Atoms

Q.No.1:
In a hydrogen like atom election makes transition from an energy level with quantum number n to another with quantum number (n − 1). If n >> 1, the frequency of radiation emitted is proportional to:

JEE 2013

A. $\frac{1}{n}$

B. $\frac{1}{n^2}$

C. $\frac{1}{n^{\frac{3}{2}}}$

D. $\frac{1}{n^3}$

Q.No.2: Each of hydrogen ($_1H^1$), deuterium ($_1H^2$), singly-ionised helium $(_2He^4)^+$ and doubly-ionised lithium $(_3Li^6)^{++}$ have one electron around the nucleus. Consider an electron transition from n = 2 to n = 1. If the wavelengths of emitted radiations are λ_1, λ_2, λ_3 and λ_4, respectively, then approximately which one of the following is correct?

A. $\lambda_1 = \lambda_2 = 4\lambda_3 = 9\lambda_4$

B. $\lambda_1 = 2\lambda_2 = 3\lambda_3 = 4\lambda_4$

C. $4\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

D. $\lambda_1 = 2\lambda_2 = 2\lambda_3 = \lambda_4$

Q.No.3: The radiation corresponding to 3 → 2 transition of hydrogen atom falls on a metal surface to produce photoelectrons. These electrons are made to enter a magnetic field of 3×10^{-4} T. If the radius of the largest circular path followed by these electrons is 10.0 mm, the work function of the metal is close to

A. 0.8 eV
B. 1.6 eV
C. 1.8 eV
D. 1.1 eV

Q.No.4: If the series limit frequency of the Lyman series is v_L, then the series limit frequency of the P fund series is : **JEE 2018**

A. v_L / 16
B. v_L / 25
C. 25 v_L
D. 16 v_L

Q.No.5: An electron from various excited states of hydrogen atom emit radiation to come to the ground state. Let λ_n, λ_g be the de Broglie wavelength of the electron in the n^{th} state and the ground state respectively. Let $\wedge_n$ be the wavelength of the emitted photon in the transition from the n^{th} state to the ground state. For large n, (A, B are constants) **JEE 2018**

A. $\wedge_n^2 \approx A + B\lambda_n^2$
B. $\wedge_n^2 \approx \lambda$
C. $\wedge_n \approx A + \frac{B}{\lambda_n^2}$
D. $\wedge_n \approx A + B\lambda_n$

Q.No.6: A hydrogen atom, initially in the ground state is excited by absorbing a photon of wavelength 980Å. The radius of the atom in the excited state, in terms of Bohr radius a_0, will be:
(hc = 12500 eV-Å) **JEE 2019**

A. $25a_0$
B. $9a_0$
C. $16a_0$
D. $4a_0$

Q.No.7: In a hydrogen like atom, when an electron jumps from the M - shell to the L - shell, the wavelength of emitted radiation is λ. If an electron jumps from N-shell to the L-shell, the wavelength of emitted radiation will be: **JEE 2019**

A. $\frac{27}{20}\lambda$
B. $\frac{16}{25}\lambda$
C. $\frac{25}{16}\lambda$
D. $\frac{20}{27}\lambda$

Q.No.8: A particle of mass *m* moves in a circular orbit in a central potential field $U(r) = \frac{1}{2}kr^2$. If Bohr's quantization conditions are applied, radii of possible orbitals and energy levels vary with quantum number *n* as: **JEE 2019**

A. $r_n \propto \sqrt{n},\ E_n \propto n$
B. $r_n \propto \sqrt{n},\ E_n \propto \frac{1}{n}$
C. $r_n \propto n,\ E_n \propto n$
D. $r_n \propto n^2,\ E_n \propto \frac{1}{n^2}$

Q.No.9: In the given figure, the energy levels of hydrogen atom have been shown along with some transitions marked A, B, C, D and E.
The transitions A, B and C respectively represent :

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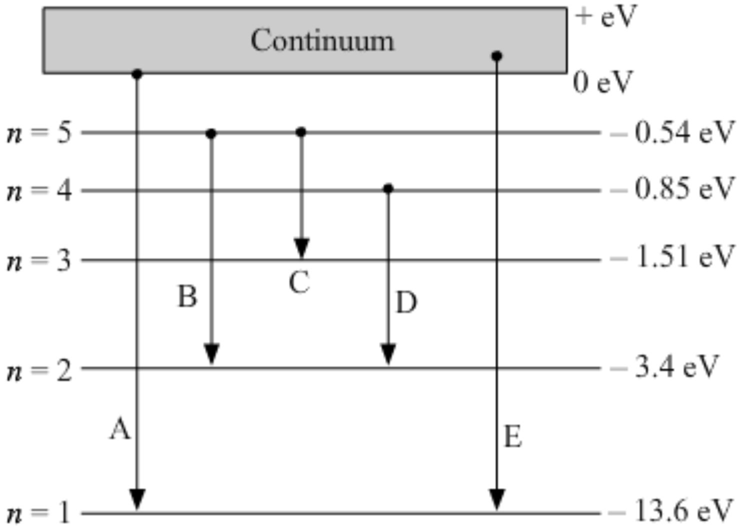

A. The ionization potential of hydrogen, second member of Balmer series and third member of Paschen series.

B. The series limit of Lyman series, third member of Balmer series and second member of Paschen series.

C. The series limit of Lyman series, second member of Balmer series and second member of Paschen series

D. The first member of the Lyman series, third member of Balmer series and second member of Paschen series.

Q.No.10: If λ_1 and λ_2 are the wavelengths of the third member of Lyman and first member of the Paschen series respectively, then the value of $\lambda_1 : \lambda_2$ is

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A. 1 : 3

B. 7 : 108

C. 7 : 135

D. 1 : 9