

Dual Nature of Radiation and Matter

NEET previous year questions · Physics

7 questions from the official papers: NEET 2026 (2), Re-NEET 2026 (3), NEET 2020 (2). Each is followed by its answer and a worked solution written by BrainIt. Generated on 23 October 2026.



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1. NEET 2026 · Q9

Match List I with List II:

List I	List II
P) $E = h\nu$	I) de Broglie wavelength
Q) Diffraction and Interference	II) Particle nature of light
R) $\lambda = h/p$	III) Wave nature of light
S) Compton effect	IV) Energy of photon

Choose the correct answer from the options given below:

- (1) P-IV, Q-I, R-II, S-III (2) P-IV, Q-III, R-II, S-I
(3) P-I, Q-IV, R-III, S-II (4) P-IV, Q-III, R-I, S-II

Answer (4)

Sol. $E = h\nu$ gives the energy of a photon (IV); diffraction and interference demonstrate the wave nature of light (III); $\lambda = h/p$ is the de Broglie wavelength of a particle (I); and the Compton effect confirms the particle nature of light (II). Hence P-IV, Q-III, R-I, S-II, which is option (4).

2. NEET 2026 · Q42

For a metal of work function 6.6 eV, which of the following wavelengths of incident radiation does not give rise to the photoelectric effect? (Take Planck's constant as 6.6×10^{-34} J s)

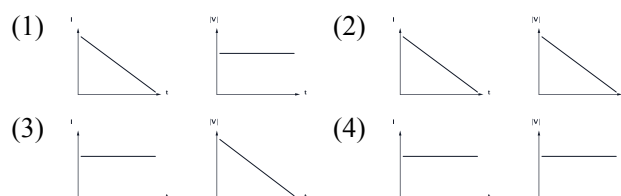
- (1) 100 nm (2) 150 nm (3) 200 nm (4) 50 nm

Answer (3)

Sol. Photoemission requires photon energy $\frac{hc}{\lambda} \geq W_0$, i.e. wavelength $\lambda \leq \frac{hc}{W_0}$. Here $\frac{hc}{W_0} = \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{6.6 \times 1.6 \times 10^{-19}} \approx 187.5$ nm. Any wavelength longer than this cannot eject electrons; $200 \text{ nm} > 187.5 \text{ nm}$, so it produces no photoelectric effect.

3. Re-NEET 2026 · Q8

A beam of light falls on a metal surface such that photo-electrons are generated. If power of the light source starts to decrease linearly with time t , then variation of the photocurrent I and magnitude of the stopping potential $|V|$ with time is best represented by:



Answer (1)

Sol. Photocurrent is set by the NUMBER of photons striking the surface per second, so it is proportional to the source power and falls linearly with t . Stopping potential, by contrast, depends only on the maximum kinetic energy of the emitted electrons, $eV_0 = h\nu - \phi_0$, which is fixed by the FREQUENCY and the work function - neither of which changes here. So $|V|$ stays flat while I decays. NCERT Class 12, Dual Nature of Radiation and Matter.

Why the other options are wrong:

- (2) treats stopping potential as intensity-dependent, the single most common photoelectric misconception
- (3) swaps the roles entirely, tying current to frequency and stopping potential to intensity

- (4) assumes neither quantity responds to the source, ignoring that current tracks photon flux

4. Re-NEET 2026 · Q18

A ray of light with wavelength λ is incident on three different photoelectric cells namely 1, 2 and 3. The threshold wavelength of these photoelectric cells are λ_1 , λ_2 , and λ_3 , respectively and the magnitude of stopping potentials of these cells are V_1 , V_2 and V_3 , respectively. The relation between λ and threshold wavelengths are $\lambda_1 < \lambda$, $\lambda_2 > \lambda$ and $\lambda_3 \gg \lambda$. The correct option is:

- (1) $V_1 = 0$, $V_2 < V_3$ (2) $V_1 = 0$, $V_2 > V_3$
 (3) $V_1 > V_2$, $V_3 = 0$ (4) $V_1 < V_2$, $V_3 = 0$

Answer (1)

Sol. Emission occurs only when the incident wavelength is SHORTER than the threshold wavelength. Cell 1 has $\lambda_1 < \lambda$, so the photons are too weak and $V_1 = 0$. For the other two, $eV_0 = hc \left(\frac{1}{\lambda} - \frac{1}{\lambda_{th}} \right)$; a LARGER threshold wavelength means a smaller work function and hence a larger stopping potential. Since $\lambda_3 \gg \lambda_2$, the term $1/\lambda_3$ is nearly zero and $V_3 > V_2$. NCERT Class 12, Dual Nature of Radiation and Matter (Einstein's photoelectric equation).

