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PHYSICS · JEE MAIN

Atomic Physics

Chapter-wise previous year questions, with answer key

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PYQS	PAPERS	TOPICS

Bohr's Model · Energy Levels and Spectral Series · Hydrogen-like Atoms · X-Rays · Thomson and Rutherford Models

1. Attempt each question on paper first — they're grouped by topic, newest papers first.
2. Check yourself against the answer key at the end.
3. Got one wrong? Tap “Step-by-step solution” under it for the full working.

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Bohr's Model · 35 PYQs

Q1 JEE Main 2025 · 4 Apr · Shift 1

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

(A) $\frac{3}{2}$ **(B)** $\frac{2}{3}$

(C) $\frac{4}{9}$ **(D)** $\frac{9}{4}$

Step-by-step solution ▸ prepwiser.in/questions/-hqeEsbB-H

Q2 JEE Main 2025 · 4 Apr · Shift 2

Given below are two statements :

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

Statement (II) : In Bohr's model electron 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 :

(A) Both Statement I and Statement II are correct

(B) Statement I is correct but Statement II is incorrect

(C) Both Statement I and Statement II are incorrect

(D) Statement I is incorrect but Statement II is correct

Step-by-step solution ▸ prepwiser.in/questions/WbnkRwTV3a

Q3 JEE Main 2025 · 3 Apr · Shift 2

Given below are two statements: one is labelled as $\mathbf{Assertion A}$ and the other is labelled as Reason $\mathbf{R}$

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

Reason $\mathbf{R}$: 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

(A) $\mathbf{A}$ is true but $\mathbf{R}$ is false

(B) Both $\mathbf{A}$ and $\mathbf{R}$ are true and $\mathbf{R}$ is the correct explanation of $\mathbf{A}$

(C) $\mathbf{A}$ is false but $\mathbf{R}$ is true

(D) Both $\mathbf{A}$ and $\mathbf{R}$ are true but $\mathbf{R}$ is NOT the correct explanation of $\mathbf{A}$

Step-by-step solution ▸ prepwiser.in/questions/vkiTgH8Zo2

Q4 JEE Main 2025 · 2 Apr · Shift 1

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 :

(A) (A), (B) only **(B)** (A), (D) only

(C) (A), (C) only **(D)** (B), (D) only

Step-by-step solution ▸ prepwiser.in/questions/CBMVRPdiPu

Q5 JEE Main 2025 · 2 Apr · Shift 2

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.)

(A) 2 **(B)** 9

(C) 1 **(D)** 3

Step-by-step solution ▸ prepwiser.in/questions/CTcp0bcDdT

Q6 JEE Main 2025 · 28 Jan · Shift 2

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

(A) $\frac{1}{n^4}$

(B) $\frac{1}{n^2}$

(C) $\frac{1}{n^3}$

(D) $\frac{1}{n}$

Step-by-step solution ▸ prepwiser.in/questions/Mgk9buaYwP

Q7 JEE Main 2025 · 22 Jan · Shift 2

An electron projected perpendicular to a uniform magnetic field B moves in a circle. If Bohr's quantization is applicable, then the radius of the electronic orbit in the first excited state is :

(A) $\sqrt{\frac{h}{\pi eB}}$

(B) $\sqrt{\frac{4h}{\pi eB}}$

(C) $\sqrt{\frac{\mathrm{h}}{2\pi e\mathrm{B}}}$

(D) $\sqrt{\frac{2h}{\pi eB}}$

Step-by-step solution ▸ prepwiser.in/questions/un9jUG87lF

Q8 JEE Main 2024 · 6 Apr · Shift 2

In Franck-Hertz experiment, the first dip in the current-voltage graph for hydrogen is observed at $10.2\mathrm{V}$. The wavelength of light emitted by hydrogen atom when excited to the first excitation level is _____ nm. (Given $\mathrm{hc} = 1245\mathrm{eVnm}, \mathrm{e} = 1.6 \times 10^{-19}\mathrm{C}$).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/3hE9Lj0lnM

Q9 JEE Main 2024 · 6 Apr · Shift 1

Radius of a certain orbit of hydrogen atom is 8.48 $\overset{o}{A}$. If energy of electron in this orbit is E/x. then $x =$ _____ (Given $\mathrm{a}_0 = 0.529\ \overset{o}{A}$, $E =$ energy of electron in ground state).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/f3qJoOAAbh

Q10 JEE Main 2024 · 5 Apr · Shift 1

An electron rotates in a circle around a nucleus having positive charge Ze. Correct relation between total energy (E) of electron to its potential energy (U) is :

