Amylase: pH and reaction time

Teacher / technician

YEAR 10 / LESSON 12 / 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

Biology only practical: 2.14B. Shared explanation: 2.13.

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
Buffers pH 4, 5, 6, 7, 8	4 cm^3 per pair plus pH-check spare	25 cm^3 of each buffer
Dilute iodine / clean droppers	one small bottle per pair	15 bottles; about 50 cm^3 total
30 °C baths / thermometers / pH check	shared baths; separate checking samples	3–5 baths; 15 thermometers; pH paper

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 of five pH values; each pair performs three repeats and a no-enzyme control. Keep the temperature at 30 °C throughout.

2. Use fresh pilot-checked amylase, 1% starch and ready-prepared buffers. Choose a common enzyme concentration giving measurable endpoints; do not change it between pHs.

3. Check supplier information for every buffer. Verify pH in a spare complete mixture; reserve sufficient stock for this check and the control. Students do not prepare enzyme powder or concentrated buffers.

4. Pilot the range and sampling interval before class. Explain that >300 s is not a measured 300 s and does not mean zero enzyme activity.

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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- Mixture pH; endpoint time and its reciprocal activity index.
- Temperature also affects enzyme activity and would confound the pH comparison.
- 0.008 s^{-1}.
- As a censored time and an activity bound; exclude it from an ordinary mean endpoint calculation.
- The indicator or electrode may alter or contaminate the reaction; a spare matching mixture checks the actual pH.
- Test closer pH values near the apparent maximum with repeats and a consistent enzyme batch.

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.