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JEE MAIN ATOMS — PYQS

Max. Marks: 92 **Questions:** 23

Section A (MCQ) — 21 questions

Q.1 The ratio of momentum of the photons of the 1st and 2nd line of Balmer series of Hydrogen atoms is α/β. The possible values of α and β are :

[JEE Main 2026 (Online) 6th April Morning Shift]

(1) 27 and 20 (2) 3 and 16
(3) 5 and 36 (4) 20 and 27

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Q.2 In the hydrogen atom, the electron makes a transition from the higher orbit (i) to a lower orbit (f). The ratio of the radius of the orbits is given by $r_i:r_f$ = 16:4. The wavelength of photon emitted due to this transition is _____ nm.
(Given Rydberg constant = 1.0973×10^7 /m)

[JEE Main 2026 (Online) 5th April Morning Shift]

(1) 121 (2) 242 (3) 486 (4) 974

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Q.3 In Rutherford's alpha-particle scattering experiment, only a few alpha particles rebound back because

A. The size of gold nucleus is very small as compared to the size of gold atom.
B. Alpha particle and gold nucleus have equal charge.
C. The impact parameter is minimum for a few alpha particles.
D. A few alpha particles have very high kinetic energy.
E. Only a few alpha particles undergo head-on collision with the nuclei.

Choose the correct answer from the options given below : [JEE Main 2026 (Online) 4th April Evening Shift]

(1) A, B Only (2) B, E Only
(3) C, D Only (4) A, C, E Only

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Q.4 Angular momentum of an electron in a hydrogen atom is $\frac{3h}{\pi}$, then the energy of the electron is _____ eV.

[JEE Main 2026 (Online) 2nd April Morning Shift]

(1) −1.51 (2) −0.85 (3) −0.38 (4) −0.28

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Q.5 Two electrons are moving in orbits of two hydrogen-like atoms with speeds 3×10^5 m/s and 2.5×10^5 m/s respectively. If the radii of these orbits are nearly same then the possible order of energy states are _____ respectively.

[JEE Main 2026 (Online) 24th January Morning Shift]

(1) 8 and 10 (2) 10 and 12
(3) 9 and 8 (4) 6 and 5

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Q.6 In hydrogen atom spectrum, (R ⟶ Rydberg's constant)

A. the maximum wavelength of the radiation of Lyman series is $\frac{4}{3R}$
B. the Balmer series lies in the visible region of the spectrum
C. the minimum wavelength of the radiation of Paschen series is $\frac{9}{R}$
D. the minimum wavelength of Lyman series is $\frac{5}{4R}$

Choose the correct answer from the options given below :

[JEE Main 2026 (Online) 23rd January Morning Shift]

(1) A, B Only (2) B, D Only
(3) A, B and D Only (4) A, B and C Only

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Q.7 A 7.9 MeV α-particle scatters from a target material of atomic number 79. From the given data the estimated diameter of nuclei of the target material is (approximately) _____ m.

$\left[\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9 \text{ N m}^2/\text{C}^2 \text{ and electron charge} = 1.6 \times 10^{-19} \text{ C}\right]$

[JEE Main 2026 (Online) 22nd January Morning Shift]

(1) 2.88×10^{-14} (2) 5.76×10^{-14}
(3) 1.44×10^{-13} (4) 1.69×10^{-12}

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Q.8 The smallest wavelength of Lyman series is 91 nm. The difference between the largest wavelengths of Paschen and Balmer series is nearly _____ nm.

[JEE Main 2026 (Online) 22nd January Evening Shift]

(1) 1784 (2) 1875 (3) 1217 (4) 1550

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Q.9 If an alpha particle with energy 7.7 MeV is bombarded on a thin gold foil, the closest distance from nucleus it can reach is _____ m. (Atomic number of gold = 79 and $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ in SI units)

[JEE Main 2026 (Online) 21st January Morning Shift]

(1) 2.95×10^{-16} (2) 3.85×10^{-14}

(3) 2.95×10^{-14} (4) 3.85×10^{-16}

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Q.10 The energy of an electron in an orbit of the Bohr's atom is $-0.04E_0$ eV where E_0 is the ground state energy. If L is the angular momentum of the electron in this orbit and h is the Planck's constant, then $\frac{2\pi L}{h}$ is _____ :

[JEE Main 2026 (Online) 21st January Evening Shift]

(1) 6 (2) 2 (3) 5 (4) 4

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Q.11 In a hydrogen like ion, the energy difference between the 2nd excitation energy state and ground is 108.8 eV. The atomic number of the ion is:

[JEE Main 2025 (Online) 7th April Morning Shift]

(1) 1 (2) 4 (3) 3 (4) 2

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Q.12 For a hydrogen atom, the ratio of the largest wavelength of Lyman series to that of the Balmer series is [JEE Main 2025 (Online) 7th April Morning Shift]

(1) 5:27 (2) 27:5 (3) 3:4 (4) 5:36

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Q.13 Considering the Bohr model of hydrogen-like atoms, the ratio of the radius of 5th orbit of the electron in Li^{2+} and He^{+} is

[JEE Main 2025 (Online) 4th April Morning Shift]

(1) $\frac{3}{2}$ (2) $\frac{2}{3}$ (3) $\frac{4}{9}$ (4) $\frac{9}{4}$

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Q.14 Given below are two statements :

Statement-I: The dimensions of Planck's constant and angular momentum are the same.

