CHAPTER-12
Atoms
ASSIGNMENT-2

Multiple choice questions (1 mark each)

Q.1 Why did Thomson's atomic model fail?

(a) Thomson's model failed to explain the scattering of alpha particles through large angles in Rutherford experiment.

(b) Thomson's model failed to explain the scattering of alpha particles through small angles in Rutherford experiment.

(c) Thomson's model failed to explain the scattering of beta particles through large angles in Rutherford experiment.

(d)) Thomson's model failed to explain the scattering of beta particles through small angles in Rutherford experiment.

Q.2 How much is the radius of Bohr's inner most orbit?

(a) r=0.51 ^{0}A (b) r=0.35 ^{0}A (c) r=0.23 ^{0}A (d) r=0.53 ^{0}A

Q3. The transition from the state n = 5 to n = 1 in a hydrogen atom results in UV radiation. Infrared radiation will be obtained in the transition

(a) 2 → 1 (b) 3 → 2 (c) 4 → 3 (d) 6 → 2

Q.4 The energy of hydrogen atom in its ground state is -13.6eV. The energy of level corresponding to n=5 is

(a)-0.54eV (b)-5.40eV (c)-0.85eV (d)-2.75eV

Q.5 Hydrogen atom are excited from ground state of the principal quantum number 4 then number of spectral lines observed will be

(a)3 (b)6 (c)5 (d) 2

Q.6 In Bohr model of hydrogen atom which of the following is quantised?

(a) linear velocity of electron (b) angular velocity of electron

(c) linear momentum (d)angular momentum

Assertion –Reason Type Questions (1 mark)

Answer: A Both are correct and reason is correct explanation of assertion.

Answer: B Both are correct but reason is not the correct explanation of assertion.

Answer: C Reason is wrong.

Answer: D Both are wrong.

Q7. **Assertion**: The force of repulsion between atomic nucleus and α-particle varies with distance according to inverse square law.

Reason: Rutherford did a-particle scattering experiment

Q8. **Assertion** : Total energy of revolving electron in any stationary orbit is negative.

Reason : Energy is a scalar quantity. It can have positive or negative value.

Q9.**Assertion:**Balmer series lies in the visible region of electromagnetic spectrum

Reason: $1/\lambda = R(1/2^2 - 1/n^n)$, where n=3,4,5…..

Case study based question (5 marks)

Q 10. HYDROGEN EMISSION SPECTRA

Hydrogen spectrum consist of discrete bright lines in dark background is known as Hydrogen Emission spectrum. There is one more type of Hydrogen spectrum that exist where we get dark lines on bright background. It is known as absorption spectra.

Balmer found empirical formula by the observation of a small part of the spectrum and it is represented by $1/\lambda = R(1/2^2 - 1/n^2)$ where n = 3,4,5 …

(I) Number of spectral lines in Hydrogen atom is

(a) 8 (b)6 (c) 15 (d) infinity

(II) Which series of hydrogen spectrum corresponding to ultra violet region

(a) Balmer series (b) Bracket series (c) Paschen series (d)Lymen Series

(III) Which of the following lines of Hydrogen Spectrum belongs to Balmer Series

(a)1025 ^{0}A (b) 1218 ^{0}A (c)4861 ^{0}A (d)18751 ^{0}A

(IV) Rydberg Constant is

(a) Universal constant (b) same for same elements

(c) different for different elements (d) none of the above

(V) Hydrogen is excited from ground state to another state with a Principal quantum number equals to 4. Then the number of spectral lines in emission spectra will be

(a) 3 (b) 5 (c) 6 (d)2

Short Answer type questions (2 marks each)

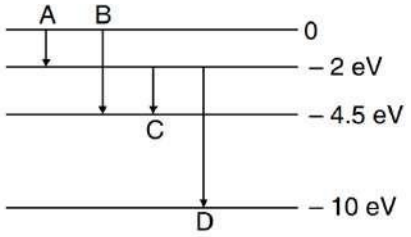
Q11.Find the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its (i) second permitted energy level to the first level (ii) the highest permitted energy level to the first permitted level

Q 12. When an electron in hydrogen atom jumps from the third excited state to the ground state, how would the de Broglie wavelength associated with the electron change? Justify your answer.

Q.13 Define the distance of closest approach. An α-particle of kinetic energy 'K' is bombarded on a thin gold foil. The distance of the closest approach is 'r'. What will be the distance of closest approach for an α- particle of double the kinetic energy?

Q.14 In the ground state of hydrogen atom, its Bohr radius is given as 5.3×10^{-11} m. The atom is excited such that the radius becomes 21.2×10^{-11} m. Find (i) the value of the principal quantum number and (ii) the total energy of the atom in this excited state. (2016)

Q.15 The energy levels of a hypothetical atom are given below. Which of the shown transitions will result in the emission of photon of wavelength 275 nm? (2016)



Q.16 Show that the radius of the orbit in hydrogen atom varies as n^2, where n is the principal quantum number of the atom. (CBSE 2015)

Short answer type questions (3 marks each)

Q 17. A monochromatic radiation of wavelength 975 Å excites the hydrogen atom from its ground state to a higher state. How many different spectral lines are possible in the resulting spectrum? Which transition corresponds to the longest wavelength amongst them. (CBSE Sample QP 2018)

Long answer type questions (5 marks each)

Q. 18. (i) Draw a schematic arrangement of the Geiger- Marsden experiment and describe it.

(ii) How did the scattering of a-particle by a thin foil of gold provide an important way to determine an upper limit on the size of the nucleus? Explain briefly.