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JEE MAIN STRUCTURE OF ATOM — PYQS

Max. Marks: 192 **Questions:** 48

Section A (MCQ) — 42 questions

Q.1 If shortest wavelength of hydrogen atom in Lyman series is x, then longest wavelength in Balmer series of He^+ is:

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

(1) $\frac{9x}{5}$ (2) $\frac{36x}{5}$ (3) $\frac{x}{4}$ (4) $\frac{5x}{9}$

Scan or tap for the full solution

Q.2 Match the **LIST-I** with **LIST-II**

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

Orbital		Radial nodes and nodal plane	
A.	2s	I.	1 Radial node + two nodal planes
B.	3s	II.	1 Radial node + one nodal plane
C.	3p	III.	2 Radial nodes + No nodal plane
D.	4d	IV.	1 Radial node + No nodal plane

(1) A-IV, B-I, C-III, D-II

(2) A-IV, B-II, C-III, D-I

(3) A-III, B-I, C-IV, D-II

(4) A-IV, B-III, C-II, D-I

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Q.3 The Bohr radius of a hydrogen like species is 70.53 pm. The species and the stationary state (n) are respectively

(Given : Hydrogen atom Bohr radius is 52.9 pm)

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

(1) Li^{2+}, 3 (2) He^+, 3 (3) He^+, 2 (4) Li^{2+}, 2

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Q.4 Arrange the following atomic orbitals of multi electron atoms in order of increasing energy.

A. n = 3, l = 2, m = + 1 B. n = 4, l = 0, m = 0

C. n = 6, l = 1, m = 0 D. n = 5, l = 1, m = + 1

E. n = 2, l = 1, m = + 1

Choose the correct answer from the options given below: [JEE Main 2026 (Online) 5th April Morning Shift]

(1) C < D < B < A < E (2) B < A < E < C < D

(3) E < C < D < B < A (4) E < B < A < D < C

Scan or tap for the full solution

Q.5 Identify the correct statements from the following : Choose the correct answer from the options given below:

A. Heisenberg uncertainty principle is applicable to electrons.

B. The size of $2p_x$ orbital is less than the size of $3p_x$ orbital.

C. The energy of 2s orbital of H atom is equal to the energy of 2s orbital of Li.

D. The electronic configuration of Cr is [Ar] $3d^5\ 4s^1$

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

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

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

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Q.6 Which of the following statement(s) is/are true ?

A. If two orbitals have the same value of (n + l), the orbital with lower value of n will have lower energy.

B. Energies of the orbitals in the same subshell increase with increase in atomic number.

C. The size of $2p_x$ orbital is less than the size of $3p_x$ orbital.

D. Among 5f, 6s, 4d, 5p and 5d orbitals, none of the orbitals have 2 radial nodes.

Choose the correct answer from the options given below : [JEE Main 2026 (Online) 5th April Evening Shift]

(1) A, B and C only (2) A and C only

(3) C and D only (4) A only

Scan or tap for the full solution

Q.7 What is the ratio of wave number of first line (lowest energy line) of Balmer series of H atomic spectrum to first line of its Brackett series?

[JEE Main 2026 (Online) 4th April Morning Shift]

(1) 5 : 1 (2) 5 : 0.81 (3) 5 : 1.75 (4) 5 : 27

Scan or tap for the full solution

Q.8 Which of the following is correct set of 4 quantum numbers of 19th electron in Chromium (Atomic number = 24) in accordance with Aufbau principle?

[JEE Main 2026 (Online) 4th April Morning Shift]

(1) $n = 3, l = 2, m = +2, s = +\frac{1}{2}$

(2) $n = 3, l = 2, m = -2, s = +\frac{1}{2}$

(3) $n = 4, l = 1, m = 0, s = +\frac{1}{2}$

(4) $n = 4, l = 0, m = 0, s = +\frac{1}{2}$

Scan or tap for the full solution

Q.9 The species having identical radii according to the Bohr's theory are :

A. H (first orbit) B. He^+ (first orbit)

C. He^+ (Second orbit) D. Li^{2+} (first orbit)

E. Be^{3+} (Second orbit)

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

(1) A and C Only (2) A and E Only

(3) B and E Only (4) C and D Only

Scan or tap for the full solution

Q.10 What is the energy (in J atom^{-1}) required for the following process ?

