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NEET DUAL NATURE OF RADIATION AND MATTER — EINSTEIN'S PHOTOELECTRIC EQUATION, PARTICLE NATURE OF LIGHT — PYQS

Max. Marks: 120 **Questions:** 30

Section A (MCQ) — 30 questions

Q.1 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)
[NEET (UG) 2026]

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

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Q.2 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: [RE-NEET (UG) 2026]

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

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Q.3 If φ is the work function of photosensitive material in eV and light of wavelength of numerical value $\lambda = \frac{hc}{e}$ metre, is incident on it with energy above its threshold value at an instant then the maximum kinetic energy of the photo-electron ejected by it at that instant (Take h-Planck's constant, c-velocity of light in free space) is (in SI units):
[RE-NEET (UG) 2024]

(1) $e + 2\varphi$ (2) $2e - \varphi$ (3) $e - e\varphi$ (4) $e + \varphi$

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Q.4 The work functions of Caesium (Cs), potassium (K) and sodium (Na) are 2.14 eV, 2.30 eV and 2.75 eV respectively. If incident electromagnetic radiation has an incident energy of 2.20 eV, which of these photosensitive surfaces may emit photoelectrons?
[NEET (UG) 2023]

(1) Both Na and K (2) K only
(3) Na only (4) Cs only

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Q.5 When two monochromatic lights of frequency, ν and $\frac{\nu}{2}$ are incident on a photoelectric metal, their stopping potential becomes $\frac{V_s}{2}$ and V_s respectively. The threshold frequency for this metal is
[NEET (UG) 2022]

(1) 2ν (2) 3ν (3) $\frac{2}{3}\nu$ (4) $\frac{3}{2}\nu$

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Q.6 The light rays having photons of energy 4.2 eV are falling on a metal surface having a work function of 2.2 eV. The stopping potential of the surface is
[NEET (UG) 2022 (Phase 2)]

(1) 6.4 V (2) 2 eV (3) 2 V (4) 1.1 V

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Q.7 The threshold frequency of a photoelectric metal is ν_0. If light of frequency $4\nu_0$ is incident on this metal, then the maximum kinetic energy of emitted electrons will be : [NEET (UG) 2022 (Phase 2)]

(1) $4h\nu_0$ (2) $h\nu_0$ (3) $2h\nu_0$ (4) $3h\nu_0$

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Q.8 When the light of frequency $2\nu_0$ (where ν_0 is threshold frequency), is incident on a metal plate, the maximum velocity of electrons emitted is v_1. When the frequency of the incident radiation is increased to $5\nu_0$, the maximum velocity of electrons emitted from the same plate is v_2. The ratio of v_1 to v_2 is [NEET 2018]

(1) 1:2 (2) 1:4 (3) 4:1 (4) 2:1

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Q.9 The photoelectric threshold wavelength of silver is 3250×10^{-10} m. The velocity of the electron ejected from a silver surface by ultraviolet light of wavelength 2536×10^{-10} m is
[Given $h = 4.14 \times 10^{-15}$ eV s and $c = 3 \times 10^8$ m s^{-1}]
[NEET 2017]

(1) $\approx 0.6 \times 10^6$ m s^{-1} (2) $\approx 61 \times 10^3$ m s^{-1}
(3) $\approx 0.3 \times 10^6$ m s^{-1} (4) $\approx 6 \times 10^5$ m s^{-1}

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Q.10 When a metallic surface is illuminated with radiation of wavelength λ, the stopping potential is V. If the same surface is illuminated with radiation of wavelength 2λ, the stopping potential is $\frac{V}{4}$. The threshold wavelength for the metallic surface is [NEET 2016 (Phase 1)]

(1) $\frac{5}{2}\lambda$ (2) 3λ (3) 4λ (4) 5λ

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Q.11 Photons with energy 5 eV are incident on a cathode C in a photoelectric cell. The maximum energy of emitted photoelectrons is 2 eV. When photons of energy 6 eV are incident on C, no photoelectrons will reach the anode A, if the stopping potential of A relative to C is [NEET 2016 (Phase 2)]