5. Re-NEET 2026 · Q19

A photon and an electron, each of 20 eV energy, move in free space. The ratio of linear momentum of electron p_e to that of photon p_{ph} , $\frac{p_e}{p_{ph}}$ is: [Take speed of light = $3 \times 10^8 \text{ ms}^{-1}$, charge of electron = $-1.6 \times 10^{-19} \text{ C}$ and mass of electron = $9 \times 10^{-31} \text{ kg}$]

- (1) $\frac{2}{450}$ (2) $\frac{1}{250}$
 (3) 225 (4) 275

Answer (3)

Sol. A photon's momentum is $p = \frac{E}{c} = \frac{20 \times 1.6 \times 10^{-19}}{3 \times 10^8} \approx 1.07 \times 10^{-26} \text{ kg m s}^{-1}$. A non-relativistic electron of the same kinetic energy has $p = \sqrt{2mE} = \sqrt{2(9 \times 10^{-31})(3.2 \times 10^{-18})} = 2.4 \times 10^{-24} \text{ kg m s}^{-1}$. The ratio is therefore about 225 - a massive particle carries far more momentum than a photon of the same energy, because $p \propto \sqrt{E}$ for matter but $p \propto E$ for light. NCERT Class 12, Dual Nature of Radiation and Matter.

6. NEET 2020 · Q143

An electron is accelerated from rest through a potential difference of V volt. If the de Broglie wavelength of the electron is $1.227 \times 10^{-2} \text{ nm}$, the potential difference is

- (1) 10^2 V (2) 10^3 V (3) 10^4 V (4) 10 V

Answer (3)

Sol. For an electron, $\lambda(\text{nm}) = 1.227/\sqrt{V}$. Setting $\lambda = 1.227 \times 10^{-2} \text{ nm}$ gives $\sqrt{V} = 100$ and $V = 10^4 \text{ V}$. Chapter: Dual Nature of Radiation and Matter.

7. NEET 2020 · Q146

Light of frequency 1.5 times the threshold frequency is incident on a photosensitive material. What will be the photoelectric current if the frequency is halved and intensity is doubled?

- (1) four times (2) one-fourth
 (3) zero (4) doubled

Answer (3)

Sol. The new frequency is $0.75\nu_0$, below the threshold ν_0 . No electrons are emitted irrespective of the doubled intensity, so the photoelectric current is zero. Chapter: Dual Nature of Radiation and Matter.

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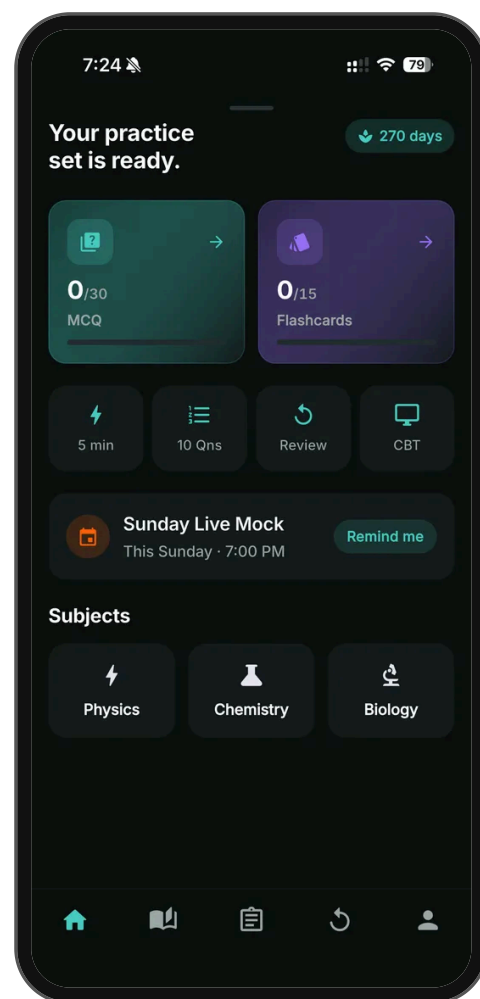
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