$Li^{2+}(g) \longrightarrow Li^{3+}(g) + e^-$

(Take the ionization energy for the H atom in the ground state as 2.18×10^{-18} J atom^{-1})

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

(1) 8.72×10^{-18} (2) 1.962×10^{-18}

(3) 1.962×10^{-17} (4) 6.54×10^{-17}

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Q.11 The wave numbers of three spectral lines of H atom are considered. Identify the set of spectral lines belonging to Balmer series.

(R = Rydberg constant)

[JEE Main 2026 (Online) 28th January Morning Shift]

(1) $\frac{5R}{36}, \frac{3R}{16}, \frac{21R}{100}$ (2) $\frac{7R}{144}, \frac{3R}{16}, \frac{16R}{255}$

(3) $\frac{3R}{4}, \frac{3R}{16}, \frac{7R}{144}$ (4) $\frac{5R}{36}, \frac{8R}{9}, \frac{15R}{16}$

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Q.12

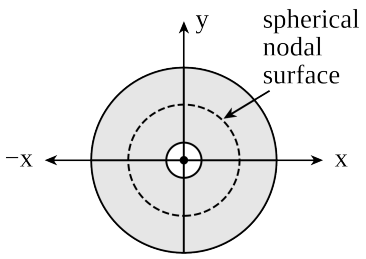

Figure 1. electron probability density for 2s orbital

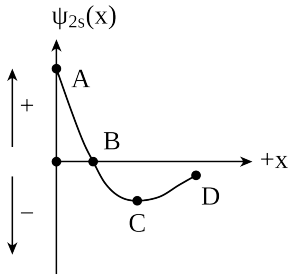

Figure 2. wave function for 2s orbital

Which of the following point in Figure 2 most accurately represents the nodal surface as shown in Figure 1?

[JEE Main 2026 (Online) 28th January Morning Shift]

(1) D (2) B (3) C (4) A

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Q.13 The wavelength of photon 'A' is 400 nm. The frequency of photon 'B' is 10^{16} s^{-1}. The wave number of photon 'C' is 10^4 cm^{-1}. The correct order of energy of these photons is :

[JEE Main 2026 (Online) 28th January Evening Shift]

(1) A > C > B (2) C > B > A

(3) B > A > C (4) A > B > C

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Q.14 The wavelength of spectral line obtained in the spectrum of Li^{2+} ion, when the transition takes place between two levels whose sum is 4 and difference is 2, is

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

(1) 1.14×10^{-6} cm (2) 2.28×10^{-6} cm

(3) 1.14×10^{-7} cm (4) 2.28×10^{-7} cm

Scan or tap for the full solution

Q.15 Given,

(A) $n = 5, m_l = -1$

(B) $n = 3,\ l = 2,\ m_l = -1,\ m_s = +\frac{1}{2}$

The maximum number of electron(s) in an atom that can have the quantum numbers as given in (A) and (B) respectively are :

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

(1) 4 and 1 (2) 2 and 4

(3) 26 and 1 (4) 8 and 1

Scan or tap for the full solution

Q.16 Which of the following statements regarding the energy of the stationary state is true in the following one-electron systems ?

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

(1) $+2.18 \times 10^{-18}$ J for second orbit of He^+ ion
(2) $+8.72 \times 10^{-18}$ J for first orbit of He^+ ion
(3) -1.09×10^{-18} J for second orbit of H atom.
(4) -2.18×10^{-18} J for third orbit of Li^{2+} ion

Scan or tap for the full solution

Q.17 The work functions of two metals (M_A and M_B) are in the 1 : 2 ratio. When these metals are exposed to photons of energy 6 eV, the kinetic energy of liberated electrons of M_A:M_B is in the ratio of 2.642 : 1. The work functions (in eV) of M_A and M_B are respectively.

