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7.2 Nuclear Reactions

Easy

PHYSICS

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EXAM PAPERS PRACTICE

7.2 Nuclear Reactions

Question Paper

Course	DP IB Physics
Section	7. Atomic, Nuclear & Particle Physics
Topic	7.2 Nuclear Reactions
Difficulty	Easy

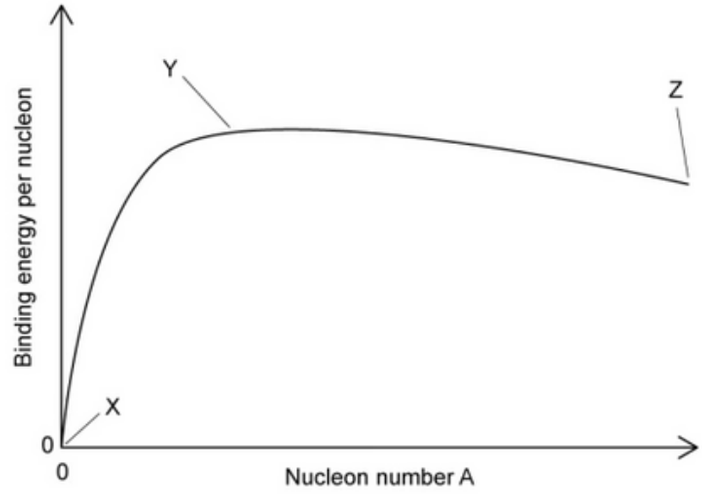
Time allowed: 20

Score: /10

Percentage: /100

Question 1

The graph shows the binding energy per nucleon against nucleon number.



Which row in the table gives possible elements found on the graph at positions X, Y and Z?

	X	Y	Z
A.	Uranium	Calcium	Xenon
B.	Hydrogen	Uranium	Iron
C.	Calcium	Hydrogen	Iron
D.	Hydrogen	Iron	Uranium

[1 mark]

Question 2

Which statement is correct regarding nuclear fission?

A. The daughter nucleus has a greater nucleon number than the original nucleus

B. Energy is absorbed during nuclear fission

C. The combined mass of the daughter nuclei is less than the mass of the original nucleus

D. Nuclear fission is the joining of two small nuclei to produce a larger nucleus

[1 mark]

Question 3

Which of the following is the best definition of the unified atomic mass unit?

A. A unit of mass which is equal to the mass of one-twelfth of a neutral carbon-12 atom

B. A unit of mass which is equal to the mass of half of a carbon-12 atom

C. A unit of mass which is equal to the mass of twelve grams of a neutral carbon-12 atom

D. A unit of mass which is equal to twice the mass of a neutral carbon-12 atom

[1 mark]

Question 4

Energy-mass equivalence is given by $\Delta E = \Delta mc^2$.

Using the given equation, determine which of the following is a valid unit of mass.

A. MeV

B. $\frac{MeV}{c}$

C. $\frac{MeV}{c^2}$

D. eV

[1 mark]

Question 5

The average binding energy per nucleon of Neon-20 $\left({}^{20}_{10}\mathrm{Ne}\right)$ nucleus is 8.0 MeV.

What is the total energy required to separate the nucleons of one nucleus of ${}^{20}_{10}\mathrm{Ne}$?

A. 0 MeV

B. 8 MeV

C. 160 MeV

D. 800 MeV

[1 mark]

Question 6

What is the approximate mass of oxygen-16 $\left({}^{16}_{8}\mathrm{O}\right)$ in atomic mass units?

A. 1 u

B. 8 u

C. 16 u

D. 3.00×10^{8} u

[1 mark]

Question 7

Nuclear reactions can be represented by equations.

$$^{235}_{92}\mathrm{U} + {}^{1}_{0}\mathrm{n} \rightarrow 2\ {}^{116}_{46}\mathrm{Pd} + 4\ {}^{1}_{0}\mathrm{n}$$

Which type of reaction does the equation show?

A. Alpha decay

B. Beta decay

C. Nuclear fusion

D. Nuclear fission

Question 8

A nuclide of deuterium ${}^{2}_{1}\mathrm{H}$ and a nuclide of tritium ${}^{3}_{1}\mathrm{H}$ undergo nuclear fusion.

[1 mark]

Which statement is not correct about nuclear fusion?

A. For fusion to occur both nuclei must have high kinetic energy

B. The process of fusion absorbs energy

C. Fusion is the combining of two smaller nuclei into a larger nucleus

D. Fusion is the process that powers stars

[1 mark]

Question 9

Which statement is a definition of binding energy per nucleon?

A. The difference between an atom's mass and the sum of the masses of its nucleons

B. The binding energy of a nucleus divided by the number of nucleons in the nucleus

C. The energy required to break a nucleus into its constituent protons and neutrons

D. The amount of kinetic energy required for fusion to occur

[1 mark]

Question 10

The following fusion reaction occurs in stars:

$$^{2}_{1}\mathrm{H} + ^{3}_{1}\mathrm{H} \rightarrow ^{4}_{2}\mathrm{He} + ^{1}_{0}\mathrm{n}$$

The binding energies are given as follows:

- The binding energy of deuterium, $^{2}_{1}\mathrm{H}$ is 2.2 MeV
- The binding energy of tritium, $^{3}_{1}\mathrm{H}$ is 8.5 MeV
- The binding energy of helium, $^{4}_{2}\mathrm{He}$ is 7.1 MeV

Given that the energy released is the difference between the binding energy of the products and the reactants, how much energy is released in this fusion process?

A. 2.2 MeV

B. 3.6 MeV

C. 7.1 MeV

D. 10.7 MeV

[1 mark]