



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 λ is—

Ⓐ $\frac{h\gamma}{C}$

Ⓑ zero

Ⓒ $\frac{h\gamma}{C^2}$

Ⓓ $\frac{h\lambda}{C}$

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

2. The mass of a photon at rest is

Ⓐ zero

Ⓑ 1.67×10^{-35} kg

Ⓒ 1 amu

Ⓓ 9×10^{-31} kg

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

Ⓐ 1 eV

Ⓑ 13.6 eV

Ⓒ 1840 eV

Ⓓ 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

Ⓐ infrared rays

Ⓑ X rays

Ⓒ radio wave

Ⓓ 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 γ_0 . If light frequency $4\gamma_0$ is incident on this metal, then, the maximum kinetic energy of emitted electrons will be

Ⓐ $h\gamma_0$

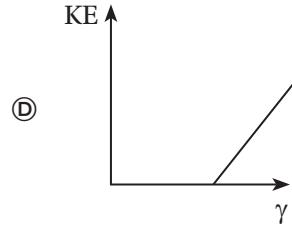
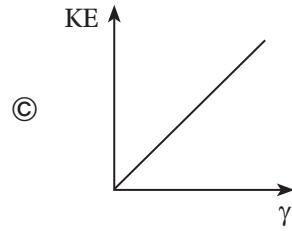
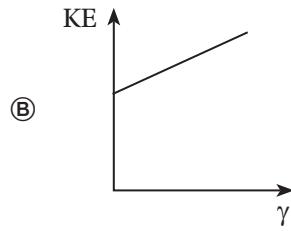
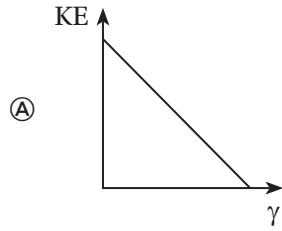
Ⓑ $2h\gamma_0$

Ⓒ $3h\gamma_0$

Ⓓ $4h\gamma_0$

[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?

Ⓐ proton

Ⓑ α particle

Ⓒ neutron

Ⓓ β -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 Ⓑ b Ⓒ c Ⓓ 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 Ⓑ b Ⓒ c Ⓓ d

[Hints : Work function $W = h\gamma_0 = h\frac{C}{\lambda_0}$ 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 Ⓑ b Ⓒ c Ⓓ 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 Ⓑ b Ⓒ c Ⓓ 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 : $K_{\max} = h\gamma - W_0$]

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 (γ) 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 Å.

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

19. In photoemissive cell, with exciting wavelength λ 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—

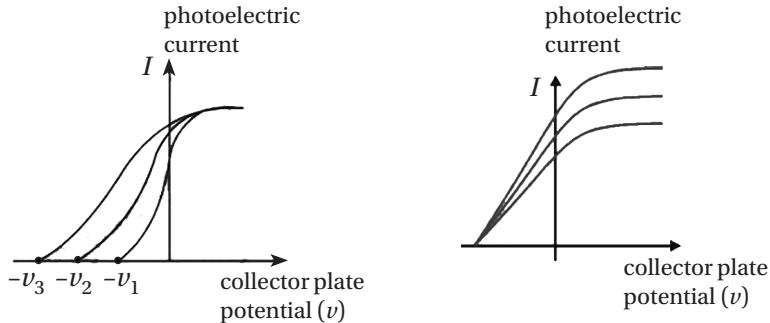
(A) $\frac{3K}{4}$ (B) $\frac{4K}{3}$ (C) less than $\frac{4K}{3}$ (D) more than $\frac{4K}{3}$

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 $h\gamma = W_0 + KE$]

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

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.	