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

(1) 3.1, 6.2 (2) 1.5, 3.0 (3) 2.3, 4.6 (4) 1.4, 2.8

Scan or tap for the full solution

Q.18 Identify the **INCORRECT** statements from the following :

A. Notation $^{24}_{12}Mg$ represents 24 protons and 12 neutrons.
B. Wavelength of a radiation of frequency $4.5 \times 10^{15}\ s^{-1}$ is 6.7×10^{-8} m.
C. One radiation has wavelength $= \lambda_1$(900 nm) and energy $= E_1$. Other radiation has wavelength $= \lambda_2$(300 nm) and energy $= E_2$. E_1:E_2 = 3:1.
D. Number of photons of light of wavelength 2000 pm that provides 1 J of energy is 1.006×10^{16}.

Choose the correct answer from the options given below :

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

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

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Q.19 The energy required by electrons, present in the first Bohr orbit of hydrogen atom to be excited to second Bohr orbit is _____ J mol^{-1}.
Given: $R_H = 2.18 \times 10^{-11}$ ergs.

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

(1) 9.835×10^{12} (2) 1.635×10^{-11}
(3) 1.635×10^{-18} (4) 9.835×10^{5}

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Q.20 The energy of first (lowest) Balmer line of H atom is x J. The energy (in J) of second Balmer line of H atom is :

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

(1) $\frac{x}{1.35}$ (2) 1.35x (3) x^2 (4) 2x

Scan or tap for the full solution

Q.21 Given below are two statements :

Statement-I: When an electric discharge is passed through gaseous hydrogen, the hydrogen molecules dissociate and the energetically excited hydrogen atoms produce electromagnetic radiation of discrete frequencies.

Statement-II: The frequency of second line of Balmer series obtained from He^+ is equal to that of first line of Lyman series obtained from hydrogen atom.

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

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

(1) Both Statement-I and Statement-II are true
(2) Statement-I is true but Statement-II is false
(3) Statement-I is false but Statement-II is true
(4) Both Statement-I and Statement-II are false

Scan or tap for the full solution

Q.22 Consider the following spectral lines for atomic hydrogen :

The correct arrangement of the above lines in ascending order of energy is :

A. First line of Paschen series
B. Second line of Balmer series
C. Third line of Paschen series
D. Fourth line of Brackett series

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

(1) D < C < A < B (2) A < B < C < D
(3) D < A < C < B (4) C < D < B < A

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Q.23 Correct statements for an element with atomic number 9 are:

A. There can be 5 electrons for which $m_s = +\frac{1}{2}$ and 4 electrons for which $m_s = -\frac{1}{2}$.
B. There is only one electron in p_z orbital.
C. The last electron goes to orbital with n = 2 and l = 1.
D. The sum of angular nodes of all the atomic orbitals is 1.

Choose the correct answer from the options given below: [JEE Main 2025 (Online) 8th April Evening Shift]

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

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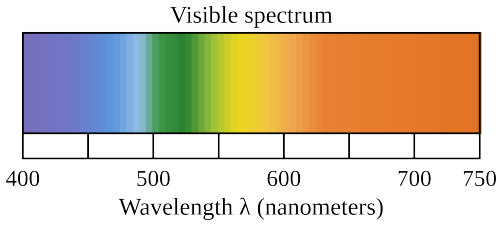
Q.24



Which of the following statements are correct, if the threshold frequency of caesium is 5.16×10^{14} Hz?

A. When Cs is placed inside a vacuum chamber with an ammeter connected to it and yellow light is focused on Cs, the ammeter shows the presence of current.

B. When the brightness of the yellow light is dimmed, the value of the current in the ammeter is reduced.

C. When a red light is used instead of the yellow light, the current produced is higher with respect to the yellow light.

D. When a blue light is used, the ammeter shows the formation of current.

E. When a white light is used, the ammeter shows formation of current.

Choose the correct answer from the options given below: [JEE Main 2025 (Online) 7th April Morning Shift]

(1) B, C and D Only (2) A, C, D and E Only

(3) A, B, D and E Only (4) A, D and E Only

Scan or tap for the full solution

Q.25 The extra stability of half-filled subshell is due to :

A. Symmetrical distribution of electrons

B. Smaller coulombic repulsion energy

C. The presence of electrons with the same spin in non-degenerate orbitals

D. Larger exchange energy

E. Relatively smaller shielding of electrons by one another

Identify the correct statements : [JEE Main 2025 (Online) 7th April Evening Shift]

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

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

Scan or tap for the full solution

Q.26 Which one of the following about an electron occupying the 1s orbital in a hydrogen atom is incorrect?

