## **Atoms And Nuclei**

- **1.** Obtain the expression for radius of nth orbit of H-atom, by using the postulates of Bohr atomic model.
- 2. Obtain the expression for energy of the electron in the nth orbit of H-atom, by using the postulates of Bohr atomic model.
- **3.** Write a note on spectral series of hydrogen atom.
- 4. State radioactive decay law and hence deduce the expression,  $N = N_0 e^{-\lambda t}$ .
- 5. Explain Soddy's group displacement law?
- 6. Show that the energy equivalent of 1 amu is 931MeV
- 7. Write the properties of Nucleus?
- 8. The wavelength of the first member of the Balmer series in the hydrogen spectrum is 656.3nm. Calculate the wavelength of the first member of the Lyman series in the same spectrum.
- **9.** The energy of an excited hydrogen atom is -3.4eV. Calculate the angular momentum of the electron according to Bohr's theory.
- 10. A doubly ionized lithium atom has atomic number 3. Find the wavelength of the radiation required to excite the electron in  $Li^{+2}$  from the first to the third Bohr orbit. Assume that the ionization energy is 13.6eV.
- **11.** A stationary He<sup>+</sup> emitted a photon corresponding to the first line of Lyman series. This photon liberated a photo electron from a stationary hydrogen atom in the ground state. Find the velocity of the photo electron.
- **12.** A hydrogen atom rises from its n=1 state to the n=4 state by absorbing energy. If the potential energy of the atom in n=1 state is -13.6 eV, calculate the potential energy in n=4 state and energy absorbed by the atom in the transition from n=1 to n=4 state.

- 13. Calculate the de Broglie wavelength of a neutron moving with a kinetic energy 150 eV, and an electron accelerated by a voltage of 50KV. given mass of the neutron =  $1.675 \times 10^{-27}$ Kg, and that of electron =  $9.1 \times 10^{-31}$  Kg.
- 14. One gram of a radioactive substance disintegrates at the rate of  $3.7 \times 10^{10}$  disintegrations per second. The atomic mass of the substance is 226. Calculate its mean life.
- **15.** Find the binding energy of an  $\alpha$ -particle from the following data. Mass of the helium nucleus=4.001265 a.m.u Mass of the proton = 1.007277 a.m.u Mass of the neutron = 1.00866 amu
- 16. Calculate the mass defect and specific binding energy of  $_7N^{14}$ . Given: The rest mass of nitrogen nucleus is 14.00307 amu. Mp = 1.00783amu, M<sub>n</sub> = 1.00867amu
- **17.** The half-life of a radioactive substance is 30s calculate i) the decay constant and ii) time taken to the sample to decay by 3/4th of the initial value?
- **18.** Calculate the half-life and mean life of Radium  $\square 226$  of activity 1Ci; Given mass of Radium -226 gram and 226 gram of radium consists of  $6.023 \times 10^{23}$  atoms.
- **19.** The half-life of a radioactive element is  $4 \times 10^8$  years. Calculate its decay constant and mean life.
- **20.** Find the activity in curie of 1g of radon: 222, whose half-life is 3.825 days. Avogadro number =  $6.023 \times 10^{23}$ , given; 1 curie =  $3.7 \times 10^{10}$  disintegrations per second.
- 21. Determine the mass of Na<sup>22</sup> which has an activity of 5mci. Half-life of Na<sup>22</sup> is 2.6 years. Avogadro number =  $6.023 \times 10^{23}$  atoms.
- 22. Calculate the mass in gram of radium 226. Whose activity is 1 curie and half-life is 1620 years. (Avogadro's number =  $6.023 \times 10^{23}$ )