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Daily Practice Problems

JEE PHYSICS

Topic: Waves

Q.1 If the value of Planck's constant is more than its present value then the De-Broglie wavelength associated with a material particle will be -

(A) more

(B) less

(C) same

(D) more for light particles and less for heavy particles

Q.2 A moving car of 2000 kg mass and velocity of 30 m/sec has associated de-Broglie wavelength given is -

(A) 10^{-38}m (B) 6.62×10^{-34} m

(C) 1.1×10^{-38}m (D) 1.1×10^{-38}cm

Q.3 A particle of rest mass m_0 moves with a speed c. The de-Broglie wavelength associated with it will be -

(A) zero (B) infinite

(C) $\frac{h}{m_0 c}$ (D) $\frac{m_0 c}{h}$

Q.4 The wave associated with each moving material particle are -

(A) probability waves

(B) mechanical waves

(C) electromagnetic waves

(D) imaginary waves

Q.5 The wave nature of electron was verified by -

(A) photoelectric effect

(B) Compton effect

(C) the incidence of electron on metallic surface

(D) diffraction of electron by crystal

Q.6 The waves associated with electrons revolving in various Bohr orbits in an atom are -

(A) transverse (B) longitudinal

(C) progressive (D) stationary

Q.7 The mass of a particle is m kg. If mass is increased nine times keeping its energy constant, then the de-Broblie wavelength associated with it will

(A) Remain unchanged (B) become half

(C) become one third (D) become nine times

Q.8 The velocity at which the mass of a particle becomes twice its rest mass, will be -

(A) $\frac{2c}{3}$ (B) $\frac{c}{2}$ (C) $\frac{c\sqrt{3}}{2}$ (D) $\frac{3c}{4}$

Q.9 The mass of electron varies with -

(A) Electron velocity

(B) The size of cathode ray tube

(C) Variation of g

(D) The size of electron

Q.10 If E and p are the respective energy and momentum of a photon, then on reducing the wavelength of the photon,

(A) both p and E will decrease

(B) both p and E will increase

(C) p will increase but E will decrease

(D) p will decrease but E will increase

Q.11 The momentum of photon of energy 1 MeV will approximately be -

(A) 10^{-22} Kg-m/s (B) 5×10^{-22} Kg-m/s

(C) 3×10^{6} Kg-m/s (D) 0

Q.12 The frequency of a photon of momentum p will be -

(A) $\frac{pc}{h}$ (B) $\frac{ph}{c}$ (C) $\frac{mh}{c}$ (D) $\frac{mc}{h}$

Q.13 If the energy of a photon of light of frequency ν is E and its momentum is P, then the velocity of light is –

(A) EP (B) E/P (C) P/E (D) 1/EP

Q.14 The momentum of photon of wavelength 0.01 Å will be -

(A) h (B) 10^{-2} h

(C) 10^{12} h (D) 10^{2} h

Q.15 The energy of a photon (in eV) of wavelength 5000 Å will be -

(A) 2.48 eV (B) 8.42 eV

(C) zero (D) 4.82 eV

Q.16 The wavelength of a photon of momentum 6.6×10^{-24} Kg-m/s will be -

(A) 10 Å (B) 1 Å

(C) 100 Å (D) 1000 Å

Q.17 The momentum of photon of frequency 10^{9} Hz will be -

(A) 31 Kg m/s (B) 7.3×10^{-21} Kg-m/s

(C) 2.2×10^{-33} Kg-m/s (D) 6.6×10^{-26} kg-m/s

Q.18 Through what potential difference should an electron be accelerated so that its de Broglie wavelength become 0.4 Å –

(A) 9410 V (B) 94.10 V

(C) 9.140 V (D) 941.0 V

Q.19 The energy of an α-particle, whose de-broglie wavelength is 0.004 Å will be -

(A) 1270 eV (B) 1200 KeV

(C) 1200 MeV (D) 1200 GeV

Q.20 The study of diffraction of electrons from a target, gives the wavelength associated as 0.65Å. The energy of the electrons will be -

(A) 40eV (B) 100 eV

(C) 356 eV (D) 1000 eV

Q.21 The energies of an photon and an electron of mass m are same. The ratio of wavelengths associated with them will be -

(A) $c\sqrt{E/2m}$ (B) $\sqrt{2mc/E}$

(C) $c\sqrt{2m/E}$ (D) $\sqrt{E/2mc}$

Q.22 Two particles of mass m_1 and m_2 respectively are identically charged and are accelerated by same potential. If de-Broglie wavelength associated with them are λ_1 and λ_2 then -

(A) $\frac{\lambda_1}{\lambda_2} = \frac{m_2}{m_1}$ (B) $\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{m_2}{m_1}}$

(C) $\frac{\lambda_1}{\lambda_2} = \frac{m_1}{m_2}$ (D) $\frac{\lambda_1}{\lambda_2} = \sqrt{\frac{m_1}{m_2}}$

Q.23 An electron is 2000 times lighter than a proton. An electron and a proton are moving with such a velocity that de-Broglie wave associated with them is 1Å. The ratio of their K.E. will be -

(A) 1 : 2000 (B) 2000 : 1

(C) 1 : 1 (D) 1 : (4.0106)

Q.24 A double slit interference experiment is performed by a beam of electrons of energy 100 eV and the fringe spacing is observed to be β. Now if the electrons energy is increased to 10 keV, then the fringe spacing -

(A) remains the same (B) becomes 10β

(C) becomes 100β (D) becomes $\beta/10$

Q.25 The hydrogen atom emits a photon of 656.3 nm line. Find the momentum of the photon associated with it.

(A) 10^{-27} kg ms^{-1} (B) 10^{-23} kg ms^{-1}

(C) 10^{-25} kg ms^{-1} (D) none of these

Q.26 If E_1, E_2 and E_3 are the respective kinetic energies of an electron, an alpha particle and a proton, each having the same de Broglie wavelength, then -

(A) $E_1 > E_3 > E_2$ (B) $E_2 > E_3 > E_1$

(C) $E_1 > E_2 > E_3$ (D) $E_1 = E_2 = E_3$

Q.27 The de-Broglie wavelength of a particle of mass m and charge e, accelerated through potential V will be -

(A) $h/\sqrt{2meV}$ (B) $\sqrt{hmeV}$

(C) $m/\sqrt{2heV}$ (D) None of the above

Q.28 The electron of a H-atom moves in n^{th} orbit. If the length of the orbit is L and de-Broglie wavelength is λ, then the relation between them is -

(A) $L = \lambda/n$ (B) $\lambda = n/L$

(C) $L = n\lambda$ (D) $L = nh\lambda$

Q.29 If the momentum of electron is changed by P_m then the De Broglie wavelength associated with it changes by 0.50 % . The initial momentum of electron will be -

(A) $\frac{P_m}{200}$ (B) $\frac{P_m}{100}$

(C) $200\ P_m$ (D) $400\ P_m$

Q.30 When the momentum of a proton is changed by an amount P_0, the corresponding change in the de-Broglie wavelength is found to be 0.25%. Then the original momentum of the proton was -

(A) P_0 (B) $100\ P_0$

(C) $400\ P_0$ (D) $4\ P_0$

ANSWER KEY

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