(A) $2\mathrm{E} = 3\mathrm{U}$ **(B)** $\mathrm{E} = \mathrm{U}$

(C) $2\mathrm{E} = \mathrm{U}$ **(D)** $\mathrm{E} = 2\mathrm{U}$

Step-by-step solution ▸ prepwiser.in/questions/f0eMJLI1Zy

Q11 JEE Main 2024 · 5 Apr · Shift 2

The angular momentum of an electron in a hydrogen atom is proportional to : (Where r is the radius of orbit of electron)

(A) $\frac{1}{\mathrm{r}}$ **(B)** $\frac{1}{\sqrt{\mathrm{r}}}$

(C) $\sqrt{\mathrm{r}}$ **(D)** r

Step-by-step solution ▸ prepwiser.in/questions/ohhd_QwWJG

Q12 JEE Main 2024 · 4 Apr · Shift 2

According to Bohr's theory, the moment of momentum of an electron revolving in 4^{th} orbit of hydrogen atom is:

(A) $2\frac{h}{\pi}$ **(B)** $\frac{h}{2\pi}$

(C) $\frac{h}{\pi}$ **(D)** $8\frac{h}{\pi}$

Step-by-step solution ▸ prepwiser.in/questions/w3nItbf6VV

Q13 JEE Main 2024 · 30 Jan · Shift 2

An electron revolving in n^{th} Bohr orbit has magnetic moment μ_n. If $\mu_n \propto n^x$, the value of x is

(A) 2 **(B)** 0

(C) 3 **(D)** 1

Step-by-step solution ▸ prepwiser.in/questions/V7Zlaa-kpT

Q14 JEE Main 2024 · 27 Jan · Shift 1

The radius of third stationary orbit of electron for Bohr's atom is R. The radius of fourth stationary orbit will be:

(A) $\frac{4}{3}\mathrm{R}$ **(B)** $\frac{16}{9}R$

(C) $\frac{3}{4}R$ **(D)** $\frac{9}{16}\mathrm{R}$

Step-by-step solution ▸ prepwiser.in/questions/-EdBDE5tOz

Q15 JEE Main 2023 · 12 Apr · Shift 1

A $12.5\mathrm{eV}$ electron beam is used to bombard gaseous hydrogen at room temperature. The number of spectral lines emitted will be:

(A) 2 **(B)** 4

(C) 3 **(D)** 1

Step-by-step solution ▸ prepwiser.in/questions/p6ZGWOrxo9

Q16 JEE Main 2023 · 10 Apr · Shift 1

The angular momentum for the electron in Bohr's orbit is L. If the electron is assumed to revolve in second orbit of hydrogen atom, then the change in angular momentum will be

(A) L
(B) $\frac{L}{2}$
(C) zero
(D) 2 L

Step-by-step solution ▸ prepwiser.in/questions/vxLoZiPVsO

Q17 JEE Main 2023 · 6 Apr · Shift 2

Experimentally it is found that $12.8\mathrm{eV}$ energy is required to separate a hydrogen atom into a proton and an electron. So the orbital radius of the electron in a hydrogen atom is $\frac{9}{x} \times 10^{-10}\mathrm{m}$. The value of the x is _____.

$$\left(1\mathrm{eV} = 1.6 \times 10^{-19}\mathrm{J},\ \frac{1}{4\pi\epsilon_0} = 9 \times 10^{9}\mathrm{Nm}^2/\mathrm{C}^2\right.$$

and electronic charge $\left. = 1.6 \times 10^{-19}\mathrm{C}\right)$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/beIinGzuJs

Q18 JEE Main 2023 · 6 Apr · Shift 2

A small particle of mass m moves in such a way that its potential energy $U = \frac{1}{2}m\omega^2r^2$ where ω is constant and r is the distance of the particle from origin. Assuming Bohr's quantization of momentum and circular orbit, the radius of n^{th} orbit will be proportional to,

(A) $\sqrt{n}$
(B) n^2
(C) $\frac{1}{n}$
(D) n

Step-by-step solution ▸ prepwiser.in/questions/r2tS1JsXjS

Q19 JEE Main 2023 · 31 Jan · Shift 2

The radius of electron's second stationary orbit in Bohr's atom is R. The radius of 3rd orbit will be

(A) 2.25R
(B) $3\mathrm{R}$
(C) $\frac{\mathrm{R}}{3}$
(D) $9\mathrm{R}$

Step-by-step solution ▸ prepwiser.in/questions/lOrMoDy5Wu

Q20 JEE Main 2023 · 30 Jan · Shift 1

Speed of an electron in Bohr's 7^{th} orbit for Hydrogen atom is $3.6 \times 10^6\mathrm{m/s}$. The corresponding speed of the electron in 3^{rd} orbit, in $\mathrm{m/s}$ is :

