

Model Question Paper
Dual nature of radiation and Matter - relativity - Part IV

12th Standard

Physics

Reg.No. :

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I. Answer all the questions.

II. Use blue pen only.

Time : 01:30:00 Hrs

Total Marks : 90

5 x 1 = 5

Part-A

- 1) The wave number of light of radiation of wavelength 5000 \AA is _____
(a) $2 \times 10^{-7} m^{-1}$ (b) $2 \times 10^{-6} m^{-1}$ (c) $5 \times 10^{-7} m^{-1}$ (d) $2 \times 10^6 m^{-1}$
- 2) If the momentum of a radiating photon is $3.3 \times 10^{-29} kgms^{-1}$ then its wavelength is _____
(a) $6 \times 10^{-3} m$ (b) $3 \times 10^{-3} m$ (c) $2 \times 10^{-3} m$ (d) $2 \times 10^{-5} m$
- 3) de Broglie wavelength of a proton is moving with $1/15^{\text{th}}$ of velocity of light is _____
(a) $3 \times 10^{-14} m$ (b) $2 \times 10^{-15} m$ (c) $2 \times 10^{-14} m$ (d) $3 \times 10^{-16} m$
- 4) The de Broglie wavelength of an electron having KE of 20eV is _____
(a) $0.275 nm$ (b) 2.75 \AA (c) $2.75 m$ (d) 0.275 \AA
- 5) A particle of mass $10^{-34} kg$ is moving with a speed of $1.8 \times 10^8 m/s$. The mass of the particle when it is in motion is _____
(a) $12.5 \times 10^{-24} kg$ (b) $1.25 \times 10^{-24} kg$ (c) $0.125 \times 10^{-24} kg$ (d) $12.5 \times 10^{-22} kg$

Part-B

6 x 5 = 30

- 6) At what speed is a particle moving if the mass is equal to three times its rest mass.
- 7) How fast would a rocket have to go relative to an observer for its length to be corrected to 99% of its length at rest .
- 8) The time interval measured by an observer at rest is $2.5 \times 10^{-8} s$. What is the time interval as measured by an observer moving with a velocity $v = 0.73 c$.
- 9) In the Bohr model of hydrogen atom, what is the de Broglie wavelength λ for the electron when it is in the (i) $n=1$ level and (ii) $n=4$ level. In each case, compare de Broglie wave length to the circumference of the orbit
- 10) In the Bohr model of hydrogen atom, what is the de-Broglie wavelength λ for the electron when it is in the 1) $n=1$ level and 2) $n=4$ level. In each case, compare the de Broglie wave to the circumference of the orbit.
- 11) UV light of wavelength 2271 \AA from a source irradiates a photo-cell which is made of molybdenum metal. If the stopping potential is 1.3 volt, calculate the work function of the metal. How would the photocell respond to high intensity ($10^5 Wm^{-2}$) red light of wavelength 6328 \AA produced by He-Ne.

6 x 5 = 30

- 12) List the uses and limitations of an electron microscope .
- 13) Explain the construction and working of a photo-emissive cell with diagram.

Generic 10

2X10=20

- 14) a) Explain the effect of frequency of incident radiation on stopping potential.
b) Explain the construction of simple photoemissive cell.
- 15) a) Explain Lorentz-Fitzgerald construction or Length contraction.
b) Explain the wave mechanical concept of atom.
