



PHYSICS

BOOKS - MBD -HARYANA BOARD

DUAL NATURE OF MATTER AND RADIATIONS

Very Short Answer Type Questions

1. The rest mass of the photon is

2. The photoelectric work function
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3. The work function of a metal
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4. Explain threshold wavelength.

5. What are photoelectrons ?

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6. If the frequency of incident radiation on a photocell is doubled for the same intensity, then what change will you observe in photoelectric current ?

7. 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 ?

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8. If the intensity of the incident radiation in a

photocell is increased, how does the stopping

potential vary?



9. If the intensity of the incident radiation in a photocell is increased, how does the stopping potential vary?

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10. What is the effect on the velocity of the emitted photoelectrons if the wavelength of the incident light is decreased ?

11. What is the de-Broglie wavelength associated with an electron accelerated through a potential of 100V ?

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12. What is the de-Broglie wavelength of a bullet of mass 0.040 kg travelling at a speed of 1.0 km/sec ?



13. Which photon is more energetic: A red one

or a violet one?

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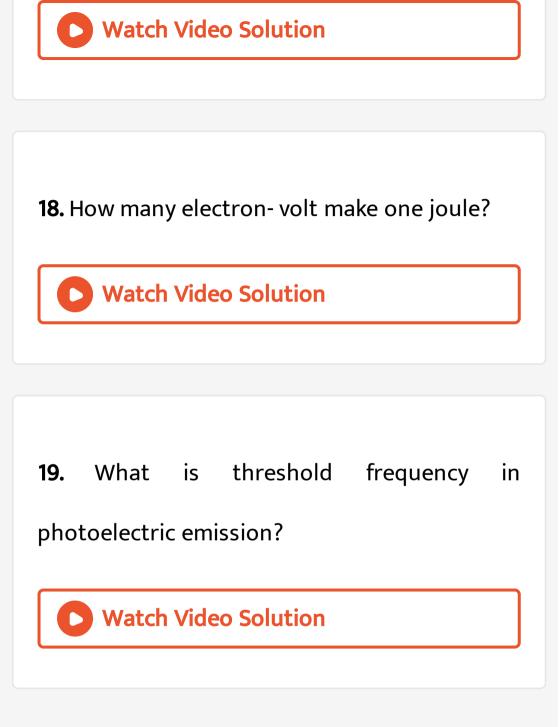
14. Work functions for metals A and B are 2 eV

and 4 eV respectively. Which metal has a lower

threshold wavelength and why?

15. The maximum kinetic energy of electrons
emitted by a photocell is 2-8 V. What is the
stopping potential ?
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16. Einsteins photoelectric equation is
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nature of electromagnetic wave is



20. What is the de-Broglie wavelength associated with an electron moving with a speed of $5.4 imes10^6ms^{-1}$?



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21. What is the effect on the velocity of emitted photoelectrons if the wavelength of

the incident light is increased ?

22. The maximum kinetic energy of a photoelectron is 3 eV. What is its stopping potential ?

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23. What is de-Broglie wavelength of a 0.2 kg

ball moving with speed of 30 ms^{-1} ?

24. The de Broglie wavelength associated with

a ball of mass 150 g travelling at 30 m s^{-1} is

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25. Calculate the de-Broglie wavelength of electrons accelerated through a potential difference of 64 volts

26. An increase in the frequency of the incident light increase the velocity with which photoelectron is ejected. Explain how?



27. Name different processes involved in electron emission.



28. What is photon ? Write formula for its energy.Watch Video Solution

29. The strength of the photoelectric current

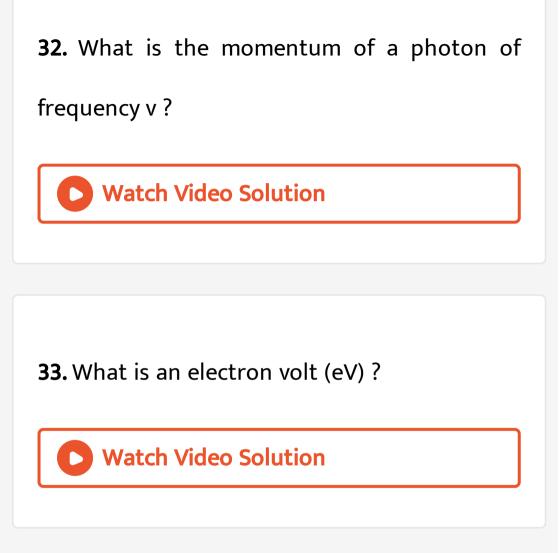
depends upon



30. Write the three characteristic features in photoelectric effect which cannot be explained on the basis of wave theory of light, but can be explained by using Einstein's equation.

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31. Give principle of a photocell.



Short Answer Type Questions

1. If the frequency of incident radiation on a photocell is doubled for the same intensity, what change will you observe in the kinetic energy of emitted photoelectrons ?

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2. Describe photoelectric effect and state the

laws of photoelectric emission.

3. Explain photoelectric effect Explain the effect of increase of intensity of incident radiations on photoelectrons emitted by a photo-tube.



4. Define photoelectric work function. How is it

related to thresold frequency?

5. Define photoelectric effect. Draw a graph to show the variation of stopping potential with frequency of incident radiation on a metal plate.



6. Explain effect of potential on photoelectric

current.

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7. Draw a graph, showing the effect of potential on photoelectric current. Hence define stopping potential.



