Follow the Energy Budget

Grade 10 | Science | Task cards | 40 minutes

Learning target

Calculate efficiency and account for transfers without describing energy as destroyed.

Prerequisites and materials

Percentages and ratios. Provide pages 2-3, pencil, and a calculator if needed. These are paper-based analyses of fictional data; no physical experiment is required.

Teaching sequence

5 min: Introduce the model and vocabulary.

10 min: Partners rehearse the four card tasks.

15 min: Each learner records calculations and reasoning.

7 min: Compare methods and revise one response.

3 min: Explain one assumption or limitation.

Assessment and access

12 points: 3 per response. Keep calculations, units, and reasoning visible. Allow oral rehearsal, annotate variables, and supply a calculator or worked example with different values during practice. For assessment, clarify directions without giving answers.

Extension

Distinguish a 15-percentage-point increase from a 25% relative increase in efficiency.

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PREVIEW - first two pages only. Full package includes responses and answer key.

Lesson reference

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Analyze fictional device records. Each run receives 200 J of energy. The boundary includes the device; useful output is the mechanical work delivered by the device. Other transfers leave as thermal energy and sound.

Vocabulary	Meaning
system boundary	The chosen limit separating a system from its surroundings.
useful output	The output counted toward the stated purpose.
efficiency	Useful energy output divided by energy input, expressed as a fraction or percent.

Reference data

Run	Useful output (J)	Thermal / sound (J)
A	120	70 / 10
B	150	45 / 5

Rules and assumptions

Efficiency = useful output / input x 100%. For these records, all outputs are listed. A different definition of useful output would change the efficiency calculation.



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