(A) $\left(1.8 \times 10^6\right)$
(B) $\left(7.5 \times 10^6\right)$
(C) $\left(8.4 \times 10^6\right)$
(D) $\left(3.6 \times 10^6\right)$

Step-by-step solution ▸ prepwiser.in/questions/t-RpYFIiFh

Q21 JEE Main 2022 · 25 Jul · Shift 1

The magnetic moment of an electron (e) revolving in an orbit around nucleus with an orbital angular momentum is given by :

(A) $\vec{\mu}_{\mathrm{L}}=\frac{\overrightarrow{\mathrm{eL}}}{2\mathrm{m}}$

(B) $\vec{\mu}_{\mathrm{L}}=-\frac{\overrightarrow{\mathrm{eL}}}{2\mathrm{m}}$

(C) $\vec{\mu}_{l}=-\frac{\overrightarrow{eL}}{\mathrm{m}}$

(D) $\vec{\mu}_{l}=\frac{2\overrightarrow{\mathrm{eL}}}{\mathrm{m}}$

Step-by-step solution ▸ prepwiser.in/questions/xGiNTSYMnO

Q22 JEE Main 2022 · 25 Jul · Shift 1

The momentum of an electron revolving in n^{th} orbit is given by :

(Symbols have their usual meanings)

(A) $\frac{\mathrm{nh}}{2\pi\mathrm{r}}$

(B) $\frac{nh}{2r}$

(C) $\frac{\mathrm{nh}}{2\pi}$

(D) $\frac{2\pi r}{\mathrm{nh}}$

Step-by-step solution ▸ prepwiser.in/questions/-52ZU0b40s

Q23 JEE Main 2022 · 25 Jul · Shift 2

Hydrogen atom from excited state comes to the ground state by emitting a photon of wavelength λ. The value of principal quantum number 'n' of the excited state will be : (R : Rydberg constant)

(A) $\sqrt{\frac{\lambda\mathrm{R}}{\lambda-1}}$

(B) $\sqrt{\frac{\lambda\mathrm{R}}{\lambda\mathrm{R}-1}}$

(C) $\sqrt{\frac{\lambda}{\lambda\mathrm{R}-1}}$

(D) $\sqrt{\frac{\lambda R^{2}}{\lambda R-1}}$

Step-by-step solution ▸ prepwiser.in/questions/-UBLYfhBDF

Q24 JEE Main 2022 · 30 Jun · Shift 1

A hydrogen atom in its first excited state absorbs a photon of energy x $\times 10^{-2}$ eV and excited to a higher energy state where the potential energy of electron is -1.08 eV. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/_EKjp9EuVf

Q25 JEE Main 2022 · 27 Jun · Shift 1

A hydrogen atom in its ground state absorbs 10.2 eV of energy. The angular momentum of electron of the hydrogen atom will increase by the value of :

(Given, Planck's constant = 6.6 $\times 10^{-34}$ Js).

(A) 2.10 $\times 10^{-34}$ Js

(B) 1.05 $\times 10^{-34}$ Js

(C) 3.15 $\times 10^{-34}$ Js

(D) 4.2 $\times 10^{-34}$ Js

Step-by-step solution ▸ prepwiser.in/questions/c5FGTMqRCX

Q26 JEE Main 2022 · 27 Jun · Shift 2

Given below are two statements :

Statement I : In hydrogen atom, the frequency of radiation emitted when an electron jumps from lower energy orbit (E_1) to higher energy orbit (E_2), is given as $hf = E_1 - E_2$

Statement II : The jumping of electron from higher energy orbit (E_2) to lower energy orbit (E_1) is associated with frequency of radiation given as $f = (E_2 - E_1)/h$

This condition is Bohr's frequency condition.

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

(A) Both Statement I and Statement II are true.

(B) Both Statement I and Statement II are false.

(C) Statement I is correct but Statement II is false.

(D) Statement I is incorrect but Statement II is true.

Step-by-step solution ▸ prepwiser.in/questions/CGyedhfGXQ

Q27 JEE Main 2022 · 25 Jun · Shift 1

The ratio for the speed of the electron in the 3^{rd} orbit of He^+ to the speed of the electron in the 3^{rd} orbit of hydrogen atom will be :

(A) 1 : 1

(B) 1 : 2

(C) 4 : 1

(D) 2 : 1

Step-by-step solution ▸ prepwiser.in/questions/L87o1z3Jyd

Q28 JEE Main 2022 · 24 Jun · Shift 2

In Bohr's atomic model of hydrogen, let K, P and E are the kinetic energy, potential energy and total energy of the electron respectively. Choose the correct option when the electron undergoes transitions to a higher level :

(A) All K, P and E increase.

(B) K decreases, P and E increase.

(C) P decreases, K and E increase.

