

PART 1 - PHYSICS

Topic : Nuclei

SECTION-A : (Maximum Marks : 8)

This section contains **TWO** questions.

Each question has **TWO** lists: **List-I** and **List-II**.

Four options are given representing matching of elements from List-I and List-II. **ONLY ONE** of these four options corresponds to a correct matching.

For each question, choose the option corresponding to the correct answer.

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

Full Marks : +4 If **ONLY** the correct option is chosen;

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

Negative Marks : -1 In all other cases.

1. A nuclear reactor starts producing a radioactive nuclide X from $t = 0$, at a constant rate of α per second. Each decay of X produces energy E_0 , which is utilized to heat a liquid of mass m and specific heat s . Assuming no heat loss from the liquid and taking λ as the decay constant of X, the rate of increase in the temperature of the liquid is:

[JEE Advanced 2026 Paper 2]

- (A) $\frac{\alpha E_0}{m s}(1 - e^{-\lambda t})$ (B) $\frac{\alpha E_0}{m s}(e^{\lambda t} - 1)$ (C) $\frac{\lambda E_0}{m s}(1 - e^{-\lambda t})$ (D) $\frac{E_0}{m s}(\alpha - \lambda e^{-\lambda t})$

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2. **List-I** shows various functional dependencies of energy (E) on the atomic number (Z). Energies associated with certain phenomena are given in **List-II**.

List-I		List-II	
P.	$E \propto Z^2$	1.	energy of characteristic x-rays
Q.	$E \propto (Z - 1)^2$	2.	electrostatic part of the nuclear binding energy for stable nuclei with mass numbers in the range 30 to 170
R.	$E \propto Z(Z - 1)$	3.	energy of continuous x-rays
S.	E is practically independent of Z	4.	average nuclear binding energy per nucleon for stable nuclei with mass number in the range 30 to 170
		5.	energy of radiation due to electronic transitions from hydrogen-like atoms

Choose the option that describes the correct match between the entries in List-I to those in List-II.

[JEE Advanced 2025 Paper 1]

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(A) $P \rightarrow 4, Q \rightarrow 3, R \rightarrow 1, S \rightarrow 2$

(B) $P \rightarrow 5, Q \rightarrow 2, R \rightarrow 1, S \rightarrow 4$

(C) $P \rightarrow 5, Q \rightarrow 1, R \rightarrow 2, S \rightarrow 4$

(D) $P \rightarrow 3, Q \rightarrow 2, R \rightarrow 1, S \rightarrow 5$

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JEE ADVANCED NUCLEI — PYQS

Test Pattern : JEE (Advanced)

ANSWER KEY

SECTION-A																											
Ques.	1	2																									
Ans.	A	C																									