal will emit electrons, when it is irradiated with light of wavelength 400 nm and why?

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41. Which surface have more friction – rough or smooth ? Why ?

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42. Give two examples where rolling friction is utilized

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43. Why are de - Broglie waves associated with a moving football not visible?

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44. An electron, αparticle and proton have the same kinetic energy .Which of these pariticles has shortest de - Broglie wavelength?

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45. An electron, αparticle and proton have the same de- Broglie wavelength. Which of this have

i) minimum kinetic energy.

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46. An electron, αparticle and proton have the same de- Broglie wavelength. Which of this have

ii) maximum kinetic energy?

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47. An electron of mass m anc charge e initially at rest is accelerated by a constant electric field E. Show that the rate of change of de - Broglie wavelength at time t is $\left(-\frac{h}{Eet^2} \right)$

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48. Name the two factors in which the magnitude of frictional force depends.

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49. An electron and a proton are having same kinetic energy. Which of them has greater wavelength?

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50. A photon and an electron have the same de Broglie wavelength. Which has greater total energy?

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51. Explain why rainbow is never seen on the surface of the moon.

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52. The maximum kinetic energy of photoelectrons emitted from a surface when photons of energy 6 eV fall on it is 4 eV. Find the stopping potential in volts.

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53. Define lens.

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54. The work function of caesium is 2.14 eV . Find Threshold frequency for caesium

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55. The work function of caesium is 2.14 eV . Find The wavelength of incident light if the

photo current is brought to zero by stopping potential of 0.60 V.

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56. For what kinetic energy of a neutron will the associated de - Broglie wavelength be 1.4×10^{-10} m?

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57. Calculate the Momentum of the electrons accelerated through a potential difference of 56 V.

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58. Calculate the Momentum of the electrons accelerated through a potential difference of 56 V.

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59. The energy of a photon is 3×10^{-19} joules. Its momentum is

A. $3 \times 10^{11} kg - m \mid s$

B. $9 \times 10^{11} kg - m \mid s$

C. $10^{-27} kg - m \mid s$

D. $10^{-8} kg - m \mid s$

Answer: C

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60. The photoelectric effect proves that

A. light travels in the form of transverse waves

B. velocity of light is infinite

C. light is in the form of quanta

D. none

Answer: C

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61. In a photo electric effect kinetic energy of photo electron depend upon which factor?

A. the intensity of radiation should be increased

B. the wave length of the radiation should be increased

C. wave length of the radiation should be decreased

D. both wave length and intensity of the radiations should be increased.

Answer: C

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62. Photo cell is a device which converts

A. chemical energy into electrical energy

B. magnetic energy into electrical energy

C. light energy into electrical energy

D. electrical energy into light energy

Answer: C

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63. The work function is

A. same for all metals

B. different for different metals

C. small for heavy metals

D. dependent on the frequency of incident radiation .

Answer: C

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64. The fact that the photon carries momentum was established by

A. Bohr's theory

B. Thomson's electromagnetic experiment

C. Crompton effect

D. Doppler effect.

Answer: C

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65. Planck's constant has same dimensions as

A. energy

B. power

C. linear momentum

D. angular momentum

Answer: D

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66. If an electron and a photon propagate in form of waves having same wavelength, they have same

A. energy

B. momentum

C. velocity

D. angular momentum

Answer: B

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67. What will happen to de- Broglie wavelength if the velocity of the electron is increased? It will

A. increase

B. decrease

C. remain same

D. become twice

Answer: B

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68. The dimension of Planck's constant is same as that of

A. Product of linear momentum and distance

B. product of energy to time

C. product of force and time

D. ratio of force and time.

Answer: C

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