

Nuclear Fission Fusion

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

Describe the process of nuclear fission of uranium-235. (4 marks)

Step 1 · Absorb

A uranium-235 nucleus absorbs a slow-moving neutron.

Step 2 · Split

The nucleus becomes unstable and splits into two smaller nuclei of roughly equal size (daughter nuclei).

Step 3 · Products

Two or three neutrons are released, along with gamma rays.

Step 4 · Energy

Energy is released: the products all have kinetic energy.

Answer: Absorbs a neutron → splits into two smaller nuclei + 2 or 3 neutrons + gamma + energy

Check: Spontaneous fission (without absorbing a neutron) is rare.

2. Now try one with the steps

Complete: $^{235}_{92}\text{U} + {}^1_0\text{n} \rightarrow {}^{141}_{56}\text{Ba} + {}^{92}_{36}\text{Kr} + x {}^1_0\text{n}$. Find x. (2 marks)

Step 1 · Mass numbers on the left

Step 2 · Mass numbers on the right

Step 3 · Balance

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Define nuclear fission. [1]

2. Name two isotopes used in nuclear fission reactors. [2]

3. State what usually has to happen to a uranium-235 nucleus before it undergoes fission. [1]

4. State the products of the fission of a uranium-235 nucleus. [3]
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5. Define nuclear fusion. [1]
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6. State where nuclear fusion happens naturally. [1]
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7. Describe how a chain reaction happens in uranium-235. [3]
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8. Explain the purpose of control rods in a nuclear reactor. [2]
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9. State the job of the moderator in a nuclear reactor. [1]
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10. Uranium-235 absorbs a neutron and splits into barium-144 and krypton-89. Calculate the number of neutrons released. [2]
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11. Each fission releases 3 neutrons and every neutron causes another fission. Starting with 1 fission in the first generation, calculate the number of fissions in the fourth generation. [2]
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12. Explain why fusion needs extremely high temperatures. [2]
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13. Suggest why fusion is not yet used to generate electricity in power stations. [2]
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14. Compare nuclear fission and nuclear fusion.

[4]

4. Before you hand it in

Mixing up fission and fusion

Fission = splitting (think 'fissure', a crack). Fusion = joining (think 'fuse together').

"Control rods slow down the neutrons."

Control rods absorb neutrons; the moderator slows them down.

"Fission releases one neutron."

Each fission releases two or three neutrons, which is what allows a chain reaction.

"Fusion is used in today's nuclear power stations."

Fusion power is still experimental. Existing nuclear power stations use fission of uranium or plutonium.