SHIKSHA CLASSES

BOARD QUESTION PAPER

Subject : Physics   **Topic: 15. Structure of Atoms and Nuclei**   **Total Marks : 20**

Class : XII   **Time : 1 Hr.**

Section (A)

Q.1. : **Select and write the most appropriate answer from given alternatives in each sub-question**   **5**

i) The wavelength limit (series Limit) present in the P-fund series is

($R = 1.097 \times 10^7 \, \text{m}^{-1}$

  a) $1572 \times 10^{-9} \, m$ b) $2535 \times 10^{-9} \, m$

  c) $2278 \times 10^{-9} \, m$ d) $1898 \times 10^{-9} \, m$

ii). A hydrogen atom initially in the ground level absorbs a photon and is excited to $n = 4$ level then the wavelength of photon is -

  a) $790 A^0$ b) $1070 A^0$

  c) $970 A^0$ d) $870 A^0$

iii) A radioactive element x with half life 2 hrs. decays giving a stable element y. After a time t, ratio of x and y atoms is 1:16. Time t is

  a) 8 hrs.   b) 6 hrs.

  c) 4 hrs.   d) 16 hrs.

iv) In nuclear reaction there is conservation of

  a) mass only   b) energy only

  c) momentum only   d) mass energy and momentum

v) The radius of nucleus of mass number 3 is R. Then the radius of nucleus of mass number 81 is ------.

  a) 3 R   b) 9 R

  c) $(27)^{1/2}_{R}$ d) 27 R

Q.2 : **Very short answer type Question**   **2**

i) Define ionization energy.

ii) Define decay constant.

Section (B)

:   **Attempt any three.**   **6**

Q.3 :   Write short notes on Thomson's model.

Q.4 :   State limitations of Bohr's model.

Q..5 :   An electron make a transition from orbit n=4 to the orbit n=2 of a hydrogen atom. What is the wave number of emitted radiation ?

Q.6 :   Calculate the De Broglies wavelength of a proton if it is moving with the speed of 2×10^5 m/s (m_p =1.673 x 10^{-27} kg)

Section (C)

:   **Attempt any one.**   **3**

Q.7 :   State the postulates of Bohr's theory of hydrogen atom. Write the necessary equations.

Q.8 :   A hydrogen atom undergoes a transition from a state with $n = 4$ to a state with $n = 1$ calculate i) The change in the angular momentum of the electron ii) The wavelength of the electron iii) The wavelength of the entitled radiation.

(h =6.63 × 10^{-34} Js, R=1.097 × 10^7 m^{-1})

Section (D)

. :   **Attempt any one.**   **4**

Q.9 :   i) State the law of radioactive decay. Hence derive the relation $N = N_0 e^{-\lambda t}$ where the symbols have their usual meanings.

ii) Show graphically how the number of nuclei (N) of radioactive element varies with time (t). Protactinium $^{233}_{91}Pa$ decays to $\left(\dfrac{1}{5}\right)^{th}$ of it's initial quantity in 62.7 days. Calculate the decay constant, mean life and halflife.

Q.1.0 :   i) Derive an expression for the radius of the nth Bohr orbit in a hydrogen atom. Hence,show that the radius of the orbit is directly proportional to the square of the principle quantum number. What is series limit ?

ii) The short wavelength limit of the Lyman series is 911.3 A^0. Calculate the short wavelength limit of the Balmer series.

* * *