



# CBSE NCERT Based Chapter wise Questions (2025-2026)

Class-XII

Subject: Physics

Chapter Name : *Dual nature of Radiation and Matter* (Chapter : 3)

Total : 07 Marks (expected) [MCQ(2)-1 Mark, SA(1)-2 Marks, LA(1)-3 Marks]

Level - 1

## MCQ Type Questions :

1. Momentum of photon of wavelength  $\lambda$  is—

- (A)  $\frac{h\gamma}{C}$  (B) zero (C)  $\frac{h\gamma}{C^2}$  (D)  $\frac{h\lambda}{C}$

[Hints : Momentum of photon  $(p) = \frac{h}{\lambda}$ ]

2. The mass of a photon at rest is

- (A) zero (B)  $1.67 \times 10^{-35}$  kg (C) 1 amu (D)  $9 \times 10^{-31}$  kg

3. When a proton is accelerated through 1 V, then its kinetic energy will be

- (A) 1 eV (B) 13.6 eV (C) 1840 eV (D) 0.54 eV

[Hints : KE = 9 V = 1 eV]

4. When ultraviolet rays are incident on metal plate then photoelectric effect does not occur, it may occur by incidence of

- (A) infrared rays (B) X rays (C) radio wave (D) microwave

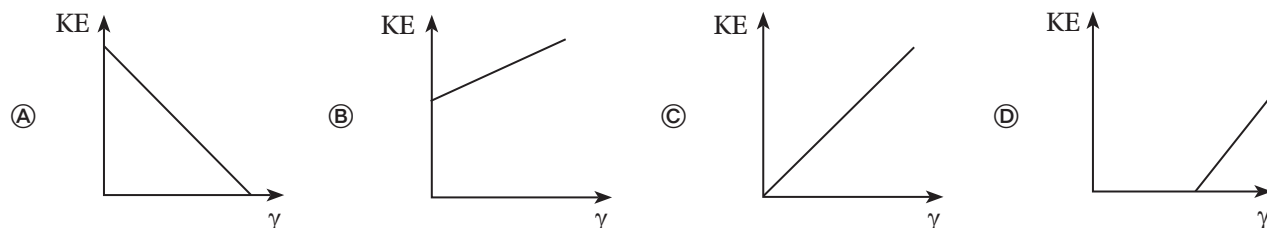
[Hints : According the question threshold frequency may be greater than the frequency of ultraviolet light]

5. The threshold frequency of a photoelectric metal is  $\gamma_0$ . If light frequency  $4\gamma_0$  is incident on this metal, then, the maximum kinetic energy of emitted electrons will be

- (A)  $h\gamma_0$  (B)  $2h\gamma_0$  (C)  $3h\gamma_0$  (D)  $4h\gamma_0$

[Hints : Use the Einstein's Photoelectric equation]

6. Which one of the following is the correct graph between the maximum kinetic energy of the emitted photoelectrons and the frequency of incident radiation for a given photosensitive surface? which one of the following is the



[Hints : use the equation  $h\gamma = W_0 + KE$ ]

7. If particles are moving with same velocity, then which has maximum de-Broglie wave length?

- (A) proton (B)  $\alpha$  particle (C) neutron (D)  $\beta$ -particle

[Hints : As  $\lambda = \frac{h}{mv}$  so, lightest mass will have maximum de-Broglie wavelength]

