QB365 Question Paper Software
12th Standard - Physics
Atoms Assertion and reason

Exam Time: 00:20 Hrs | Date: 2025-09-30
Total Marks: 10

Questions:

1. **Assertion (A)** : It is essential that all the lines available in the emission spectrum will not be available in the absorption spectrum.
Reason (R) : The spectrum of hydrogen atom is only absorption spectrum.
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

2. **Assertion (A)** : Total energy of electron in an hydrogen atom is negative.
Reason (R) : It is bounded to the nucleus.
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

3. **Assertion (A)** : An electron in hydrogen atom passes from n = 4 to n = 1 level. The maximum number of photons that can be emitted is 4.
Reason (R) : Maximum number of p~otons emitted can only be 4.
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

4. **Assertion (A)** : Balmer series lies in the visible region of electromagnetic spectrum.
Reason (R): $\frac{1}{\lambda} = R\left(\frac{1}{2^2} - \frac{1}{K^2}\right),$, where $K = 3, 4, 5, \ldots$
Codes:
(a) Both A and R are true and R is the correct explanation of A
(b) Both A and R are true but R is NOT the correct explanation of A
(c) A is true but R is false
(d) A is false and R is also false

5. **Assertion (A) :** According to classical theory, the proposed path of an electron in Rutherford atom model will be circular.
Reason (R) : According to electromagnetic theory an accelerated particle continuously emits radiation.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

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.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

7. **Assertion (A):** In the Bohr model of the hydrogen atom, electrons revolve around the nucleus in circular orbits of fixed radii.
Reason (R): The angular momentum of the electron is quantized in the Bohr model, leading to the restriction of specific allowed orbits.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

8. **Assertion (A):** The de Broglie wavelength of an electron is inversely proportional to its momentum.
Reason (R): The de Broglie wavelength of a particle is given by $\lambda = h / p$, where h is Planck's constant and p is the momentum of the particle.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

9. **Assertion (A):** The energy levels in multi-electron atoms are more complex than those in hydrogen-like atoms.
Reason (R): The presence of multiple electrons in an atom leads to electron-electron repulsions and additional energy levels.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

10. **Assertion (A):** The Pauli exclusion principle states that no two electrons in an atom can have the same set of quantum numbers.
Reason (R): The Pauli exclusion principle is a consequence of the wave nature of electrons and is essential for the stability of matter.
Codes:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false and R is also false.

Answers Key:

1. **(c)**: Emission transitions can take place between any higher energy level and any energy level below it while absorption transitions start from the lowest energy level only and may end at any higher energy level. Hence number of absorptions transitions between two given energy levels is always less than the number of emission transitions between same two levels.
2. **(a)**: We knew that, $E = -\frac{13.6}{n^2}$eV
   It shows that total energy of electron in a stationary orbit in a hydrogen atom is negative, which means the electron is bound to the nucleus and is not free to leave it.
3. **(d)**: The maximum number of photons emitted = 6 corresponding to the transitions $4 \rightarrow 3$; $3 \rightarrow 2$, $2 \rightarrow 1$, $4 \rightarrow 2$, $4 \rightarrow 1$ and $3 \rightarrow 1$.
4. **(b)**: When we put R = 10^7 $m^{-1}$and K = 3,4, 5 in the given formula, values of λ calculated lie between 4000 $\dot{A}$ and 8000 $\dot{A}$, which is the visible region. The reason is true, but does not explain the assertion properly.
5. (b) Both A and R are true but R is not the correct explanation of A.
6. (a) Both A and R are true and R is the correct explanation of A.
7. (a) Both A and R are true and R is the correct explanation of A.
8. (a) Both A and R are true and R is the correct explanation of A.
9. (a) Both A and R are true and R is the correct explanation of A.
10. (a) Both A and R are true and R is the correct explanation of A.