

Board – CBSE

Class – 11<sup>th</sup>

Topic – Structure of Atom

1. What is the main difference between electromagnetic wave theory & Plank's quantum theory?
2. What were the discrepancies observed in Bohr's model?
3. Calculate the number of photons of a light with wavelength of 400 nm that can provide 2J of energy.
4. The I E of H atom is  $1.312 \times 10^6 \text{ J mol}^{-1}$ . Calculate the energy required to excite the electron in a hydrogen atom from the ground state to the first excited state.
5. Calculate the wavelength in Angstrom of the photon that is emitted when an electron in Bohr's orbit  $n = 2$  returns to  $n = 1$  in H atom. The ionization potential of the ground state of H atom is  $2.17 \times 10^{-11}$  ergs per atom.
6. Calculate the wavelength of the shortest transition in the Balmer series of hydrogen spectrum. [  $R_H = 109677 \text{ cm}^{-1}$  ]
7. Calculate the de Broglie wavelength of an electron travelling at 1 % speed of light. [Mass of electron =  $9.1 \times 10^{-31} \text{ kg}$ ,  $c = 3 \times 10^8 \text{ ms}^{-1}$ ]
8. What will be uncertainty in position of an electron (mass of electron =  $9.1 \times 10^{-28} \text{ g}$ ) moving with a velocity  $3.0 \times 10^4 \text{ ms}^{-1}$  accurate up to 0.011%?
9. Calculate the ratio between the wavelength of electron and proton if the proton is moving with half the velocity of electron ( mass of the proton =  $1.67 \times 10^{-27} \text{ kg}$  and mass of the electron =  $9.11 \times 10^{-31} \text{ kg}$ )
10. Derive de Broglie's relationship. What is its significance?
11. What were the discrepancies observed in Bohr's model?
12. Draw the shapes of 's' 'p' and 'd' orbitals.
13. State and explain the following:
  - (i) Aufbau principle
  - (ii) Pauli's exclusion principle
  - (iii) Hund's rule of maximum multiplicity
14. Similar to electron diffraction, neutron diffraction microscope is also used for the determination of the structure of molecules. If the wavelength used here is 800 pm, calculate the characteristic velocity associated with the neutron.

15. Dual behavior of matter proposed by de Broglie led to the discovery of electron microscope often used for the highly magnified images of biological molecules and other type of material. If the velocity of the electron in this microscope is  $1.6 \times 10^6 \text{ ms}^{-1}$ , calculate de Broglie wavelength associated with this electron.
16. If the photon of the wavelength 150 pm strikes an atom and one of its inner bound electrons is ejected out with a velocity of  $1.5 \times 10^7 \text{ ms}^{-1}$ , calculate the energy with which it is bound to the nucleus
17. The ejection of the photoelectron from the silver metal in the photoelectric effect experiment can be stopped by applying the voltage of 0.35 V when the radiation 256.7 nm is used. Calculate the work function for silver metal
18. The longest wavelength doublet absorption transition is observed at 589 and 589.6 nm. Calculate the frequency of each transition and energy difference between two excited states
19. Neon gas is generally used in the sign boards. If it emits strongly at 616 nm, calculate (a) the frequency of emission, (b) distance traveled by this radiation in 30 s (c) energy of quantum and (d) number of quanta present if it produces 2 J of energy.
20. An element with mass number 81 contains 31.7% more neutrons as compared to protons. Assign the atomic symbol.