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NEET ATOMS — BOHR MODEL OF THE HYDROGEN ATOM (RADIUS, VELOCITY, ENERGY) — PYQS

Max. Marks: 80 **Questions:** 20

Section A (MCQ) — 20 questions

Q.1 In the first excited state of hydrogen atom, the energy of its electron is −3.4 eV. The radial distance of the electron from the hydrogen nucleus in this case is approximately :
(Take 1 eV = 1.6×10^{-19} J, e = 1.6×10^{-19} C and $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ N m^2/C^2) [NEET (UG) 2026]
(1) 2.1×10^{-8} m (2) 2.1×10^{-10} m
(3) 2.1×10^{-11} m (4) 2.1×10^{-9} m

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Q.2 Consider that an electron is revolving in an excited state of Hydrogen atom with velocity $\sqrt{25.6} \times 10^5$ ms^{-1}. The radius of the orbit is $x \times 10^{-9}$ m. The value of x is:
[Take the mass of electron to be 9×10^{-31} kg, charge of electron = -1.6×10^{-19} C and $\frac{1}{4\pi\varepsilon_0} = 9 \times 10^9$ Nm^{2}C^{-2}] [RE-NEET (UG) 2026]
(1) 1 (2) 4 (3) 3 (4) 2

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Q.3 A particle of mass m is moving around the origin with a constant force F pulling it towards the origin. If Bohr model is used to describe its motion, the radius of the nth orbit and the particle's speed v in the orbit depend on n as [NEET (UG) 2025]
(1) r $n^{2/3}$; v $n^{1/3}$ (2) r $n^{4/3}$; v $n^{-1/3}$
(3) r $n^{1/3}$; v $n^{1/3}$ (4) r $n^{1/3}$; v $n^{2/3}$

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Q.4 De-Broglie wavelength of an electron orbiting in the n = 2 state of hydrogen atom is close to
(Given Bohr radius = 0.052 nm) [NEET (UG) 2025]
(1) 1.67 nm (2) 2.67 nm
(3) 0.067 nm (4) 0.67 nm

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Q.5 The radius of inner most orbit of hydrogen atom is 5.3×10^{-11} m. What is the radius of third allowed orbit of hydrogen atom? [NEET (UG) 2023]
(1) 1.06 Å (2) 1.59 Å (3) 4.77 Å (4) 0.53 Å

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Q.6 Let T_1 and T_2 be the energy of an electron in the first and second excited states of hydrogen atoms, respectively. According to the Bohr's model of an atom, the ratio T_1:T_2 is [NEET (UG) 2022]
(1) 1:4 (2) 4:1 (3) 4:9 (4) 9:4

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Q.7 Let R_1 be the radius of the second stationary orbit and R_2 be the radius of the fourth stationary orbit of an electron in Bohr's model. The ratio $\frac{R_1}{R_2}$ is : [NEET (UG) 2022 (Phase 2)]
(1) 4 (2) 0.25 (3) 0.5 (4) 2

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Q.8 For which one of the following, Bohr model is not valid? [NEET (UG) 2020]
(1) Singly ionised helium atom (He^+)
(2) Deuteron atom
(3) Singly ionised neon atom (Ne^+)
(4) Hydrogen atom

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Q.9 The total energy of an electron in an atom in an orbit is −3.4 eV. Its kinetic and potential energies are, respectively. [NEET (UG) 2019]
(1) 3.4 eV, −6.8 eV (2) 3.4 eV, 3.4 eV
(3) −3.4 eV, −3.4 eV (4) −3.4 eV, −6.8 eV

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Q.10 The ratio of kinetic energy to the total energy of an electron in a Bohr orbit of the hydrogen atom, is [NEET 2018]
(1) 1:1 (2) 1: − 1 (3) 2: − 1 (4) 1: − 2

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Q.11 Consider 3rd orbit of He^+ (Helium), using non-relativistic approach, the speed of electron in this orbit will be [given $K = 9 \times 10^9$ constant, Z = 2 and h (Planck's Constant) $= 6.6 \times 10^{-34}$ J s] [AIPMT 2015 (Cancelled)]

(1) 0.73×10^6 m/s (2) 3.0×10^8 m/s
(3) 2.92×10^6 m/s (4) 1.46×10^6 m/s

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Q.12 An electron in hydrogen atom makes a transition $n_1 \longrightarrow n_2$ where n_1 and n_2 are principal quantum numbers of the two states. Assuming Bohr's model to be valid, the time period of the electron in the initial state is eight times that in the final state. The possible values of n_1 and n_2 are [NEET 2013 (Karnataka)]

(1) $n_1 = 6$ and $n_2 = 2$ (2) $n_1 = 8$ and $n_2 = 1$
(3) $n_1 = 8$ and $n_2 = 2$ (4) $n_1 = 4$ and $n_2 = 2$

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Q.13 The energy of a hydrogen atom in the ground state is −13.6 eV. The energy of a He^+ ion in the first excited state will be [AIPMT 2010 (Prelims)]

(1) −13.6 eV (2) −27.2 eV
(3) −54.4 eV (4) −6.8 eV

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Q.14 The energy of a hydrogen atom in the ground state is −13.6 eV. The energy of a He^+ ion in the first excited state will be [AIPMT 2010 (Prelims)]

(1) −13.6 eV (2) −27.2 eV
(3) −54.4 eV (4) −6.8 eV

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Q.15 The ground state energy of hydrogen atom is −13.6 eV. When its electron is in the first excited state, its excitation energy is [AIPMT 2008]

(1) 10.2 eV (2) 0 (3) 3.4 eV (4) 6.8 eV

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Q.16 The total energy of electron in the ground state of hydrogen atom is −13.6 eV. The kinetic energy of an electron in the first excited state is [AIPMT 2007]

(1) 6.8 eV (2) 13.6 eV (3) 1.7 eV (4) 3.4 eV

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Q.17 The total energy of an electron in the first excited state of hydrogen atom is about −3.4 eV. Its kinetic energy in this state is [AIPMT 2005]

(1) 3.4 eV (2) 6.8 eV (3) −3.4 eV (4) −6.8 eV

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Q.18 The Bohr model of atoms [AIPMT 2004]

(1) Assumes that the angular momentum of electrons is quantized.
(2) Uses Einstein's photoelectric equation.
(3) Predicts continuous emission spectra for atoms.
(4) Predicts the same emission spectra for all types of atoms.

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Q.19 In which of the following systems will the radius of the first orbit (n = 1) be minimum? [AIPMT 2003]

(1) doubly ionized lithium
(2) singly ionized helium
(3) deuterium atom
(4) hydrogen atom

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Q.20 The energy of hydrogen atom in n^{th} orbit is E_n, then the energy in n^{th} orbit of singly ionised helium atom will be [AIPMT 2001]

(1) $4E_n$ (2) $E_n/4$ (3) $2E_n$ (4) $E_n/2$

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ANSWER KEY

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