

Edexcel Physics A-Level

Topic 11.2 - Nuclear Energy

Flashcards

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How does the mass of a nucleus compare to the sum of the individual masses of its constituents?



How does the mass of a nucleus compare to the sum of the individual masses of its constituents?

The mass of the nucleus is always less than the sum of the individual masses of its constituents.



What is the name given to the difference in the mass of a nucleus and its individual constituents?



What is the name given to the difference in the mass of a nucleus and its individual constituents?

The mass defect.



Explain why there is a mass defect in nuclei.



Explain why there is a mass defect in nuclei.

The mass defect is a result of some of the mass being converted into energy used to hold the nucleus together.



What is the name for the value of the energy required to hold a nucleus together?



What is the name for the value of the energy required to hold a nucleus together?

Binding energy.



How can the mass defect be used to calculate the binding energy of a nucleus?



How can the mass defect be used to calculate the binding energy of a nucleus?

By substituting the mass defect into Einstein's mass energy equation.



Why isn't it useful to compare binding energies for different nuclei?



Why isn't it useful to compare binding energies for different nuclei?

Different nuclei have different numbers of nucleons.



What is a more useful measure used to compare the binding energies of different nuclei?



What is a more useful measure used to compare the binding energies of different nuclei?

The binding energy per nucleon.



State the equation used to calculate the binding energy per nucleon of a nucleus.



State the equation used to calculate the binding energy per nucleon of a nucleus.

$$\textit{Binding Energy Per Nucleon} = \frac{\textit{Binding Energy}}{\textit{Number of Nucleons}}$$



What is the relationship between the stability of a nucleus and its binding energy per nucleon?



What is the relationship between the stability of a nucleus and its binding energy per nucleon?

The larger the binding energy per nucleon, the more stable the nucleus will be.



What is the most stable nucleus?



What is the most stable nucleus?

Iron



Name two nuclear processes that can be used to generate energy.



Name two nuclear processes that can be used to generate energy.

1. Nuclear Fission
2. Nuclear Fusion



What are the two types of fission?



What are the two types of fission?

1. Spontaneous fission
2. Induced fission



Explain the basic process of induced fission.



Explain the basic process of induced fission.

A large nucleus absorbs a thermal neutron causing it to split into two smaller nuclei, releasing energy and at least one neutron.



Explain the basic process of nuclear fusion.



Explain the basic process of nuclear fusion.

Two smaller nuclei join together to form a larger one, and releases energy in the process.



Why is nuclear fusion is not currently a feasible method of energy production?



Why is nuclear fusion is not currently a feasible method of energy production?

Nuclear fusion requires very high temperatures in order to overcome the electrostatic force between the nuclei. This makes it hard to contain and means more energy must be inputted to heat the nuclei than is generated.



Where does nuclear fusion constantly
take place?



Where does nuclear fusion constantly take place?

In stars (for example, the sun).