(D) K increases, P and E decrease.

Step-by-step solution ▸ prepwiser.in/questions/Bx_Ww6jlTE

Q29 JEE Main 2021 · 27 Jul · Shift 1

In Bohr's atomic model, the electron is assumed to revolve in a circular orbit of radius 0.5 $\overset{o}{A}$. If the speed of electron is 2.2×16^6 m/s, then the current associated with the electron will be _____ $\times 10^{-2}$ mA. [Take π as $\frac{22}{7}$]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/VueHsD9QQ9

Q30 JEE Main 2021 · 17 Mar · Shift 1

If an electron is moving in the n^{th} orbit of the hydrogen atom, then its velocity (v_n) for the n^{th} orbit is given as :

(A) $v_n \propto \frac{1}{n}$

(B) $v_n \propto n^2$

(C) $v_n \propto n$

(D) $v_n \propto \frac{1}{n^2}$

Step-by-step solution ▸ prepwiser.in/questions/MA2XMo7nia

Q31 JEE Main 2021 · 17 Mar · Shift 2

A particle of mass m moves in a circular orbit in a central potential field $U(r) = U_0 r^4$. If Bohr's quantization conditions are applied, radii of possible orbitals r_n vary with $n^{\frac{1}{\alpha}}$, where α is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/sDy6tX3W6s

Q32 JEE Main 2021 · 26 Feb · Shift 2

The recoil speed of a hydrogen atom after it emits a photon in going from n = 5 state to n = 1 state will be :

(A) 4.34 m/s

(B) 2.19 m/s

(C) 3.25 m/s

(D) 4.17 m/s

Step-by-step solution ▸ prepwiser.in/questions/B6MTyp7xxQ

Q33 JEE Main 2021 · 24 Feb · Shift 2

According to Bohr atomic model, in which of the following transitions will the frequency be maximum?

(A) n = 2 to n = 1

(B) n = 3 to n = 2

(C) n = 4 to n = 3

(D) n = 5 to n = 4

Step-by-step solution ▸ prepwiser.in/questions/BB7jG8UFH5

Q34 JEE Main 2020 · 2 Sep · Shift 2

In a hydrogen atom the electron makes a transition from $(n + 1)^{th}$ level to the n^{th} level. If $n >> 1$, the frequency of radiation emitted is proportional to :

(A) $\frac{1}{n}$

(B) $\frac{1}{n^2}$

(C) $\frac{1}{n^3}$

(D) $\frac{1}{n^4}$

Step-by-step solution ▸ prepwiser.in/questions/wWDIEGTExo

Q35 JEE Main 2020 · 7 Jan · Shift 1

The time period of revolution of electron in its ground state orbit in a hydrogen atom is 1.6×10^{-16} s. The frequency of revolution of the electron in its first excited state (in s^{-1}) is :

(A) 5.6×10^{12}

(B) 1.6×10^{14}

(C) 7.8×10^{14}

(D) 6.2×10^{15}

Step-by-step solution ▸ prepwiser.in/questions/NXk-Tat_Eb

Energy Levels and Spectral Series · 32 PYQs

Q36 JEE Main 2025 · 3 Apr · Shift 2

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_____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/XEr4LJA-MB

Q37 JEE Main 2025 · 24 Jan · Shift 1

During the transition of electron from state A to state C of a Bohr atom, the wavelength of emitted radiation is $2000\ \overset{o}{A}$ and it becomes $6000\ \overset{o}{A}$ 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

(A) $4000\ \overset{o}{A}$

(B) $6000\ \overset{o}{A}$

(C) $2000\ \overset{o}{A}$

(D) $3000\ \overset{o}{A}$

Step-by-step solution ▸ prepwiser.in/questions/HiQWmK6Bnw

Q38 JEE Main 2024 · 9 Apr · Shift 2

A hydrogen atom in ground state is given an energy of $10.2\mathrm{eV}$. How many spectral lines will be emitted due to transition of electrons?

(A) 3

(B) 6

(C) 10

(D) 1

Step-by-step solution ▸ prepwiser.in/questions/cp2GbciOnj

Q39 JEE Main 2024 · 6 Apr · Shift 1

The ratio of the shortest wavelength of Balmer series to the shortest wavelength of Lyman series for hydrogen atom is :

(A) $1:2$

(B) $1:4$

(C) $2:1$

(D) $4:1$

Step-by-step solution ▸ prepwiser.in/questions/Os0Z8Nh0o1

Q40 JEE Main 2024 · 6 Apr · Shift 2

The longest wavelength associated with Paschen series is : (Given $R_H = 1.097 \times 10^7 SI$ unit)

