DCAM classes

Dynamic Classes for Academic Mastery

Objective Questions

(For Complete Chapter)

Multiple Choice Questions (MCQs)

1. Paschen series of atomic spectrum of hydrogen gas lies in **All India 2020**

(a) infrared region

(b) ultraviolet region

(c) visible region

(d) partly in ultraviolet and visible region

2. In the α-particle scattering experiment, the shape of the trajectory of the scattered α-particles depend upon **All India 2020**

(a) only on impact parameter

(b) only on the source of α-particles

(c) Both impact parameter and source of α-particles

(d) impact parameter and the screen material of the detector

3. The existance of a positively charged nucleus in an atom was first suggested by the experiment of

(a) J J Thomson

(b) Rutherford

(c) Chadwick

(d) Hahn and Strassman

4. Rutherford's atomic model could account for

(a) stability of atoms

(b) origin of spectra

(c) the positive charged central core of an atom

(d) concept of stationary orbits

5. In the lowest energy level of hydrogen atom, the electron has the angular momentum

(a) $\frac{\pi}{h}$ (b) $\frac{h}{\pi}$

(c) $\frac{h}{2\pi}$ (d) $\frac{2\pi}{h}$

6. According to Bohr's theory (assuming infinite mass of the nucleus), the frequency of the second line of the Balmer series is

(a) 6.16×10^{14} Hz

(b) 6.16×10^{13} Hz

(c) 6.16×10^{10} Hz

(d) 6.16×10^{16} Hz

7. The transition from the state $n = 3$ to $n = 1$ in a hydrogen like atom results in ultraviolet radiation. Infrared radiation will be obtained in the transition from

(a) $2 \rightarrow 1$ (b) $3 \rightarrow 2$

(c) $4 \rightarrow 2$ (d) $4 \rightarrow 3$

8. According to the Bohr's atomic model, the relation between principal quantum number (n) and radius of orbit (r) is

(a) $r \propto n^2$ (b) $r \propto \frac{1}{n^2}$

(c) $r \propto \frac{1}{n}$ (d) $r \propto n$

9. When an electron jumps from the orbit $n = 2$ to $n = 4$, then wavelength of the radiations absorbed will be (R is Rydberg's constant)

(a) $\frac{16}{3R}$ (b) $\frac{16}{5R}$

(c) $\frac{5R}{16}$ (d) $\frac{3R}{16}$

10. If ν_1 is the frequency of the series limit of Lyman series, ν_2 is the frequency of the first line of Lyman series and ν_3 is the frequency of the series limit of the Balmer series. Then,

(a) $\nu_1 - \nu_2 = \nu_3$

(b) $\nu_1 = \nu_2 - \nu_3$

(c) $\frac{1}{\nu_2} = \frac{1}{\nu_1} + \frac{1}{\nu_3}$

(d) $\frac{1}{\nu_1} = \frac{1}{\nu_2} + \frac{1}{\nu_3}$

Assertion-Reason Questions

Directions (Q. Nos. 11-16) *In the following questions, two statements are given- one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below*

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

11. Assertion Light emitted from rarefied gases heated in a flame or excited electrically in a glow tube like mercury vapour light has only certain discrete wavelengths.

Reason In such gases, the average spacing between atom is large.

12. Assertion Most of an atom is an empty space.

Reason From Rutherford's experiment, size of the nucleus is 10^{-10} m and from kinetic theory, size of the atom is 10^{-15} m.

13. Assertion If the electrons in an atom were stationary, then they would fall into the nucleus.

Reason Electrostatic force of attraction acts between negatively charged electrons and positive nucleus.

14. Assertion Angular momentum of single electron in any orbit of hydrogen type atoms is independent of the atomic number of the element.

Reason In ground state angular momentum is minimum.

15. Assertion It is essential that all the lines available in the emission spectrum will also be available in the absorption spectrum.

Reason The spectrum of hydrogen atom is only absorption spectrum.

16. Assertion Second orbit circumference of hydrogen atom is two times the de-Broglie wavelength of electrons in that orbit.

Reason de-Broglie wavelength of electron in ground state is minimum.

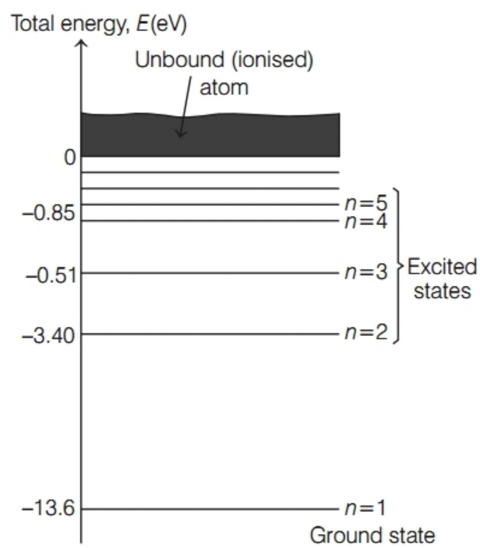
Case Based Questions

Direction (Q.No. 17) *This question is case study based question. Attempt any 4 sub-parts from this question. Each question carries 1 mark.*

17. Excited State of Atom

At room temperature, most of the H-atoms are in ground state. When an atom receives some energy (i.e. by electron collisions), the atom may acquire sufficient energy to raise electron to higher energy state. In this condition, the atom is said to be in excited state.

From the excited state, the electron can fall back to a state of lower energy, emitting a photon equal to the energy difference of the orbit.



In a mixture of H—He^+ gas (He^+ is single ionized He atom), H-atoms and He^+ ions are excited to their respective first excited states. Subsequently, H atoms transfer their total excitation energy to He^+ ions (by collisions).

(i) The quantum number n of the state finally populated in He^+ ions is

(a) 2 (b) 1
(c) 4 (d) 5

(ii) The energy required to excite H-atom from $n = 2$ to $n = 4$ is

(a) 2.55 eV (b) 4.25 eV

(c) 4 eV (d) 0.85 eV

(iii) The ratio of kinetic energy of the electrons for the H-atom to that of He^{+} ion for $n = 3$ is

(a) $\frac{1}{4}$ (b) $\frac{1}{2}$

(c) 1 (d) 2

(iv) The radius of nth orbit of H-atom is r, then r and n are related as

(a) $r \propto n$ (b) $r \propto n^2$

(c) $r \propto \frac{1}{n}$ (d) $r \propto \frac{1}{n^2}$

(v) Angular momentum of an electron in H-atom in second excited state is

(a) $\frac{3h}{2\pi}$ (b) $\frac{2\pi}{3h}$

(c) $\frac{3h}{\pi}$ (d) $\frac{h}{2\pi}$