Response

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.

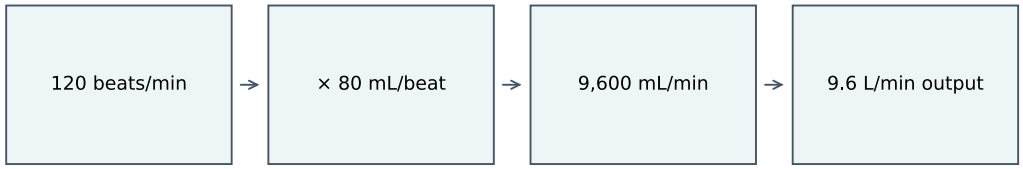
Acute responses and cardiac output

What would explain this observation?

- Two students finish the same step test: heart rates 150 and 170. The higher reading does not name the fitter student, because **cardiac output** (the blood volume pumped per minute) is heart rate times stroke volume, and conditions must match before comparison.

Build the model

- Cardiac output = heart rate multiplied by stroke volume (blood volume per beat).
- An **acute response** occurs during or soon after exercise.
- A **training adaptation** develops over repeated sessions.
- Heart rate and stroke volume can both rise during exercise; longer-term training adaptations develop across repeated sessions.
- cardiac output: Blood volume pumped by the heart per minute.



Choose evidence that can test it

- A lower post-exercise heart rate cannot alone establish greater fitness without comparable workload and participant conditions.
- Measure a baseline, a standardized workload and timed recovery points.
- Voluntary informed participation, school supervision and an approved low-intensity protocol only.

In the lab: Stop for discomfort; never use maximal exertion or health diagnosis as a classroom task; record conditions (time of day, prior activity) with every measurement.

Work from known quantities

- Known: student A: resting 60 beats per minute; after a three-minute standardized step, 150; recovery 90 at one minute.
- Student B, same workload: resting 70; after, 170; recovery 100 at one minute.
- The comparable claims: both rose acutely and both recover; the between-student comparison needs matched conditions.
- With stroke volume stated (A 70 mL per beat), cardiac output at rest = 60 x 70 = 4 200 mL per minute.

Your turn: Recompute cardiac output for A at 150 beats per minute if stroke volume rises to 90 mL per beat.

Check the conclusion and its limits

- One session shows an acute response, not a training adaptation.
- Recovery curves depend on workload, environment and prior activity.

Not true: A lower post-exercise heart rate proves greater fitness. Without the same workload and participant conditions, the reading compares situations, not fitness.

Key:

- Cardiac output = heart rate x stroke volume.
- Acute response now; adaptation over sessions.
- Watch for: unmatched workload in fitness claims.