(A) $2.973 \times 10^{-6} m$ **(B)** $1.876 \times 10^{-6} m$

(C) $1.094 \times 10^{-6} m$ **(D)** $3.646 \times 10^{-6} m$

Step-by-step solution ▸ prepwiser.in/questions/JNvKWnsfGI

Q41 JEE Main 2024 · 5 Apr · Shift 2

The shortest wavelength of the spectral lines in the Lyman series of hydrogen spectrum is $915 \overset{o}{A}$. The longest wavelength of spectral lines in the Balmer series will be _____ $\overset{o}{A}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/EcG3Gnz1Pn

Q42 JEE Main 2024 · 4 Apr · Shift 1

A hydrogen atom changes its state from $n = 3$ to $n = 2$. Due to recoil, the percentage change in the wave length of emitted light is approximately 1×10^{-n}. The value of n is _____.

[Given Rhc

$$= 13.6 eV, hc = 1242 eV nm, h = 6.6 \times 10^{-34} Js$$

mass of the hydrogenatom $= 1.6 \times 10^{-27} kg$]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/gSbWqxudMK

Q43 JEE Main 2024 · 1 Feb · Shift 2

A particular hydrogen-like ion emits the radiation of frequency $3 \times 10^{15} Hz$ when it makes transition from $n = 2$ to $n = 1$. The frequency of radiation emitted in transition from $n = 3$ to $n = 1$ is $\frac{x}{9} \times 10^{15} Hz$, when $x =$ _____ .

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/A0NqM_VO8U

Q44 JEE Main 2024 · 1 Feb · Shift 1

The minimum energy required by a hydrogen atom in ground state to emit radiation in Balmer series is nearly :

(A) $13.6 eV$ **(B)** $1.5 eV$

(C) $12.1 eV$ **(D)** $1.9 eV$

Step-by-step solution ▸ prepwiser.in/questions/lyScqKO2bo

Q45 JEE Main 2024 · 31 Jan · Shift 1

If the wavelength of the first member of Lyman series of hydrogen is λ. The wavelength of the second member will be

(A) $\frac{27}{5}\lambda$ **(B)** $\frac{5}{27}\lambda$

(C) $\frac{27}{32}\lambda$ **(D)** $\frac{32}{27}\lambda$

Step-by-step solution ▸ prepwiser.in/questions/AFgn2k5fiU

Q46 JEE Main 2024 · 30 Jan · Shift 1

A electron of hydrogen atom on an excited state is having energy $\mathrm{E_n} = -0.85\mathrm{eV}$. The maximum number of allowed transitions to lower energy level is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/yxJG-11oXU

Q47 JEE Main 2024 · 30 Jan · Shift 1

The ratio of the magnitude of the kinetic energy to the potential energy of an electron in the 5^{th} excited state of a hydrogen atom is :

(A) 4 **(B)** 1

(C) $\frac{1}{2}$ **(D)** $\frac{1}{4}$

Step-by-step solution ▸ prepwiser.in/questions/wzwNZgfwBp

Q48 JEE Main 2024 · 29 Jan · Shift 2

Hydrogen atom is bombarded with electrons accelerated through a potential difference of V, which causes excitation of hydrogen atoms. If the experiment is being performed at $\mathrm{T} = 0\mathrm{K}$, the minimum potential difference needed to observe any Balmer series lines in the emission spectra will be $\frac{\alpha}{10}\mathrm{V}$, where $\alpha =$ _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/N0wYfUgg4Z

Q49 JEE Main 2024 · 27 Jan · Shift 2

If Rydberg's constant is R, the longest wavelength of radiation in Paschen series will be $\frac{\alpha}{7R}$, where $\alpha =$ _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/T-Z_cdDoPz

Q50 JEE Main 2023 · 13 Apr · Shift 2

An atom absorbs a photon of wavelength $500\mathrm{nm}$ and emits another photon of wavelength $600\mathrm{nm}$. The net energy absorbed by the atom in this process is $n \times 10^{-4}\mathrm{eV}$. The value of n is _____. [Assume the atom to be stationary during the absorption and emission process] (Take $\mathrm{h} = 6.6 \times 10^{-34}\mathrm{Js}$ and $\mathrm{c} = 3 \times 10^{8}\mathrm{m/s}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/DG6ESLvP-Q

Q51 JEE Main 2023 · 11 Apr · Shift 1

A monochromatic light is incident on a hydrogen sample in ground state. Hydrogen atoms absorb a fraction of light and subsequently emit radiation of six different wavelengths. The frequency of incident light is $x \times 10^{15}\mathrm{Hz}$. The value of x is _____.