(Bohr's radius is represented by a_0) [JEE Main 2025 (Online) 4th April Morning Shift]

(1) The probability density of finding the electron is maximum at the nucleus

(2) The total energy of the electron is maximum when it is at a distance a_0 from the nucleus

(3) The electron can be found at a distance $2a_0$ from the nucleus

(4) The 1s orbital is spherically symmetrical

Scan or tap for the full solution

Q.27 Consider the ground state of chromium atom (Z = 24). How many electrons are with Azimuthal quantum number l = 1 and l = 2 respectively ? [JEE Main 2025 (Online) 4th April Evening Shift]

(1) 16 and 5 (2) 12 and 5

(3) 12 and 4 (4) 16 and 4

Scan or tap for the full solution

Q.28 Which of the following postulate of Bohr's model of hydrogen atom is not in agreement with quantum mechanical model of an atom? [JEE Main 2025 (Online) 3rd April Morning Shift]

(1) The electron in a H atom's stationary state moves in a circle around the nucleus.

(2) An atom can take only certain distinct energies E_1, E_2, E_3, etc. These allowed states of constant energy are called the stationary states of atom.

(3) An atom in a stationary state does not emit electromagnetic radiation as long as it stays in the same state.

(4) When an electron makes a transition from a higher energy stationary state to a lower energy stationary state, then it emits a photon of light.

Scan or tap for the full solution

Q.29 For electrons in '2s' and '2p' orbitals, the orbital angular momentum values, respectively are: [JEE Main 2025 (Online) 3rd April Evening Shift]

(1) 0 and $\sqrt{6}\frac{h}{2\pi}$ (2) 0 and $\sqrt{2}\frac{h}{2\pi}$

(3) $\sqrt{2}\frac{h}{2\pi}$ and 0 (4) $\frac{h}{2\pi}$ and $\sqrt{2}\frac{h}{2\pi}$

Scan or tap for the full solution

Q.30 According to Bohr's model of hydrogen atom, which of the following statement is incorrect? [JEE Main 2025 (Online) 2nd April Morning Shift]

(1) Radius of 4th orbit is four times larger than that of 2nd orbit

(2) Radius of 8th orbit is four times larger than that of 4th orbit

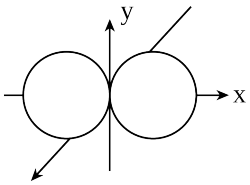
(3) Radius of 6th orbit is three times larger than that of 4th orbit

(4) Radius of 3rd orbit is nine times larger than that of 1st orbit

Scan or tap for the full solution

Q.31 Which of the following statements are true?

A. The subsidiary quantum number l describes the shape of the orbital occupied by the electron.

B. 

is the boundary surface diagram of the $2p_x$ orbital.

C. The + and - signs in the wave function of the $2p_x$ orbital refer to charge.

D. The wave function of $2p_x$ orbital is zero everywhere in the xy plane.

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

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

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

Scan or tap for the full solution

Q.32 If a_0 is denoted as the Bohr radius of hydrogen atom, then what is the de Broglie wavelength (λ) of the electron present in the second orbit of hydrogen atom? [n : any integer]

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

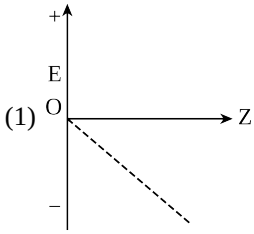
(1) $\frac{8\pi a_0}{n}$ (2) $\frac{2a_0}{n\pi}$ (3) $\frac{na_0}{4\pi}$ (4) $\frac{4\pi a_0}{n}$

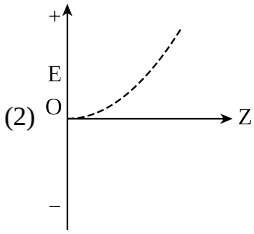
Scan or tap for the full solution

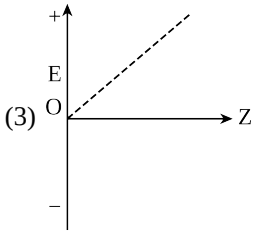
Q.33 For hydrogen like species, which of the following graphs provides the most appropriate representation of E vs Z plot for a constant n?