8. Discuss the variation of photocurrent with

collector plate potential for different intensity

of radiations.

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9. What is photoelectric effect ? Explain effect

of intensity on photoelectric current.



10. State Einstein's photoelectric equation and

explain the terms involved.

11. Explain Einstein's equation for photoelectric

emission.

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12. Write Einstein's photoelectric equation. Define the threshold frequency v_0 and stopping potential V_0 .

13. Describe photoelectric effect and state the

laws of photoelectric emission.



14. Define photoelectric effect and state the

laws of photoelectric emission.



15. State two laws of photoelectric emission.

Are cathode rays waves or particle?

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16. Explain the laws of photoelectric effect

from the Einstein photoelectric equation.

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17. State Einstein's photoelectric equation. Explain any two characteristics of photoelectric effect on the basis of this equation.

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18. State laws of photoelectric emission.

19. Show that the de-Broglie wavelength A of an electron of energy E is given by the relation : $\lambda = \frac{h}{\sqrt{2mE}}.$ View Text Solution

20. Derive expression for the de-Broglie wavelength of an electron moving under a potential difference of V volt. Name an

experiment which verified the wave nature of

electrons.



21. Why are de-Broglie waves with a moving

foot ball not visible?

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22. Why are de Broglie waves associated with a

moving football is not apparent to us?



23. Blue light can eject electrons from a photosensitive surface while orange light can not. Will violet and red light eject electrons from the same surface?

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24. State de-Broglie relation for wavelength of

matter waves. Show that the de-Broglie

wavelength of electrons accelerated through a

potential of V volt can be expressed as :

$$\lambda = rac{h}{\sqrt{2meV}}$$

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25. How does Davisson and Germer's experiment verify the wave nature of electrons

?

26. Kinetic energy remaining the same, which

of the two have greater de-Broglie wavelength

proton or electron ? Explain.



27. An electron and proton are moving in the same direction and possess same K.E. Find the ratio of de-Broglie wavelength associated with

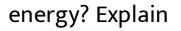
these particles.



28. The wavelength λ of a photon and the de-Broglie wavelength of an electron have the same value. Show that the energy of the photon is $\frac{2\lambda mc}{h}$ times the kinetic energy of the electron, Where m,c and h have their usual meanings.

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29. A photon and an elecron have the same de Broglie wavelength. Which has greater total



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Long Answer Type Question

1. What are photons ? State their properties.

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Objective Type Questions

1. The wavelength of a wave with frequency 10^{14} Hz will be :

A. $3 imes 10^{-6}$ m

 $\text{B.}\,3\times10^6~\text{m}$

 $C. 10^6 m$

D. None

Answer: A

2. If threshold wavelength for sodium is 6800Å

then the work function will be

A. 1.82 eV

B. 3.64 eV

C. 0.91 eV

D. 2.73 eV

Answer: A



3. For which of the following stopping potential required is maximum ?

A. Blue

B. Green

C. Red

D. Yellow

Answer: D

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4. The de-Broglie waves associated with an

electron accelerated through a potential

difference of 121V is :

A. 1.227 nm

B. 12.270 nm

C. 0.112 nm

D. 11.200 nm

Answer: C

5. The wavelength of an electron of energy 10 keV will be :

A. 0.12\AA

B. 1.2Å

C. 12Å

D. 120Å

Answer: A

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

A. both have the same kinetic energy

B. proton has more K.E. than electron

C. electron has more K.E. than proton

D. Both have the same velocity.

Answer: C

7. The de-Broglie waves associated with an electron moving under a potential difference of 100 V will have wavelength :

A. $12.27 imes10^{-11}$

B. $12.27 imes 10^{-10}$ m

C. $12.27 imes 10^{-9}$ m

D.1m

Answer: A

8. The rest mass of the photon is

A. zero

B.hv

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

D. $rac{hv}{c}$

Answer: A



9. When a proton is accelerated with 1 volt potential difference, then its kinetic energy is

A.
$$\frac{1}{1840}$$
 eV

B. 1840 eV

C. 1 eV

D. 1840 c^2 eV.

Answer: C

10. Which of the following has the largest de

Broglie wavelength (all have eual velocity)?

A. Proton

B. α -particle

C. Neutron

D. Electron

Answer: D

11. Plancks' constant has the dimensions of

A. Linear momentum

B. Angular momentum

C. Energy

D. Power

Answer: B

12. Light of wavelength 4000 Å falls on a photosensitive plate with photoelectric work function 1.96 eV. The K.E. of photoelectrons emitted will be :

A. 1.148 eV

B. 1.152 eV

C. 1.156 eV

D. 1.158 eV

Answer: A





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

A.
$$hc\lambda$$

B. $\frac{hc}{\lambda}$
C. $\frac{\lambda}{hc}$
D. $\frac{h\lambda}{c}$

Answer: B



14. Stopping potential for which will be minimum ?

A. Yellow

B. X-lays

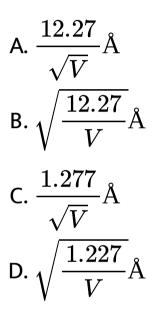
C. Red

D. Blue

Answer: C

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15. de-Broglie wavelength associated with an electron at V potential difference is :



Answer: A

16. Which of the following has minimum

stopping potential?

A. Blue

B. Yellow

C. Violet

D. Red

Answer: D

17. The de-Broglie wavelength associated with

a particle of momentum p is given as :

A. p/h

B. h/p

C. hp

D. None of these

Answer: B