(1) +3 V (2) +4 V (3) −1 V (4) −3 V

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Q.12 A photoelectric surface is illuminated successively by monochromatic light of wavelength λ and λ/2. If the maximum kinetic energy of the emitted photoelectrons in the second case is 3 times that in the first case, the work function of the surface of the material is
(h = Planck's constant, c = speed of light) [AIPMT 2015]

(1) $\frac{2hc}{\lambda}$ (2) $\frac{hc}{3\lambda}$ (3) $\frac{hc}{2\lambda}$ (4) $\frac{hc}{\lambda}$

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Q.13 A certain metallic surface is illuminated with monochromatic light of wavelength, λ. The stopping potential for photo-electric current for this light is $3V_0$. If the same surface is illuminated with light of wavelength 2λ, the stopping potential is V_0. The threshold wavelength for this surface for photo-electric effect is [AIPMT 2015 (Cancelled)]

(1) $\frac{\lambda}{4}$ (2) $\frac{\lambda}{6}$ (3) 6λ (4) 4λ

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Q.14 When the energy of the incident radiation is increased by 20%, the kinetic energy of the photoelectrons emitted from a metal surface increased from 0.5 eV to 0.8 eV. The work function of the metal is [AIPMT 2014]

(1) 0.65 eV (2) 1.0 eV (3) 1.3 eV (4) 1.5 eV

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Q.15 For photoelectric emission from certain metal the cutoff frequency is ν. If radiation of frequency 2ν impinges on the metal plate, the maximum possible velocity of the emitted electron will be (m is the electron mass) [NEET 2013]

(1) $\sqrt{\frac{2h\nu}{m}}$ (2) $2\sqrt{\frac{h\nu}{m}}$
(3) $\sqrt{\frac{h\nu}{(2m)}}$ (4) $\sqrt{\frac{h\nu}{m}}$

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Q.16 Two radiations of photons energies 1 eV and 2.5 eV, successively illuminate a photosensitive metallic surface of work function 0.5 eV. The ratio of the maximum speeds of the emitted electrons is [AIPMT 2012 (Mains)]

(1) 1 : 4 (2) 1 : 2 (3) 1 : 1 (4) 1 : 5

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Q.17 Monochromatic radiation emitted when electron in hydrogen atom jumps from first excited to the ground state irradiates a photosensitive material. The stopping potential is measured to be 3.57 V. The threshold frequency of the material is [AIPMT 2012 (Prelims)]

(1) 4×10^{15} Hz (2) 5×10^{15} Hz
(3) 1.6×10^{15} Hz (4) 2.5×10^{15} Hz

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Q.18 The threshold frequency for a photosensitive metal is 3.3×10^{14} Hz. If light of frequency 8.2×10^{14} Hz is incident on this metal, the cut-off voltage for the photoelectron emission is nearly [AIPMT 2011 (Mains)]

(1) 1 V (2) 2 V (3) 3 V (4) 5 V

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Q.19 Light of two different frequencies whose photons have energies 1 eV and 2.5 eV respectively illuminate a metallic surface whose work function is 0.5 eV successively. Ratio of maximum speeds of emitted electrons will be [AIPMT 2011 (Prelims)]

(1) 1 : 4 (2) 1 : 2 (3) 1 : 1 (4) 1 : 5

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Q.20 In photoelectric emission process from a metal of work function 1.8 eV, the kinetic energy of most energetic electrons is 0.5 eV. The corresponding stopping potential is [AIPMT 2011 (Prelims)]

(1) 1.8 V (2) 1.3 V (3) 0.5 V (4) 2.3 V

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Q.21 The electron in the hydrogen atom jumps from excited state (n = 3) to its ground state (n = 1) and the photons thus emitted irradiate a photosensitive material. If the work function of the material is 5.1 eV, the stopping potential is estimated to be (the energy of the electron in n^{th} state $E_n = -\frac{13.6}{n^2}$ eV) [AIPMT 2010 (Mains)]