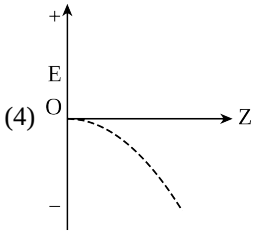
[E : Energy of the stationary state, Z : atomic number, n = principal quantum number]

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

(1) 

(2) 

(3) 

(4) 

Scan or tap for the full solution

Q.34 Given below are two statements :

Statement-I: It is impossible to specify simultaneously with arbitrary precision, both the linear momentum and the position of a particle.

Statement-II: If the uncertainty in the measurement of position and uncertainty in measurement of momentum are equal for an electron, then the uncertainty in the measurement of velocity is $\geq \sqrt{\frac{h}{\pi}} \times \frac{1}{2m}$.

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

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

(1) Statement-I is false but Statement-II is true

(2) Both Statement-I and Statement-II are true

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

(4) Statement-I is true but Statement-II is false

Scan or tap for the full solution

Q.35 In a multielectron atom, which of the following orbitals described by three quantum numbers will have same energy in absence of electric and magnetic fields?

A. $n = 1, l = 0, m_l = 0$ B. $n = 2, l = 0, m_l = 0$

C. $n = 2, l = 1, m_l = 1$ D. $n = 3, l = 2, m_l = 1$

E. $n = 3, l = 2, m_l = 0$

Choose the correct answer from the options given below:

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

(1) B and C Only (2) C and D Only

(3) A and B Only (4) D and E Only

Scan or tap for the full solution

Q.36 Which of the following is/are not correct with respect to energy of atomic orbitals of hydrogen atom?

A. 1s < 2p < 3d < 4s

B. 1s < 2s = 2p < 3s = 3p
C. 1s < 2s < 2p < 3s < 3p
D. 1s < 2s < 4s < 3d
Choose the **correct** answer from the options given below :

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

(1) (A) and (B) only (2) (A) and (C) only
(3) (B) and (D) only (4) (C) and (D) only

Scan or tap for the full solution

Q.37 For hydrogen atom, the orbital/s with lowest energy is/are :

A. 4s B. $3p_x$
C. $3d_{x^2-y^2}$ D. $3d_{z^2}$
E. $4p_z$

Choose the correct answer from the options given below :

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

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

Scan or tap for the full solution

Q.38 Heat treatment of muscular pain involves radiation of wavelength of about 900 nm. Which spectral line of H atom is suitable for this?
Given : Rydberg constant $R_H = 10^5\ cm^{-1}$,
$h = 6.6 \times 10^{-34}$ J s, $c = 3 \times 10^8$ m/s

[JEE Main 2025 (Online) 23rd January Morning Shift]

(1) Lyman series, $\infty \longrightarrow 1$
(2) Balmer series, $\infty \longrightarrow 2$
(3) Paschen series, $5 \longrightarrow 3$
(4) Paschen series, $\infty \longrightarrow 3$

Scan or tap for the full solution

Q.39 Given below are two statements :
Statement-I: For a given shell, the total number of allowed orbitals is given by n^2.
Statement-II: For any subshell, the spatial orientation of the orbitals is given by −l to +l values including zero.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

(1) Both Statement-I and Statement-II are true
(2) Both Statement-I and Statement-II are false
(3) Statement-I is false but Statement-II is true
(4) Statement-I is true but Statement-II is false

Scan or tap for the full solution

Q.40 Given below are two statements about X-ray spectra of elements :

Statement-I: A plot of $\sqrt{\nu}$ (ν = frequency of X-rays emitted) vs atomic mass is a straight line.
Statement-II: A plot of ν (ν = frequency of X-rays emitted) vs atomic number is a straight line.

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

[JEE Main 2025 (Online) 23rd January Evening Shift]

(1) Statement-I is false but Statement-II is true
(2) Both Statement-I and Statement-II are true
(3) Statement-I is true but Statement-II is false
(4) Both Statement-I and Statement-II are false

Scan or tap for the full solution

Q.41 Radius of the first excited state of Helium ion is given as : $a_0 \longrightarrow$ radius of first stationary state of hydrogen atom.