Statement-II: In Bohr's model electrons revolve around the nucleus only in those orbits for which angular momentum is integral multiple of Planck's constant.

In the light of the above statements, choose the most appropriate answer from the options given below :

[JEE Main 2025 (Online) 4th April Evening Shift]

(1) Both Statement-I and Statement-II are correct

(2) Statement-I is correct but Statement-II is incorrect

(3) Both Statement-I and Statement-II are incorrect

(4) Statement-I is incorrect but Statement-II is correct

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Q.15 Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion (A): The Bohr model is applicable to hydrogen and hydrogen-like atoms only.

Reason (R): The formulation of Bohr model does not include repulsive force between electrons.

In the light of the above statements, choose the correct answer from the options given below

[JEE Main 2025 (Online) 3rd April Evening Shift]

(1) A is true but R is false

(2) Both A and R are true and R is the correct explanation of A

(3) A is false but R is true

(4) Both A and R are true but R is NOT the correct explanation of A

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Q.16 Considering Bohr's atomic model for hydrogen atom :

A. the energy of H atom in ground state is same as energy of He^{+} ion in its first excited state.

B. the energy of H atom in ground state is same as that for Li^{++} ion in its second excited state.

C. the energy of H atom in its ground state is same as that of He^{+} ion for its ground state.

D. the energy of He^{+} ion in its first excited state is same as that for Li^{++} ion in its ground state.

Choose the correct answer from the options given below : [JEE Main 2025 (Online) 2nd April Morning Shift]

(1) (A), (B) only (2) (A), (D) only

(3) (A), (C) only (4) (B), (D) only

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Q.17 Assuming the validity of Bohr's atomic model for hydrogen-like ions the radius of Li^{++} ion in its ground state is given by $\frac{1}{X}a_0$, where X = _____ (Where a_0 is the first Bohr's radius.)

[JEE Main 2025 (Online) 2nd April Evening Shift]

(1) 2 (2) 9 (3) 1 (4) 3

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Q.18 The number of spectral lines emitted by atomic hydrogen that is in the 4th energy level, is

[JEE Main 2025 (Online) 29th January Evening Shift]

(1) 3 (2) 6 (3) 1 (4) 0

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Q.19 The frequency of revolution of the electron in Bohr's orbit varies with n, the principal quantum number as:

[JEE Main 2025 (Online) 28th January Evening Shift]

(1) $\frac{1}{n^4}$ (2) $\frac{1}{n^2}$ (3) $\frac{1}{n^3}$ (4) $\frac{1}{n}$

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Q.20 During the transition of electron from state A to state C of a Bohr atom, the wavelength of emitted radiation is 2000 Å and it becomes 6000 Å when the electron jumps from state B to state C. Then the wavelength of the radiation emitted during the transition of electrons from state A to state B is

[JEE Main 2025 (Online) 24th January Morning Shift]

(1) 4000 Å (2) 6000 Å (3) 2000 Å (4) 3000 Å

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Q.21 An electron in the ground state of the hydrogen atom has the orbital radius of 5.3×10^{-11} m while that for the electron in third excited state is 8.48×10^{-10} m. The ratio of the de Broglie wavelengths of electron in the ground state to that in the excited state is

[JEE Main 2025 (Online) 22nd January Morning Shift]

(1) 4 (2) 3 (3) 9 (4) 16

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Section B (Numerical) — 2 questions

Q.22 Using Bohr's model, calculate the ratio of the magnetic fields generated due to the motion of the electrons in the 2nd and 4th orbits of hydrogen atom _____. [JEE Main 2026 (Online) 2nd April Evening Shift]

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Q.23 An electron in the hydrogen atom initially in the fourth excited state makes a transition to n^{th} energy state by emitting a photon of energy 2.86 eV. The integer value of n will be _____.

[JEE Main 2025 (Online) 3rd April Evening Shift]

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ANSWER KEY

Section A (MCQ) — 21 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	**4**	**3**	**4**	**3**	**4**	**4**	**2**	**3**	**3**	**3**	**3**
Ques.	12	13	14	15	16	17	18	19	20	21	
Ans.	**1**	**2**	**2**	**2**	**1**	**4**	**2**	**3**	**4**	**1**	

Section B (Numerical) — 2 questions

Ques.	22	23									
Ans.	**32**	**2**									