(1) 5.1 V (2) 12.1 V (3) 17.2 V (4) 7 V

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Q.22 The potential difference that must be applied to stop the fastest photoelectrons emitted by a nickel surface, having work function 5.01 eV, when ultraviolet light of 200 nm falls on it, must be [AIPMT 2010 (Prelims)]

(1) 2.4 V (2) −1.2 V (3) −2.4 V (4) 1.2 V

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Q.23 The work function of a surface of a photosensitive material is 6.2 eV. The wavelength of the incident radiation for which the stopping potential is 5 V lies in the [AIPMT 2008]

(1) infrared region (2) X-ray region
(3) Ultraviolet region (4) Visible region

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Q.24 When photons of energy hν fall on an aluminium plate (of work function E_0), photoelectrons of maximum kinetic energy K are ejected. If the frequency of radiation is doubled, the maximum kinetic energy of the ejected photoelectrons will be [AIPMT 2006]

(1) K + hν (2) K + E_0 (3) 2K (4) K.

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Q.25 The work functions for metals A, B and C are respectively 1.92 eV, 2.0 eV and 5 eV. According to Einstein's equation the metals which will emit photoelectrons for a radiation of wavelength 4100 Å is/are [AIPMT 2005]

(1) A only (2) A and B only
(3) all the three metals (4) none

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Q.26 A photosensitive metallic surface has work function, $h\nu_0$. If photons of energy $2h\nu_0$ fall on this surface, the electrons come out with a maximum velocity of 4×10^6 m/s. When the photon energy is increased to $5h\nu_0$, then maximum velocity of photoelectrons will be [AIPMT 2005]

(1) 2×10^7 m/s (2) 2×10^6 m/s
(3) 8×10^6 m/s (4) 8×10^5 m/s

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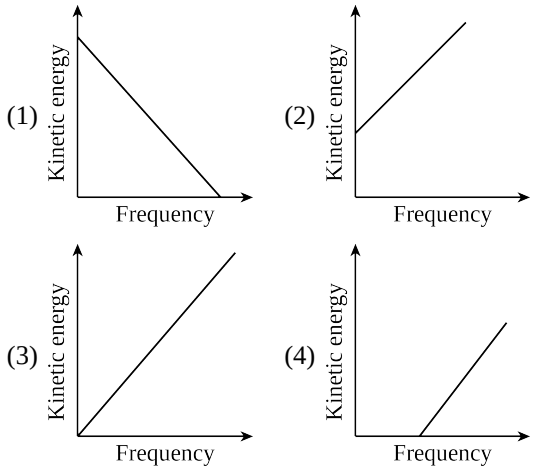
Q.27 According to Einstein's photoelectric equation, the graph between the kinetic energy of photoelectrons ejected and the frequency of incident radiation is [AIPMT 2004]



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Q.28 The value of Planck's constant is [AIPMT 2002]

(1) 6.63×10^{-34} J/sec.
(2) 6.63×10^{-34} kg-m^2/sec^2
(3) 6.63×10^{-34} kg-m^2
(4) 6.63×10^{-34} J-sec.

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Q.29 Which one among the following shows particle nature of light? [AIPMT 2001]

(1) photoelectric effect (2) interference
(3) refraction (4) polarization

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Q.30 By photoelectric effect, Einstein proved [AIPMT 2000]

(1) E = hν (2) K.E. = $\frac{1}{2}mv^2$
(3) E = mc^2 (4) E = $\frac{-Rhc}{n^2}$

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ANSWER KEY

Ques.	1	2	3	4	5	6	7
Ans.	**1**	**2**	**3**	**4**	**4**	**3**	**4**
Ques.	8	9	10	11	12	13	14
Ans.	**1**	**1, 4**	**2**	**4**	**3**	**4**	**2**
Ques.	15	16	17	18	19	20	21
Ans.	**1**	**2**	**3**	**2**	**2**	**3**	**4**
Ques.	22	23	24	25	26	27	28
Ans.	**2**	**3**	**1**	**2**	**3**	**4**	**4**
Ques.	29	30					
Ans.	**1**	**1**					