

NEET DUAL NATURE OF RADIATION AND MATTER — WAVE NATURE OF MATTER, DE BROGLIE WAVELENGTH — PYQS

Max. Marks: 84

Questions: 21

Section A (MCQ) — 21 questions

- Q.1** A photon and an electron (mass m) have the same energy E . The ratio $(\lambda_{\text{photon}}/\lambda_{\text{electron}})$ of their de Broglie wavelengths is: (c is the speed of light)

[NEET (UG) 2025]

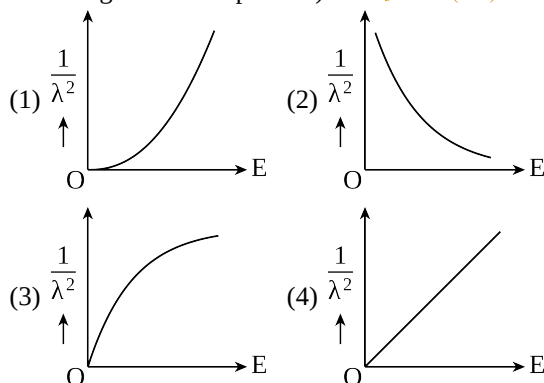
- (1) $c\sqrt{\frac{2m}{E}}$ (2) $\frac{1}{c}\sqrt{E/2m}$
 (3) $\sqrt{E/2m}$ (4) $c\sqrt{2mE}$

Scan or tap for the full solution



- Q.2** The graph which shows the variation of $\left(\frac{1}{\lambda^2}\right)$ and its kinetic energy, E is (where λ is de Broglie wavelength of a free particle):

[NEET (UG) 2024]



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- Q.3** An electron and an alpha particle are accelerated by the same potential difference. Let λ_e and λ_α denote the de-Broglie wavelengths of the electron and the alpha particle, respectively, then:

[RE-NEET (UG) 2024]

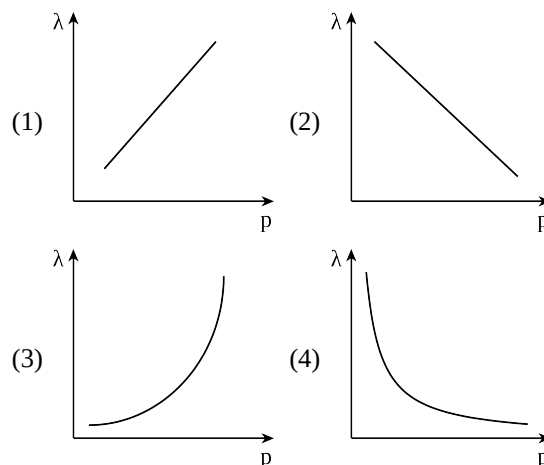
- (1) $\lambda_e > \lambda_\alpha$ (2) $\lambda_e = 4\lambda_\alpha$ (3) $\lambda_e = \lambda_\alpha$ (4) $\lambda_e < \lambda_\alpha$

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- Q.4** The graph which shows the variation of the de Broglie wavelength (λ) of a particle and its associated momentum (p) is

[NEET (UG) 2022]



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- Q.5** An electromagnetic wave of wavelength ' λ ' is incident on a photosensitive surface of negligible work function. If ' m ' mass is of photoelectron emitted from the surface has de-Broglie wavelength λ_d , then :

[NEET (UG) 2021]

- (1) $\lambda = \left(\frac{2h}{mc}\right)\lambda_d^2$ (2) $\lambda = \left(\frac{2m}{hc}\right)\lambda_d^2$
 (3) $\lambda_d = \left(\frac{2mc}{h}\right)\lambda^2$ (4) $\lambda = \left(\frac{2mc}{h}\right)\lambda_d^2$

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- Q.6** An electron is accelerated from rest through a potential difference of V volt. If the de-Broglie wavelength of the electron is 1.227×10^{-2} nm, the potential difference is :

[NEET (UG) 2020]

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

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- Q.7** An electron is accelerated through a potential difference of 10,000 V. Its de Broglie wavelength is (nearly) : ($m_e = 9 \times 10^{-31}$ kg)

[NEET (UG) 2019]

- (1) 12.2×10^{-12} m (2) 12.2×10^{-13} m
 (3) 12.2×10^{-14} m (4) 12.2 nm

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Q.8 An electron of mass m with an initial velocity $\vec{v} = v_0 \hat{i}$ ($v_0 > 0$) enters an electric field $\vec{E} = -E_0 \hat{i}$ ($E_0 = \text{constant} > 0$) at $t = 0$. If λ_0 is its de-Broglie wavelength initially, then its de-Broglie wavelength at time t is [NEET 2018]

(1) $\frac{\lambda_0}{\left(1 + \frac{eE_0}{mv_0}t\right)}$ (2) $\lambda_0 \left(1 + \frac{eE_0}{mv_0}t\right)$

(3) $\lambda_0 t$ (4) λ_0

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Q.9 The de-Broglie wavelength of a neutron in thermal equilibrium with heavy water at a temperature T (kelvin) and mass m , is [NEET 2017]

