

7.2 Nuclear Reactions

Question Paper

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

Time allowed: 20
Score: /10
Percentage: /100

Question 1

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 2

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 3

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

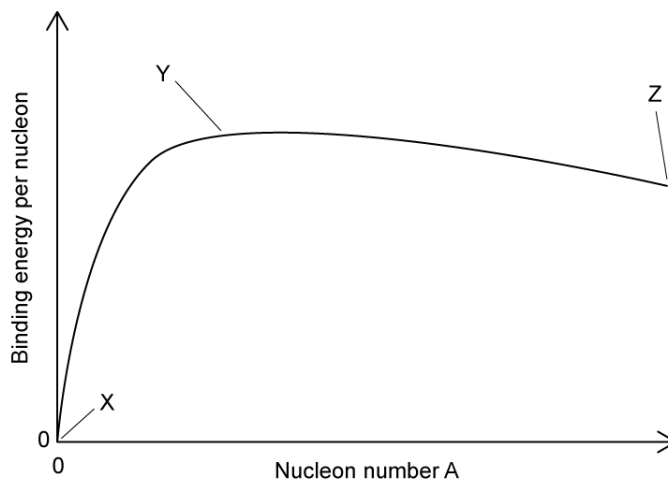
What is the total energy required to separate the nucleons of one nucleus of ${}_{10}^{20}\text{Ne}$?

- A. 0 MeV
- B. 8 MeV
- C. 160 MeV
- D. 800 MeV

[1 mark]

Question 4

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 5

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 6

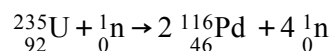
What is the approximate mass of oxygen-16 ($^{16}_8\text{O}$) in atomic mass units?

- 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.



Which type of reaction does the equation show?

- A. Alpha decay
- B. Beta decay
- C. Nuclear fusion
- D. Nuclear fission

[1 mark]

Question 8

A nuclide of deuterium ^2_1H and a nuclide of tritium ^3_1H undergo nuclear fusion.

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

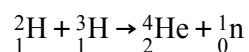
Which statement is a definition of binding energy per nucleon?

- 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:



The binding energies are given as follows:

- The binding energy of deuterium, ${}^2_1\text{H}$ is 2.2 MeV
- The binding energy of tritium, ${}^3_1\text{H}$ is 8.5 MeV
- The binding energy of helium, ${}^4_2\text{He}$ 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]