

# Hydration and nutrition · supported focus

International Baccalaureate · IB Diploma · Sports, Exercise and Health Science · HL

## Scope and prerequisites

Supported HL focus. First assessment 2026; current SL/HL brief 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.

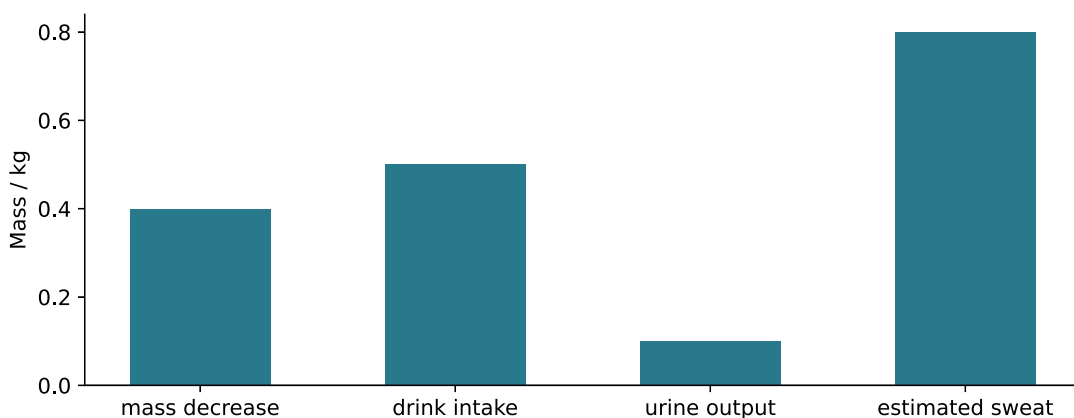
## Hydration: interpret balance without forcing dehydration

### ■ What would explain this observation?

- Body mass can change during activity, but the change is not a direct measurement of sweat alone. Drinking, urine, clothing and scale uncertainty affect the estimate.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

### ■ Build the model

- **Water balance** compares inputs and outputs. During exercise, heat production can increase sweating, while thirst and hormonal regulation contribute to fluid balance. Hydration needs vary with activity, environment and the person; a classroom calculation cannot prescribe a universal intake or diagnose a health condition.
- **water balance:** Relationship between water inputs, outputs and storage; **sweat rate** : Sweat volume lost per unit time under stated conditions.



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## ■ Choose evidence that can test it

- For a simplified field estimate, sweat loss in kilograms is approximately pre-activity mass minus post-activity mass plus drink mass minus urine mass. Express the estimate per hour only after recording duration. This approximation omits some respiratory and metabolic mass changes and assumes comparable dry clothing and a suitable balance.
- Analyse fictional or consented teacher-approved low-risk data. Record balance resolution, time, intake and whether clothing conditions match. Students need not exercise or disclose personal body mass. Never restrict drinking or induce dehydration to create a result. Compare uncertainties and alternative explanations before interpreting a difference.

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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: fictional mass is 60.0 kg before and 59.6 kg after one hour; drink intake is 0.50 kg and urine output 0.10 kg. Estimated sweat loss =  $60.0 - 59.6 + 0.50 - 0.10 = 0.80$  kg, approximately 0.80 L using 1 kg/L. The 0.40 kg body-mass decrease alone would underestimate this modelled loss.

### Example:

Fictional mass changes from 70.0 to 69.7 kg, with 0.40 kg drink and 0.10 kg urine in one hour. Estimate sweat loss. Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

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## ■ Check the conclusion and its limits

- A change in mass is not necessarily a change in body fat. A modelled sweat estimate does not justify fluid restriction, diagnosis, or a one-size-fits-all sports recommendation.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

### Warn:

Body-mass change during an activity directly measures sweat loss without other information. This claim is false: A change in mass is not necessarily a change in body fat. A modelled sweat estimate does not justify fluid restriction, diagnosis, or a one-size-fits-all sports recommendation.

### Key:

Hydration: interpret balance without forcing dehydration: For a simplified field esti-

mate, sweat loss in kilograms is approximately pre-activity mass minus post-activity mass plus drink mass minus urine mass. Express the estimate per hour only after recording duration. This approximation omits some respiratory and metabolic mass changes and assumes comparable dry clothing and a suitable balance.

## Digestion , transport and health evidence

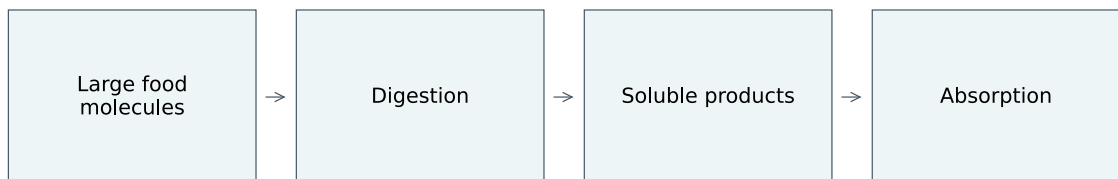
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### ■ What would explain this observation?

- Two foods can have the same mass but provide different nutrients. A health claim must distinguish the nutrient measured from the health outcome inferred.
  - Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.
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### ■ Build the model

- Large insoluble food molecules are digested into smaller soluble molecules. Carbohydrases form sugars, proteases form amino acids, and lipases form fatty acids and glycerol. Bile emulsifies lipids and helps neutralize acidic stomach contents.
- **digestion**: Breakdown of large food molecules; **absorption** : Movement of soluble products into the body.



### ■ Choose evidence that can test it

- Absorption moves soluble products into blood or lymph. Thin exchange surfaces and a large surface area shorten diffusion paths and increase transfer. Enzyme activity and transport are different processes.
  - Use Benedict reagent with controlled heating for reducing sugars, iodine for starch, Biuret reagent for protein, and the ethanol emulsion test for lipids. Keep ethanol away from flames. Use positive and negative controls.
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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: 6 of 24 study participants report a condition. Proportion = cases / total. Percentage =  $6/24 \times 100 = 25\%$ . The percentage describes this sample. It does not establish that one food caused the condition; confounders and how the sample was chosen matter.

### Example:

9 of 36 participants report an outcome. Calculate the percentage. Use the same sequence: known quantities → model → relation → substitution → unit and interpretation.

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## ■ Check the conclusion and its limits

- Bile is not an enzyme. A positive food test identifies a component under the test conditions; it does not show that a food is healthy or unhealthy in every diet.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

### Warn:

A correlation between diet and illness proves causation. This claim is false: Bile is not an enzyme. A positive food test identifies a component under the test conditions; it does not show that a food is healthy or unhealthy in every diet.

### Key:

Digestion, transport and health evidence: Absorption moves soluble products into blood or lymph. Thin exchange surfaces and a large surface area shorten diffusion paths and increase transfer. Enzyme activity and transport are different processes.