PART 1 - PHYSICS

Topic : Atoms

SECTION–1 : (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	: −2	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 −2 marks.

1. Consider a hydrogen atom with v_k, r_k, and K_k denoting the velocity, orbital radius and kinetic energy of the electron in the kth orbit, respectively. The electron undergoes a transition from the nth orbit, emitting radiation corresponding to the Lyman series. Considering h to be the Planck's constant and ε_0 the permittivity of the free space, the correct statement(s) is/are: [JEE Advanced 2026 Paper 1]

(A) Magnitude of change in kinetic energy of electron can be expressed as $\frac{h}{4\pi}\left|\frac{nv_n}{r_n}-\frac{v_1}{r_1}\right|$.

(B) Magnitude of change in de Broglie wavelength of the electron can be expressed as $\frac{e^2}{4\varepsilon_0}\left|\frac{1}{K_n}-\frac{1}{K_1}\right|$.

(C) Frequency of the radiation emitted can be expressed as $\frac{e^2}{8\pi\varepsilon_0 h}\left(\frac{1}{r_1}-\frac{1}{r_n}\right)$.

(D) Magnitude of change in total energy of the electron can be expressed as $\frac{h}{2\pi}\left|\frac{v_1}{r_1}-\frac{nv_n}{r_n}\right|$.

Scan or tap for the full solution

Space for Rough Work

SECTION–2 : (Maximum Marks : 4)

- This section contains **ONE** question.
- The answer to each question is a **NUMERICAL VALUE**.
- For each question, enter the correct numerical value of the answer (in decimal notation, truncated / rounded-off to the **SECOND DECIMAL PLACE**; e.g. 6.25, 7.00, −0.33, −.30, 30.27, −127.30) 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. A hydrogen atom, initially at rest in its ground state, absorbs a photon of frequency ν_1 and ejects the electron with a kinetic energy of 10 eV. The electron then combines with a positron at rest to form a positronium atom in its ground state and simultaneously emits a photon of frequency ν_2. The center of mass of the resulting positronium atom moves with a kinetic energy of 5 eV. It is given that positron has the same mass as that of electron and the positronium atom can be considered as a Bohr atom, in which the electron and the positron orbit around their center of mass. Considering no other energy loss during the whole process, the difference between the two photon energies (in eV) is ___

[JEE Advanced 2025 Paper 2]

Scan or tap for the full solution

Space for Rough Work

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

Test Pattern : **JEE (Advanced)**

ANSWER KEY

SECTION–1																									
Ques.	1																								
Ans.	**A, C**																								

SECTION–2												
Ques.	2											
Ans.	**11.7 to 11.9**											