Amylase: temperature and reaction time

Teacher / technician

YEAR 10 / LESSON 10 / BIOLOGY + SCIENCE (DOUBLE AWARD)

Staff preparation and answer guidance. Keep separate from student sheets. Whole-class practical with repeated measurements at assigned temperatures. Reciprocal endpoint time is a comparative activity index, not an initial molar reaction rate.

Coverage and delivery

Shared Biology / Double Award: 2.12. Core practical: temperature and enzyme activity.

Allow about 70 minutes. Follow the student sequence and use the answers to check reasoning.

Requisition • class of 30, working in 15 pairs

Item	Per pair / setup	Class total
Booklets / eye protection	2 of each per pair	30 of each
Tube / timer / tile sets	4 tubes, 1 timer, sufficient wells per pair	60 tubes; 15 timers and tile sets
1% starch solution	8 cm^3 per pair for 3 trials + control	150 cm^3 including spare
Pilot-checked amylase solution	6 cm^3 per pair	120 cm^3 including spare
pH 7 buffer	4 cm^3 per pair	75 cm^3 including spare
Dilute iodine / clean droppers	one small bottle per pair	15 bottles; about 50 cm^3 total
Water baths / thermometers	20, 30, 40, 50, 60 °C stations	5 stations; 15 thermometers

Immediate safety

Wear eye protection; iodine stains and can irritate eyes. Avoid contact with buffer and enzyme solutions. Hot water and glass can burn: use racks and holders at the warmer baths. Students do not handle enzyme powder or saliva.

Preparation and delivery

Read alongside the student method

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1. Allocate three pairs to each temperature. Each pair runs three repeats and a water-for-enzyme control, producing nine trial timings per temperature before exclusions.

2. Staff prepare starch and fresh commercial amylase; start near 0.5% amylase and pilot to obtain measurable endpoints with this stock and 20 s sampling. Adjust the common enzyme concentration before class, then label and hold it constant. Do not use saliva.

3. Use supplied dilute iodine (about 0.01 mol dm^{-3}) and a suitable pH 7 buffer with checked supplier information. Verify actual bath temperatures and safe tube access.

4. Pilot the lowest/highest temperatures. If results are too rapid or all exceed the limit, revise the common concentration and timetable before teaching, then document the change. Explain censored data rather than inventing endpoint times.

Close of lesson

- Collect iodine and buffer mixtures as directed by the school's disposal instructions.
- Rinse equipment promptly, return it safely, clean the bench and wash hands.

Check before teaching

Check the cards, reference data and quantities against this requisition. Keep the staff answer guide separate until the checking stage. Supplied numerical practice datasets are labelled examples; they are not class measurements.

Answers and teaching notes

Expected explanations • do not give as experimental observations

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- Measured reaction temperature; time to the first negative iodine test, with reciprocal time as an activity index.
- The reaction should begin near the assigned temperature when mixing starts, rather than during warming.
- 0.0125 s^{-1}.
- As a censored observation, not an exact 300 s or zero activity; do not include it as a numerical endpoint in a mean.
- Whether loss of detectable starch occurs without active enzyme under the same conditions.
- The peak may lie between sampled temperatures; repeat with smaller intervals and adequate replication near the apparent maximum.

References and provenance

Pearson Biology specification

Practical Biology: amylase sampling and controls

Prepared 22 November 2026. Original wording, tables and questions. Sources inform the concepts and technique; the lesson scope and classroom quantities are explicitly described here. No laboratory trial or final school risk approval is claimed.