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

(1) $r = \frac{a_0}{4}$ (2) $r = 2a_0$ (3) $r = 4a_0$ (4) $r = \frac{a_0}{2}$

Scan or tap for the full solution

Q.42 Given below are two statements :
Statement-I: A spectral line will be observed for a $2p_x \longrightarrow 2p_y$ transition.
Statement-II: $2p_x$ and $2p_y$ are degenerate orbitals.

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

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

(1) Statement-I is false but Statement-II is true
(2) Both Statement-I and Statement-II are false
(3) Statement-I is true but Statement-II is false
(4) Both Statement-I and Statement-II are true

Scan or tap for the full solution

Section B (Numerical) — 6 questions

Q.43 Consider two radiations of wavelengths
1. $\lambda_1 = 2000$ Å
2. $\lambda_2 = 6000$ Å
The ratio of the energies of these two radiations $\left(\frac{E_1}{E_2}\right)$ is _____ (Nearest integer).

[JEE Main 2026 (Online) 8th April Evening Shift]

Scan or tap for the full solution

Q.44 Niobium (Nb) and ruthenium (Ru) have "x" and "y" number of electrons in their respective 4 d orbitals. The value of x + y is _____.

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

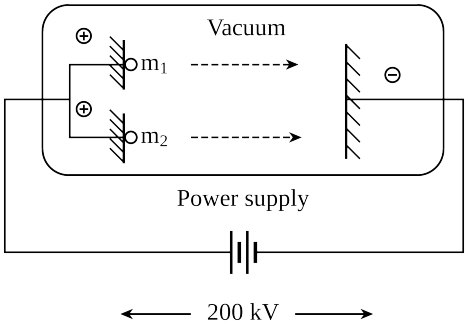
Scan or tap for the full solution

Q.45 The surface of sodium metal is irradiated with radiation of wavelength x nm. The kinetic energy of ejected electrons is 2.8×10^{-20} J. The work function of sodium is 2.3 eV. The value of x is _____ $\times 10^{2}$ nm. (Nearest integer)
(Given : $h = 6.6 \times 10^{-34}$ J s; 1 eV = 1.6×10^{-19} J; c = 3.0×10^{8} m s^{-1})

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

Scan or tap for the full solution

Q.46 Two positively charged particles m_1 and m_2 have been accelerated across the same potential difference of 200 kV as shown below.



[Given mass of m_1 = 1 amu and m_2 = 4 amu]
The de Broglie wavelength of m_1 will be x times of m_2. The value of x is _____ (nearest integer)

[JEE Main 2026 (Online) 28th January Evening Shift]

Scan or tap for the full solution

Q.47 The hydrogen spectrum consists of several spectral lines in Lyman series (L_1, L_2, L_3…;L_1 has lowest energy among Lyman series). Similarly it consists of several spectral lines in Balmer series (B_1, B_2, B_3…;B_1 has lowest energy among Balmer lines). The energy of L_1 is x times the energy of B_1. The value of x is _____ $\times 10^{-1}$. (Nearest integer)

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

Scan or tap for the full solution

Q.48 The energy of an electron in the first Bohr orbit of the H-atom is −13.6 eV.
The magnitude of energy value of an electron in the first excited state of Be^{3+} is _____ eV (nearest integer value).

[JEE Main 2025 (Online) 8th April Evening Shift]

Scan or tap for the full solution

ANSWER KEY

Section A (MCQ) — 42 questions

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	**1**	**4**	**4**	**4**	**2**	**2**	**2**	**4**	**2**	**3**	**1**
Ques.	12	13	14	15	16	17	18	19	20	21	22
Ans.	**2**	**3**	**1**	**4**	**4**	**3**	**2**	**4**	**2**	**1**	**3**
Ques.	23	24	25	26	27	28	29	30	31	32	33
Ans.	**3**	**3**	**2**	**2**	**2**	**1**	**2**	**3**	**1**	**1**	**4**
Ques.	34	35	36	37	38	39	40	41	42		
Ans.	**2**	**4**	**4**	**3**	**4**	**1**	**4**	**2**	**1**		

Section B (Numerical) — 6 questions

Ques.	43	44	45	46	47	48					
Ans.	**3**	**11**	**5**	**2**	**54**	**54**					