

PART 1 - PHYSICS

Topic : Atoms

SECTION-A : (Maximum Marks : 4)

This section contains **ONE** question.

Each question has **FOUR** options (A), (B), (C) and (D). **ONE OR MORE THAN ONE** of these four option(s) is(are) correct answer(s).

For each question, choose the option(s) corresponding to (all) the correct answer(s).

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 ONLY if (all) the correct option(s) is(are) chosen;

Partial Marks : +3 If all the four options are correct but ONLY three options are chosen;

Partial Marks : +2 If three or more options are correct but ONLY two options are chosen, both of which are correct;

Partial Marks : +1 If two or more options are correct but ONLY one option is chosen and it is a correct option;

Zero Marks : 0 If none of the options is chosen (i.e. the question is unanswered);

Negative Marks : -1 In all other cases.

For example, in a question, if (A), (B) and (D) are the ONLY three options corresponding to correct answers, then choosing ONLY (A), (B) and (D) will get +4 marks; choosing ONLY (A) and (B) will get +2 marks; choosing ONLY (A) and (D) will get +2 marks; choosing ONLY (B) and (D) will get +2 marks; choosing ONLY (A) will get +1 mark; choosing ONLY (B) will get +1 mark; choosing ONLY (D) will get +1 mark; choosing no option (i.e. the question is unanswered) will get 0 marks; and choosing any other combination of options will get -1 marks.

1. A particle of mass m is moving in a circular orbit under the influence of the central force $F(r) = -kr$, corresponding to the potential energy $V(r) = kr^2/2$, where k is a positive force constant and r is the radial distance from the origin. According to the Bohr's quantization rule, the angular momentum of the particle is given by $L = n\hbar$, where $\hbar = h/(2\pi)$, h is the Planck's constant, and n a positive integer. If v and E are the speed and total energy of the particle, respectively, then which of the following expression(s) is(are) correct?

[JEE Advanced 2024 Paper 1]

$$(A) \ r^2 = n\hbar \sqrt{\frac{1}{mk}} \quad (B) \ v^2 = n\hbar \sqrt{\frac{k}{m^3}} \quad (C) \ \frac{L}{mr^2} = \sqrt{\frac{k}{m}} \quad (D) \ E = \frac{n\hbar}{2} \sqrt{\frac{k}{m}}$$

Scan or tap for the
full solution



Space for Rough Work

SECTION-B : (Maximum Marks : 4)

This section contains **ONE** question.

The answer to each question is a **NON-NEGATIVE INTEGER**.

For each question, enter the correct integer corresponding to the answer in the place designated to enter the answer.

Answer to each question will be evaluated according to the following marking scheme :

Full Marks : +4 If **ONLY** the correct answer is entered;

Zero Marks : 0 In all other cases.

2. Consider an electron in the $n = 3$ orbit of a hydrogen-like atom with atomic number Z . At absolute temperature T , a neutron having thermal energy $k_B T$ has the same de Broglie wavelength as that of this electron. If this temperature is given by $T = \frac{Z^2 h^2}{\alpha \pi^2 a_0^2 m_N k_B}$, (where h is the Planck's constant, k_B is the Boltzmann constant, m_N is the mass of the neutron and a_0 is the first Bohr radius of hydrogen atom) then the value of α is ____

[JEE Advanced 2025 Paper 1]

Scan or tap for the
full solution



Space for Rough Work

JEE ADVANCED ATOMS — DE BROGLIE'S EXPLANATION OF BOHR'S QUANTISATION — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A

Ques.	1																		
Ans.	A, B, C																		

SECTION-B

Ques.	2																		
Ans.	72																		