(1) $\frac{h}{\sqrt{3mkT}}$ (2) $\frac{2h}{\sqrt{3mkT}}$

(3) $\frac{2h}{\sqrt{mkT}}$ (4) $\frac{h}{\sqrt{mkT}}$

Scan or tap for the full solution



Q.10 An electron of mass m and a photon have same energy E . The ratio of de-Broglie wavelengths associated with them is [NEET 2016 (Phase 1)]

(1) $c(2mE)^{\frac{1}{2}}$ (2) $\frac{1}{c} \left(\frac{2m}{E}\right)^{\frac{1}{2}}$

(3) $\frac{1}{c} \left(\frac{E}{2m}\right)^{\frac{1}{2}}$ (4) $\left(\frac{E}{2m}\right)^{\frac{1}{2}}$

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Q.11 Light of wavelength 500 nm is incident on a metal with work function 2.28 eV. The de Broglie wavelength of the emitted electron is [AIPMT 2015]

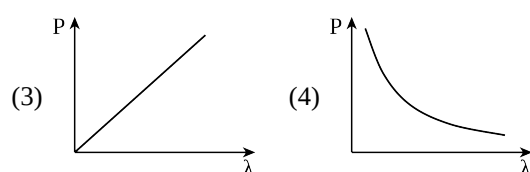
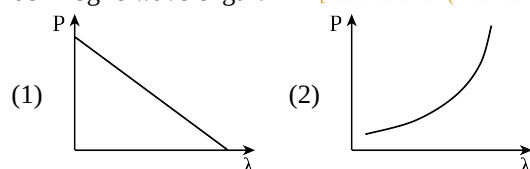
(1) $\geq 2.8 \times 10^{-9}$ m (2) $\leq 2.8 \times 10^{-12}$ m

(3) $< 2.8 \times 10^{-10}$ m (4) $< 2.8 \times 10^{-9}$ m

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Q.12 Which of the following figures represent the variation of particle momentum and the associated de-Broglie wavelength? [AIPMT 2015 (Cancelled)]



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Q.13 If the kinetic energy of the particle is increased to 16 times its previous value, the percentage change in the de Broglie wavelength of the particle is [AIPMT 2014]

(1) 25 (2) 75 (3) 60 (4) 50

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Q.14 A parallel beam of fast moving electrons is incident normally on a narrow slit. A fluorescent screen is placed at a large distance from the slit. If the speed of the electrons is increased, which of the following statements is correct? [NEET 2013]

(1) The angular width of the central maximum will decrease.

(2) The angular width of the central maximum will be unaffected.

(3) Diffraction pattern is not observed on the screen in the case of electrons.

(4) The angular width of the central maximum of the diffraction pattern will increase.

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Q.15 The wavelength λ_e of an electron and λ_p of a photon of same energy E are related by [NEET 2013]

(1) $\lambda_p \propto \sqrt{\lambda_e}$ (2) $\lambda_p \propto \frac{1}{\sqrt{\lambda_e}}$

(3) $\lambda_p \propto \lambda_e^2$ (4) $\lambda_p \propto \lambda_e$

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Q.16 The de-broglie wavelength of neutrons in thermal equilibrium at temperature T is [NEET 2013 (Karnataka)]

(1) $\frac{3.08}{\sqrt{T}}$ Å (2) $\frac{0.308}{\sqrt{T}}$ Å

(3) $\frac{0.0308}{\sqrt{T}}$ Å (4) $\frac{30.8}{\sqrt{T}}$ Å

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Q.17 If the momentum of an electron is changed by P , then the de Broglie wavelength associated with it changes by 0.5%. The initial momentum of electron will be [AIPMT 2012 (Mains)]

(1) 200 P (2) 400 P (3) $\frac{P}{200}$ (4) 100 P

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- Q.18** An α -particle moves in a circular path of radius 0.83 cm in the presence of a magnetic field of 0.25 Wb/m^2 . The de Broglie wavelength associated with the particle will be [AIPMT 2012 (Prelims)]
 (1) $1 \text{ \AA}$ (2) $0.1 \text{ \AA}$ (3) $10 \text{ \AA}$ (4) $0.01 \text{ \AA}$

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full solution



- Q.19** Electrons used in an electron microscope are accelerated by a voltage of 25 kV. If the voltage is increased to 100 kV, then the de Broglie wavelength associated with the electrons would [AIPMT 2011 (Prelims)]
 (1) increase by 2 times (2) decrease by 2 times
 (3) decrease by 4 times (4) increase by 4 times

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- Q.20** A particle of mass 1 mg has the same wavelength as an electron moving with a velocity of $3 \times 10^6 \text{ m s}^{-1}$. The velocity of the particle is [AIPMT 2008]
 (1) $3 \times 10^{-31} \text{ m s}^{-1}$ (2) $2.7 \times 10^{-21} \text{ m s}^{-1}$
 (3) $2.7 \times 10^{-18} \text{ m s}^{-1}$ (4) $9 \times 10^{-2} \text{ m s}^{-1}$

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- Q.21** If particles are moving with same velocity, then which has maximum de Broglie wavelength? [AIPMT 2002]
 (1) proton (2) α -particle
 (3) neutron (4) β -particle

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full solution



ANSWER KEY

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	1	4	1	4	4	3	1	1	1	3	1
Ques.	12	13	14	15	16	17	18	19	20	21	
Ans.	4	2	1	3	4	1	4	2	3	4	