(Given $\mathrm{h} = 4.25 \times 10^{-15}\mathrm{eVs}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Dg1mDluihY

Q52 JEE Main 2023 · 10 Apr · Shift 2

If 917 $\overset{o}{A}$ be the lowest wavelength of Lyman series then the lowest wavelength of Balmer series will be _____ $\overset{o}{A}$.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/7n9kg8o9H0

Q53 JEE Main 2023 · 8 Apr · Shift 2

The ratio of wavelength of spectral lines H_α and H_β in the Balmer series is $\frac{x}{20}$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/rIbKuoG9wT

Q54 JEE Main 2023 · 1 Feb · Shift 1

A light of energy $12.75\mathrm{eV}$ is incident on a hydrogen atom in its ground state. The atom absorbs the radiation and reaches to one of its excited states. The angular momentum of the atom in the excited state is $\frac{x}{\pi} \times 10^{-17}\mathrm{eVs}$. The value of x is _____ (use $h = 4.14 \times 10^{-15}\mathrm{eVs}, c = 3 \times 10^{8}\mathrm{ms}^{-1}$).

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/fDDzGB0T-a

Q55 JEE Main 2023 · 25 Jan · Shift 1

The wavelength of the radiation emitted is λ_0 when an electron jumps from the second excited state to the first excited state of hydrogen atom. If the electron jumps from the third excited state to the second orbit of the hydrogen atom, the wavelength of the radiation emitted will $\frac{20}{x}\lambda_0$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/LJkI-kfH5U

Q56 JEE Main 2023 · 24 Jan · Shift 2

A photon is emitted in transition from n = 4 to n = 1 level in hydrogen atom. The corresponding wavelength for this transition is (given, h = 4×10^{-15} eVs) :

(A) 99.3 nm

(B) 94.1 nm

(C) 974 nm

(D) 941 nm

Step-by-step solution ▸ prepwiser.in/questions/dxI5dM4qIC

Q57 JEE Main 2022 · 29 Jul · Shift 1

Find the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its (i) second permitted energy level to the first level, and (ii) the highest permitted energy level to the first permitted level.

(A) 3 : 4

(B) 4 : 3

(C) 1 : 4

(D) 4 : 1

Step-by-step solution ▸ prepwiser.in/questions/1mil4ylwSP

Q58 JEE Main 2022 · 26 Jul · Shift 1

In the hydrogen spectrum, λ be the wavelength of first transition line of Lyman series. The wavelength difference will be "aλ" between the wavelength of 3^{rd} transition line of Paschen series and that of 2^{nd} transition line of Balmer series where $a =$ _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/Wasfxj-v2-

Q59 JEE Main 2022 · 25 Jul · Shift 2

$\frac{x}{x+4}$ is the ratio of energies of photons produced due to transition of an electron of hydrogen atom from its

(i) third permitted energy level to the second level and

(ii) the highest permitted energy level to the second permitted level.

The value of x will be _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/tBE-OThUud

Q60 JEE Main 2022 · 30 Jun · Shift 1

A hydrogen atom in ground state absorbs 12.09 eV of energy. The orbital angular momentum of the electron is increased by :

(A) 1.05×10^{-34} Js

(B) 2.11×10^{-34} Js

(C) 3.16×10^{-34} Js

(D) 4.22×10^{-34} Js

Step-by-step solution ▸ prepwiser.in/questions/lKR2ImRmcy

Q61 JEE Main 2021 · 31 Aug · Shift 2

A free electron of 2.6 eV energy collides with a H^+ ion. This results in the formation of a hydrogen atom in the first excited state and a photon is released. Find the frequency of the emitted photon. (h = 6.6×10^{-34} Js)

(A) 1.45×10^{16} MHz

(B) 0.19×10^{15} MHz

(C) 1.45×10^{9} MHz

(D) 9.0×10^{27} MHz

Step-by-step solution ▸ prepwiser.in/questions/XTD9-FDf6e

Q62 JEE Main 2021 · 27 Aug · Shift 2

X different wavelengths may be observed in the spectrum from a hydrogen sample if the atoms are exited to states with principal quantum number n = 6 ? The value of X is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/D-LfD5-yd-

Q63 JEE Main 2021 · 17 Mar · Shift 2

The atomic hydrogen emits a line spectrum consisting of various series. Which series of hydrogen atomic spectra is lying in the visible region?

(A) Brackett series
(B) Balmer series
(C) Paschen series
(D) Lyman series

Step-by-step solution ▸ prepwiser.in/questions/UrTzwtLrE0

Q64 JEE Main 2021 · 16 Mar · Shift 1

The first three spectral lines of H-atom in the Balmer series are
given λ_1, λ_2, λ_3 considering the Bohr atomic model, the wave lengths of first and third spectral lines $\left(\frac{\lambda_1}{\lambda_3}\right)$ are related by a factor of approximately 'x' $\times 10^{-1}$.

