

Fission · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; full Physics guide acquired (84 PDF pages). Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Fission · 1.1

Reasoning

A neutron can trigger a heavy nucleus to split, releasing energy and further neutrons. Whether the process becomes a chain reaction depends on what happens to those neutrons. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Fission · 2.1

Reasoning

In nuclear fission a heavy nucleus splits into lighter nuclei. Proton number and nucleon number balance in a nuclear equation. The total rest mass can decrease; the difference corresponds to released energy through $E = \Delta mc^2$. fission: Splitting of a heavy nucleus into lighter nuclei; chain reaction: A sequence in which products initiate further events.

Fission · 3.1

Reasoning

Separate conservation of nucleon number from conservation of total energy. Released neutrons may initiate further fissions, escape or be absorbed. A controlled reactor and an uncontrolled chain reaction have different neutron-management conditions. Balance a supplied nuclear equation, use the specified mass data and identify the system. Analyse models or published reactor data; this is not a school attempt to produce fission or handle reactor materials.

Fission · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: U-235 absorbs one neutron, forming Ba-141, Kr-92 and three neutrons. Nucleon balance: $235+1 = 141+92+3 = 236$. Proton balance: $92 = 56+36$. A mass decrease of 2.0×10^{-28} kg corresponds to 1.8×10^{-11} J using $c=3.0 \times 10^8$ m/s.

Fission · 4.2

Reasoning

A U-235 nucleus plus one neutron produces fragments with mass numbers 141 and 92. How many neutrons balance the equation? Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

Fission · 5.1

Reasoning

Mass number is not a precise mass in kilograms. Balanced integer labels alone do not calculate the released energy. Radioactive decay and neutron-induced fission are not interchangeable descriptions. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Fission · 5.2

Reasoning

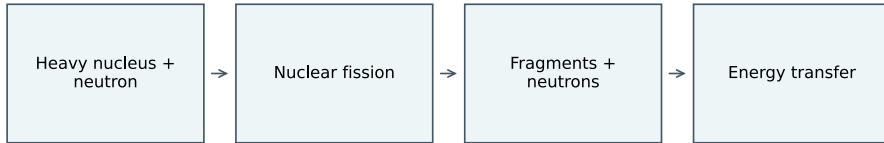
A balanced nucleon-number equation alone gives the energy release in joules. This claim is false: Mass number is not a precise mass in kilograms. Balanced integer labels alone do not calculate the released energy. Radioactive decay and neutron-induced fission are not interchangeable descriptions.

Fission · 5.3

Reasoning

Fission: conserve charge and nucleons, account for energy: Separate conservation of nucleon number from conservation of total energy. Released neutrons may initiate further fissions, escape or be absorbed. A controlled reactor and an uncontrolled chain reaction have different neutron-management conditions.

Fission · diagram



- Original teaching diagram: Fission : conserve charge and nucleons, account for energy
- Use the labels and the stated model together.

Fission · original transfer

Your turn

For $^{235}\text{U} + n \rightarrow ^{141}\text{Ba} + ^{92}\text{Kr} + xn$, find x and verify proton balance using atomic numbers 92, 56 and 36. Does nucleon conservation mean rest mass is unchanged?

Fission · transfer reasoning

Method and interpretation

$x=3$; proton balance is $92=56+36$. Nucleon number and charge balance while binding-energy differences allow rest mass to become other energy.

Check yourself

- Explain chain reaction using the stated model.
- Explain fission using the stated model.
- Change one value in the original transfer; explain which assumption still matters.