CHAPTER 12

Atoms

Alpha-Particle Scattering and Rutherford's Nuclear Model of Atom (Distance of Closest Approach and Impact Parameter, Electron Orbits)

1. When an α particle of mass m moving with velocity v bombards on a heavy nucleus of charge 'Ze', its distance of closest approach from the nucleus depends on mass: *(2016 - I)*

a. $\frac{1}{m}$ b. $\frac{1}{\sqrt{m}}$

c. $\frac{1}{m^2}$ d. m

Bohr H-atom Model, Radius of Orbit, Velocity and Energy of Electrons, Wavelengths of Hydrogen Spectrum and Ionisation Potential

2. Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atom, respectively. According to the Bohr's model of an atom, the ratio $T_1 : T_2$ is : *(2022)*

a. 9 : 4 b. 1 : 4

c. 4 : 1 d. 4 : 9

3. For which one of the following, Bohr's model is not valid? *(2020)*

a. Singly ionised helium atom (He^+)

b. Deuteron atom

c. Singly ionised neon atom (Ne^+)

d. Hydrogen atom

4. The total energy of an electron in the n^{th} stationary orbit of the hydrogen atom can be obtained by. *(2020-Covid)*

a. $E_n = -\frac{13.6}{n^2} eV$ b. $E_n = -\frac{1.36}{n^2} eV$

c. $E_n = -13.6 \times n^2 \, eV$ d. $E_n = \frac{13.6}{n^2} eV$

5. The total energy of an electron in n atom in an orbit is –3.4 eV. Its kinetic and potential energies are, respectively: *(2019)*

a. –3.4 eV, –3.4 eV b. –3.4 eV, –6.8 eV

c. 3.4 eV, –6.8 eV d. 3.4 eV, 3.4 eV

6. The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is *(2018)*

a. 2 : –1 b. 1 : –1

c. 1 : 1 d. 1 : –2

7. The ratio of wavelengths of the last line of Balmer series and the last line of Lyman series is: *(2017-Delhi)*

a. 1 b. 4

c. 0.5 d. 2

8. If an electron in a hydrogen atom jumps from the 3rd orbit to the 2nd orbit, it emits a photon of wavelength λ. When it jumps from the 4th orbit to the 3rd orbit, the corresponding wavelength of the photon will be: *(2016 - II)*

a. $\frac{20}{7}\lambda$ b. $\frac{20}{13}\lambda$

c. $\frac{16}{25}\lambda$ d. $\frac{9}{16}\lambda$

9. Given the value of Rydberg constant is 10^7 m^{-1}, the wave number of the last line of the Balmer series in hydrogen spectrum will be: *(2016 - I)*

a. 0.025×10^4 m^{-1} b. 0.5×10^7 m^{-1}

c. 0.25×10^7 m^{-1} d. 2.5×10^7 m^{-1}

10. Consider 3rd orbit of He^+ (Helium) using non relativistic approach the speed of electron in this orbit will be (given $K = 9 \times 10^9$ constant Z = 2 and h (Planck's constant) $= 6.6 \times 10^{-34}$ Js): *(2015)*

a. 1.46×10^6 m/s b. 0.73×10^6 m/s

c. 3.0×10^8 m/s d. 2.92×10^6 m/s

11. In the spectrum of hydrogen, the ratio of the longest wavelength in the Lyman series to the longest wavelength in the Balmer series is: *(2015 Pre)*

a. 5/27 b. 4/9

c. 9/4 d. 27/5

12. Hydrogen atom in ground state is excited by a monochromatic radiation of λ = 975 Å. Number of spectral lines in the resulting spectrum emitted will be: *(2014)*

a. 3
b. 2
c. 6
d. 10

13. Ratio of longest wavelengths corresponding to Lyman and Balmer series in hydrogen spectrum is: *(2013)*

a. 9/31
b. 5/27
c. 3/ 23
d. 7/29

Answer Key

1	2	3	4	5	6	7	8	9	10	11	12	13
a	a	c	a	c	b	b	a	c	a	a	c	b