The value of x, to the nearest integer, is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/fMgIqxCaby

Q65 JEE Main 2021 · 26 Feb · Shift 1

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 :

(A) 7 : 135
(B) 7 : 108
(C) 1 : 9
(D) 1 : 3

Step-by-step solution ▸ prepwiser.in/questions/JJghzVs-U1

Q66 JEE Main 2021 · 25 Feb · Shift 2

The wavelength of the photon emitted by a hydrogen atom when an electron makes a transition from n = 2 to n = 1 state is :

(A) 194.8 nm
(B) 490.7 nm
(C) 913.3 nm
(D) 121.8 nm

Step-by-step solution ▸ prepwiser.in/questions/gf0YbsRsKK

Q67 JEE Main 2020 · 8 Jan · Shift 2

The first member of the Balmer series of hydrogen atom has a wavelength of 6561 Å. The wavelength of the second member of the Balmer series (in nm) is:

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/BDRvfnz_ua

Hydrogen-like Atoms · 11 PYQs

Q68 JEE Main 2025 · 7 Apr · Shift 1

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

(A) 1 **(B)** 4

(C) 3 **(D)** 2

Step-by-step solution ▸ prepwiser.in/questions/Ww9ZP9G801

Q69 JEE Main 2023 · 13 Apr · Shift 1

The radius of 2^{nd} orbit of He^{+} of Bohr's model is r_1 and that of fourth orbit of Be^{3+} is represented as r_2. Now the ratio $\frac{r_2}{r_1}$ is $x : 1$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/SsB6f1YN-S

Q70 JEE Main 2023 · 11 Apr · Shift 2

The energy of He^{+} ion in its first excited state is, (The ground state energy for the Hydrogen atom is -13.6eV) :

(A) -13.6eV **(B)** -27.2eV

(C) -3.4eV **(D)** -54.4eV

Step-by-step solution ▸ prepwiser.in/questions/yNbokLBviQ

Q71 JEE Main 2023 · 6 Apr · Shift 1

The radius of fifth orbit of the Li^{++} is _____ $\times 10^{-12}\text{m}$.

Take: radius of hydrogen atom $= 0.51\ \overset{o}{A}$

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/MmDs4BSNOi

Q72 JEE Main 2023 · 1 Feb · Shift 2

An electron of a hydrogen like atom, having $Z = 4$, jumps from 4^{th} energy state to 2^{nd} energy state. The energy released in this process, will be :

(Given Rch = 13.6eV)

Where R = Rydberg constant

c = Speed of light in vacuum

h = Planck's constant

(A) 10.5eV **(B)** 40.8eV

(C) 13.6eV **(D)** 3.4eV

Step-by-step solution ▸ prepwiser.in/questions/eNTupSeVem

Q73 JEE Main 2023 · 31 Jan · Shift 2

If the binding energy of ground state electron in a hydrogen atom is $13.6\,\mathrm{eV}$, then, the energy required to remove the electron from the second excited state of Li^{2+} will be : $x \times 10^{-1}\mathrm{eV}$. The value of x is _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/D-CASC3LFI

Q74 JEE Main 2022 · 27 Jun · Shift 1

A beam of monochromatic light is used to excite the electron in Li^{++} from the first orbit to the third orbit. The wavelength of monochromatic light is found to be x $\times$ 10^{-10} m. The value of x is _____.

[Given hc = 1242 eV nm]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/5jvlsqvRww

Q75 JEE Main 2021 · 26 Aug · Shift 1

A particular hydrogen like ion emits radiation of frequency 2.92 $\times$ 10^{15} Hz when it makes transition from n = 3 to n = 1. The frequency in Hz of radiation emitted in transition from n = 2 to n = 1 will be :

(A) 0.44 $\times$ 10^{15}

(B) 6.57 $\times$ 10^{15}

(C) 4.38 $\times$ 10^{15}

(D) 2.46 $\times$ 10^{15}

Step-by-step solution ▸ prepwiser.in/questions/Dbp2UqFaPo

Q76 JEE Main 2021 · 18 Mar · Shift 1

Imagine that the electron in a hydrogen atom is replaced by a muon (μ). The mass of muon particle is 207 times that of an electron and charge is equal to the charge of an electron. The ionization potential of this hydrogen atom will be :

(A) 13.6 eV

(B) 2815.2 eV

(C) 331.2 eV

(D) 27.2 eV

Step-by-step solution ▸ prepwiser.in/questions/iSJvwQbPz9

Q77 JEE Main 2021 · 17 Mar · Shift 1

Which level of the single ionized carbon has the same energy as the ground state energy of hydrogen atom?