## Assertion-Reason based questions

- a) Both Assertion and Reason are correct and Reason is a correct explanation of Assertion  
b) Both Assertion and Reason are correct and Reason is not a correct explanation of Assertion  
c) Assertion is correct, Reason is incorrect  
d) Assertion is incorrect, Reason is correct
8. Assertion : Number of photons increases with increase in frequency of light.  
Reason : Maximum kinetic energy of emitted electrons increases with the frequency of incident radiations.  
(A) a (B) b (C) c (D) d
9. Assertion : Work function of copper is greater than that of sodium. But both will have same value of threshold frequency and threshold wave length.  
Reason : The frequency is directly proportional to wavelength.  
(A) a (B) b (C) c (D) d
- [Hints : Work function  $W = h\nu_0 = h \frac{c}{\lambda_0}$  for different work function, different threshold frequency]
10. Assertion : The photoelectric effect does not take place, if the energy of the incident radiation is less than the work function of a metal.  
Reason : Kinetic energy of the photoelectrons is zero, if threshold frequency incident on the metal.  
(A) a (B) b (C) c (D) d
11. Assertion : Davisson-Germer experiment established the wave nature of electrons.  
Reason : If electrons have wave nature, they can interfere and show diffraction.  
(A) a (B) b (C) c (D) d

## Short Answer Type Questions (SAQ)

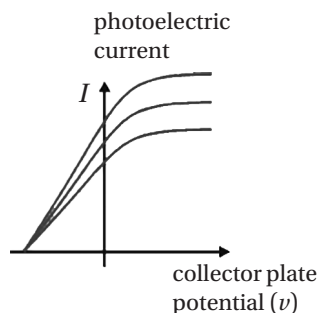
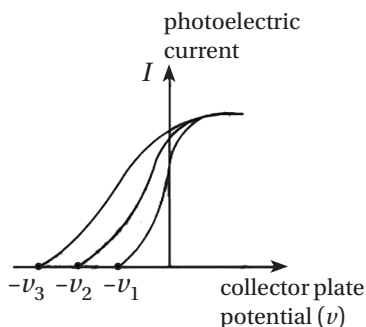
12. How does the stopping potential in photoelectric emission depends on  
(i) the intensity of the incident radiation.  
(ii) the frequency of the incident radiation.  
[Hints : Read from page 278 in NCERT book]
13. How does the maximum kinetic energy of electrons emitted vary with the work function of the metal?  
[Hints :  $K_{\max} = h\nu - W_0$ ]
14. What considerations led de-Broglie to suggest the material particles can also show wave property?  
[Hints : Read from NCERT book, page no. 285]
15. Draw a graph between the frequency of incident radiation ( $\nu$ ) and stopping potential.  
[Hints : From NCERT book page no. 279]
16. Draw a graph between the photoelectric current and collector plate potential.  
[Hints : Read from NCERT book page no. 279]

## Long Answer Type Questions (LAQ)

17. On what factors will the following depend during photoelectric emission from a metal surface?  
i) the magnitude of photoelectric current.  
ii) the velocity of ejected electrons.  
iii) threshold frequency.
18. Calculate the kinetic energy of an electron having de-Broglie wavelength of  $1 \text{ \AA}$ .

[Hints :  $\lambda = \frac{h}{p} = \frac{h}{\sqrt{2mk}}$ ]

19. In photoemissive cell, with exciting wavelength  $\lambda$  the maximum kinetic energy of the electron is  $K$ . If the exciting wavelength is changed to  $\frac{3\lambda}{4}$ , the kinetic energy of emitted electron will be—
- (A)  $\frac{3K}{4}$                       (B)  $\frac{4K}{3}$                       (C) less than  $\frac{4K}{3}$                       (D) more than  $\frac{4K}{3}$
20. If the frequency of incident light on a metal surface is doubled, will the kinetic energy of the photoelectrons be doubled? Give reason.
- [Hints : Use Einstein's equation  $h\nu = W_0 + KE$ ]
21. A deuteron and a alpha particle are accelerated with the same potential, which one has greater value of de-broglie wavelength? Explain.
22. In the graphs identify which of the two of incident light is being kept constant in each case. Explain.



## ANSWER

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|--------|---------|-----|
| 1. (A) | 9. (D)  | 17. |
| 2. (A) | 10. (B) | 18. |
| 3. (A) | 11. (A) | 19. |
| 4. (B) | 12.     | 20. |
| 5. (C) | 13.     | 21. |
| 6. (D) | 14.     | 22. |
| 7. (D) | 15.     |     |
| 8. (D) | 16.     |     |