

Transfer of energy and matter · supported focus

Supported focus · HL

Supported scope

- Supported HL focus. First assessment 2025; current subject brief acquired; full Biology guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

Trophic Energy · 1.1

Reasoning

Energy available as new biomass usually decreases along a food chain. Energy is conserved overall, but some transferred energy leaves the next-level production pathway. Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

Trophic Energy · 2.1

Reasoning

Producers convert an energy input into chemical energy in organic material. Consumers obtain material by feeding. Trophic transfer efficiency compares production available at one level with production at the preceding level over a common area and time. Energy can enter detrital pathways, remain in uneaten material, leave in egested waste or be transferred as heat through respiration. trophic transfer efficiency: Production at one trophic level divided by production at the preceding level over a common interval; assimilation : Uptake of digested material into an organism's usable internal pool.

Trophic Energy · 3.1

Reasoning

Use the same energy units and period in numerator and denominator. Distinguish ingestion, assimilation and production: consumed energy is not all assimilated, and assimilated energy is not all stored as new biomass. An energy pyramid records a flow per area per time; a standing biomass snapshot is a different quantity. Analyse attributed or fictional ecosystem budget data. Draw a boundary and arrows for feeding, detritus and heat transfer. Identify which values are measured and which inferred, and check whether the budget includes decomposers. Avoid treating a fixed 10% rule as a universal measurement for every ecosystem.

Trophic Energy · 4.1

Reasoning

State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution. Known: producer production is $10,000 \text{ kJ/m}^2/\text{year}$ and primary-consumer production is $1,200 \text{ kJ/m}^2/\text{year}$. Transfer efficiency is $1,200/10,000 \times 100 = 12\%$. Secondary-consumer production of $180 \text{ kJ/m}^2/\text{year}$ gives $180/1,200 \times 100 = 15\%$ for that step. These different values show why a universal 10% assumption would misrepresent this dataset.

Trophic Energy · 4.2

Reasoning

Producer production is 8,000 and primary-consumer production is 800 kJ/m²/year. Calculate transfer efficiency. Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

Trophic Energy · 5.1

Reasoning

Energy is not destroyed when respiration transfers it as heat. Material can cycle through an ecosystem, while usable energy flow depends on continuing input. A count pyramid or biomass snapshot cannot automatically be substituted into an energy-efficiency calculation. Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Trophic Energy · 5.2

Reasoning

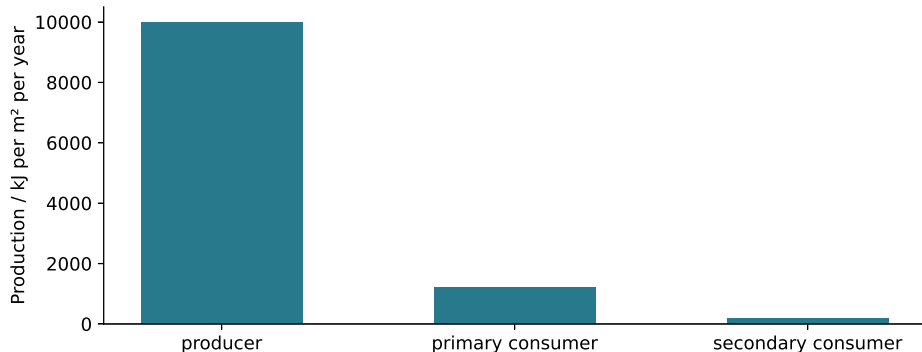
Respiration destroys energy instead of transferring it to other forms. This claim is false: Energy is not destroyed when respiration transfers it as heat. Material can cycle through an ecosystem, while usable energy flow depends on continuing input. A count pyramid or biomass snapshot cannot automatically be substituted into an energy-efficiency calculation.

Trophic Energy · 5.3

Reasoning

Energy transfer: use production and a stated boundary: Use the same energy units and period in numerator and denominator. Distinguish ingestion, assimilation and production: consumed energy is not all assimilated, and assimilated energy is not all stored as new biomass. An energy pyramid records a flow per area per time; a standing biomass snapshot is a different quantity.

Trophic Energy · diagram



- Original teaching diagram: Energy transfer: use production and a stated boundary
- Use the labels and the stated model together.

Trophic Energy · original transfer

Your turn

Fictional production values are 12,000, 1,800 and 180 kJ/(m² year) at successive levels. Find both transfer efficiencies and explain why a universal 10% assumption fails.

Trophic Energy · transfer reasoning

Method and interpretation

15% then 10%. Use adjacent levels with the same area/time basis; losses and unconsumed material vary. The dataset gives two different fractions.

Check yourself

- Explain trophic transfer efficiency using the stated model.
- Explain assimilation using the stated model.
- Change one value in the original transfer; explain which assumption still matters.