(A) 8

(B) 6

(C) 1

(D) 4

Step-by-step solution ▸ prepwiser.in/questions/lSnS6y38Su

Q78 JEE Main 2020 · 9 Jan · Shift 2

The energy required to ionise a hydrogen like ion in its ground state is 9 Rydbergs. What is the wavelength of the radiation emitted when the electron in this ion jumps from the second excited state to the ground state ?

(A) 35.8 nm

(B) 11.4 nm

(C) 8.6 nm

(D) 24.2 nm

Step-by-step solution ▸ prepwiser.in/questions/aJiwQAhqkm

X-Rays · 3 PYQs

Q79 JEE Main 2023 · 8 Apr · Shift 2

The waves emitted when a metal target is bombarded with high energy electrons are

(A) Infrared rays

(B) Radio Waves

(C) Microwaves

(D) X-rays

Step-by-step solution ▸ prepwiser.in/questions/QoDHg_hyrk

Q80 JEE Main 2021 · 27 Jul · Shift 2

The K_α X-ray of molybdenum has wavelength 0.071 nm. If the energy of a molybdenum atoms with a K electron knocked out is 27.5 keV, the energy of this atom when an L electron is knocked out will be _____ keV. (Round off to the nearest integer)

[h = 4.14 $\times$ 10^{-15} eVs, c = 3 $\times$ 10^{8} ms^{-1}]

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ieR7wTYmZh

Q81 JEE Main 2021 · 24 Feb · Shift 2

An X-ray tube is operated at 1.24 million volt. The shortest wavelength of the produced photon will be :

(A) 10^{-2} nm

(B) 10^{-1} nm

(C) 10^{-3} nm

(D) 10^{-4} nm

Step-by-step solution ▸ prepwiser.in/questions/ROWvRT3gbU

Thomson and Rutherford Models · 3 PYQs

Q82 JEE Main 2024 · 8 Apr · Shift 1

In an alpha particle scattering experiment distance of closest approach for the α particle is $4.5 \times 10^{-14}\mathrm{m}$. If target nucleus has atomic number 80 , then maximum velocity of α-particle is _____ $\times 10^{5}\mathrm{m/s}$ approximately.

($\frac{1}{4\pi\epsilon_0} = 9 \times 10^{9}\mathrm{SI}$ unit, mass of α particle $= 6.72 \times 10^{-27}\mathrm{kg}$)

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/ZgWEhuqfP_

Q83 JEE Main 2024 · 29 Jan · Shift 2

Given below are two statements:

Statement I : Most of the mass of the atom and all its positive charge are concentrated in a tiny nucleus and the electrons revolve around it, is Rutherford's model.

Statement II : An atom is a spherical cloud of positive charges with electrons embedded in it, is a special case of Rutherford's model.

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

(A) Both Statement I and Statement II are true

(B) Statement I is true but Statement II is false

(C) Statement I is false but Statement II is true

(D) Both statement I and statement II are false

Step-by-step solution ▸ prepwiser.in/questions/dzO__4KKW3

Q84 JEE Main 2022 · 29 Jun · Shift 1

$\sqrt{d_1}$ and $\sqrt{d_2}$ are the impact parameters corresponding to scattering angles 60° and 90° respectively, when an α particle is approaching a gold nucleus. For $d_1 = x\, d_2$, the value of x will be _____.

Numerical answer — enter the value.

Step-by-step solution ▸ prepwiser.in/questions/oy3UrX5VD-

Answer key — Atomic Physics

Numbers match the question numbers above. For full working, open the solution link under each question.

1	**B**	2	**B**	3	**B**	4	**A**	5	**D**	6	**C**	7	**A**	8	**122**
9	**16**	10	**C**	11	**C**	12	**A**	13	**D**	14	**B**	15	**C**	16	**A**
17	**16**	18	**A**	19	**A**	20	**C**	21	**B**	22	**A**	23	**B**	24	**286**
25	**B**	26	**D**	27	**D**	28	**B**	29	**112**	30	**A**	31	**3**	32	**D**
33	**A**	34	**C**	35	**C**	36	**2**	37	**D**	38	**D**	39	**D**	40	**B**
41	**6588**	42	**7**	43	**32**	44	**C**	45	**C**	46	**6**	47	**C**	48	**121**
49	**144**	50	**4125**	51	**3**	52	**3668**	53	**27**	54	**828**	55	**27**	56	**B**
57	**A**	58	**5**	59	**5**	60	**B**	61	**C**	62	**15**	63	**B**	64	**15**
65	**A**	66	**D**	67	**486**	68	**C**	69	**2**	70	**A**	71	**425**	72	**B**
73	**136**	74	**114**	75	**D**	76	**B**	77	**B**	78	**B**	79	**D**	80	**10**
81	**C**	82	**156**	83	**B**	84	**3**								