Hydration and nutrition

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

Scope and prerequisites

This handout covers selected HL topics for the course first assessed in 2026; it is not the whole syllabus.

Prerequisites: read the stated quantities and units, and use arithmetic and the model conditions below.

The examples are original and fictional: they are not real measurements or real student investigations.

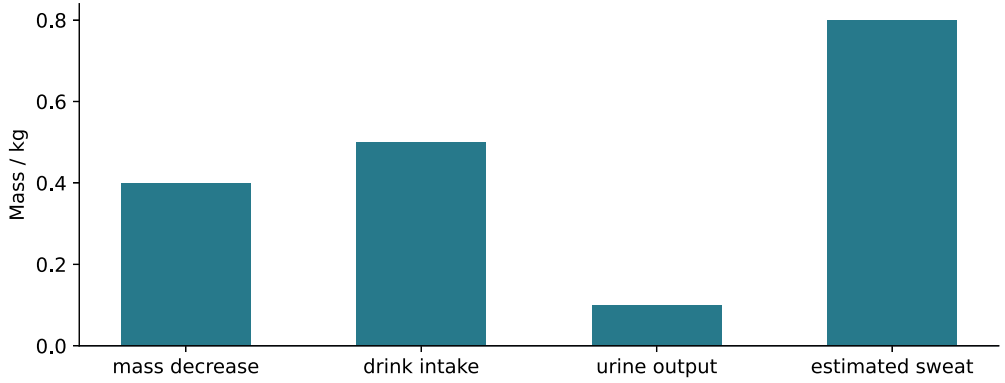
Hydration: interpret balance without forcing dehydration

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.

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.



Sweat loss = mass decrease + drink intake − urine = 0.4 + 0.5 − 0.1 = 0.8 kg

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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.

In the lab: 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.

Work from known quantities

- 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.

Your turn: 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.

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.

Not true: Body-mass change during an activity directly measures sweat loss without other information. Mass change during exercise mixes sweat loss with fluid intake, urine and even substrate use. Only the full balance - mass change plus recorded intake and output - estimates sweat loss.

Key:

- Water balance compares inputs and outputs.
- For a simplified field estimate, sweat loss in kilograms is approximately pre-activity mass minus post-activity mass plus drink mass minus urine mass.
- Watch for: A change in mass is not necessarily a change in body fat.

■ **Write from a sweat loss of 0.70 kg**

- Fictional mass changes from 55.0 kg to 54.5 kg. Drink intake is 0.40 kg and urine output is 0.20 kg.
- Estimate sweat loss. The mass change alone is not the sweat loss.

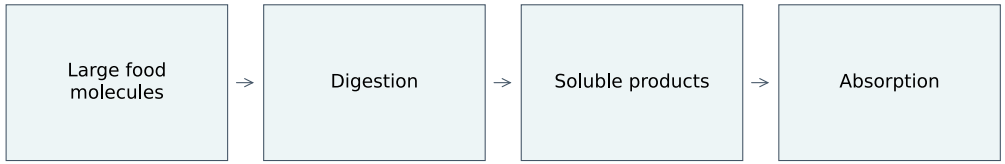
Digestion , transport and health evidence

■ **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.

■ **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.



Digestion makes food molecules small and soluble enough to be absorbed

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■ **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.

In the lab: 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.

■ **Work from known quantities**

- 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.

Your turn: 9 of 36 participants report an outcome. Calculate the percentage.

■ **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.

Not true: A correlation between diet and illness proves causation. A correlation shows that two measurements vary together; it does not prove one causes the other. A confounding variable, reverse causation or chance could explain the link, so a controlled comparison is needed before claiming causation.

Key:

- Large insoluble food molecules are digested into smaller soluble molecules.
- Absorption moves soluble products into blood or lymph.
- Watch for: bile is not an enzyme.

■ **Write from 20 percent of a sample**

- 4 of 20 study participants report a condition.
- Find the percentage. The percentage does not prove that one food caused the condition.