

Chapter 12

Atoms

(Assertion and Reason Questions)

Directions: These questions consist of two statements, each printed as Assertion and Reason. While answering these questions, you are required to choose any one of the following four responses.

- (a) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.
- (b) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.
- (c) If the Assertion is correct but Reason is incorrect.
- (d) If both the Assertion and Reason are incorrect.

Q.1. Assertion: The force of repulsion between atomic nucleus and α -particle varies with distance according to inverse square law.

Reason: Rutherford did α -particle scattering experiment.

Q.2. Assertion: According to classical theory the proposed path of an electron in Rutherford atom model will be parabolic.

Reason: According to electromagnetic theory an accelerated particle continuously emits radiation.

Q.3. Assertion: Bohr had to postulate that the electrons in stationary orbits around the nucleus do not radiate.

Reason: According to classical physics all moving electrons radiate.

Q.4. Assertion: Electrons in the atom are held due to coulomb forces.

Reason: The atom is stable only because the centripetal force due to Coulomb's law is balanced by the centrifugal force.

Q.5. Assertion: Hydrogen atom consists of only one electron but its emission spectrum has many lines.

Reason: Only Lyman series is found in the absorption spectrum of hydrogen atom whereas in the emission spectrum, all the series are found.

Q.6. Assertion: Between any two given energy levels, the number of absorption transitions is always less than the number of emission transitions.

Reason: Absorption transitions start from the lowest energy level only and may end at any higher energy level. But emission transitions may start from any higher energy level and end at any energy level below it.

Q.7. Assertion: In Lyman series, the ratio of minimum and maximum wavelength is $\frac{3}{4}$

Reason: Lyman series constitute spectral lines corresponding to transition from higher energy to ground state of hydrogen atom.

-X-X-X-

ANSWER KEY

Q.1 : (b) Rutherford confirmed that the repulsive force of α - particle due to nucleus varies with distance according to inverse square law and that the positive charges are concentrated at the centre and not distributed throughout the atom.

Q.2 : (d) According to classical electromagnetic theory, an accelerated charged particle continuously emits radiation. As electrons revolving in circular paths are constantly experiencing centripetal acceleration, hence they will be losing their energy continuously and the orbital radius will go on decreasing, form spiral and finally the electron will fall in the nucleus.

Q.3 : (b) Bohr postulated that electrons in stationary orbits around the nucleus do not radiate. This is the one of Bohr's postulate, According to this the moving electrons radiates only when they go from one orbit to the next lower orbit.

Q.4 : (c) According to postulates of Bohr's atom model the electron revolves around the nucleus in fixed orbit of definite radii. As long as the electron is in a certain orbit it does not radiate any energy.

Q.5 : (b) When the atom gets appropriate energy from outside, then this electron rises to some higher energy level. Now it can return either directly to the lower energy level or come to the lowest energy level after passing through other lower energy levels hence all possible transitions take place in the source and many lines are seen in the spectrum.

Q.6 : (a)

Q.7 : (b)