

Energy from fuels · supported focus

International Baccalaureate · IB Diploma · Chemistry · HL

Scope and prerequisites

Supported HL focus. First assessment 2025; current brief acquired; full Chemistry guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

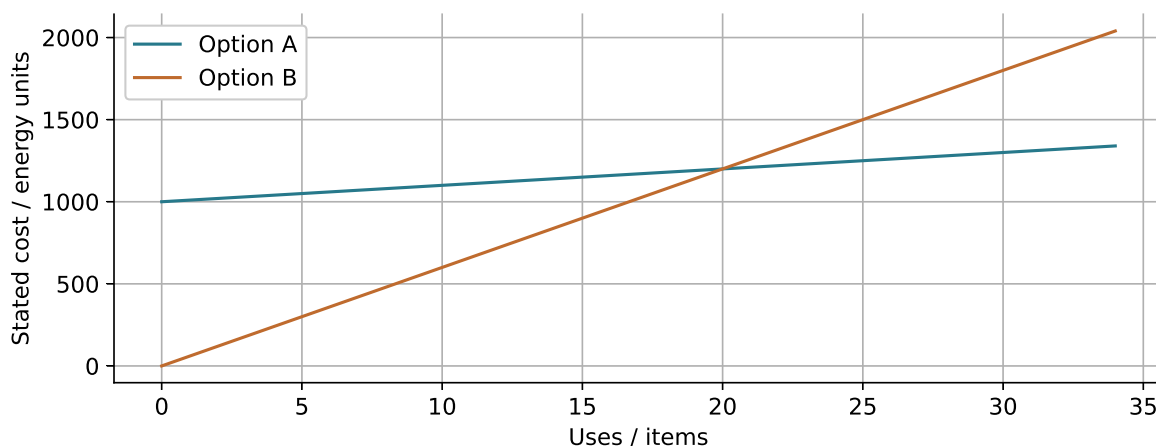
Atmosphere, resources and life-cycle decisions

■ What would explain this observation?

- A reusable container can require more energy to manufacture than a single-use one. Its impact depends on how often it is used and what happens at disposal.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ Build the model

- A **life-cycle assessment** considers raw materials, manufacture, transport, use and end-of-life processes. Greenhouse gases absorb and emit infrared radiation; pollution and climate effects are related but distinct questions.
- life-cycle assessment: Assessment across production, use and disposal; **functional unit** : The common service used for a fair comparison.



■ Choose evidence that can test it

- Define the functional unit before comparing products. The same delivered service, such as carrying one litre of water a hundred times, is fairer than comparing one object with another regardless of lifetime.
 - List system boundaries, energy sources and assumptions. Compare water demand, emissions and waste separately before making a judgement. Explain whose priorities affect the decision and where the data are uncertain.
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■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: a reusable item requires 1,000 energy units to make and 10 per use; a disposable item requires 60 per use. Equality occurs when $1,000 + 10n = 60n$. Rearranging gives $1,000 = 50n$, so $n = 20$ uses under this simplified model.

Example:

A reusable item costs 600 energy units initially and 5 per use; disposables cost 35 per use. Find break-even uses. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- A break-even model is sensitive to cleaning, transport and disposal assumptions. Recyclable does not guarantee that an item is actually collected and recycled.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

A recyclable product is always recycled after use. This claim is false: A break-even model is sensitive to cleaning, transport and disposal assumptions. Recyclable does not guarantee that an item is actually collected and recycled.

Key:

Atmosphere, resources and life-cycle decisions: Define the functional unit before comparing products. The same delivered service, such as carrying one litre of water a hundred times, is fairer than comparing one object with another regardless of lifetime.