

# Edexcel Biology IGCSE

## 2.12: Enzymes and Temperature

### Practical notes

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## Effect of temperature on enzyme activity

### Aim

Investigate the effect of changes in temperature on amylase activity, measured by the rate of disappearance of substrate (starch).

Amylase catalyses the reaction below:

Starch → Maltose

### Equipment

- test tubes
- a test tube rack
- water baths (electrical or Bunsen burners and beakers)
- spotting tiles
- a 5 cm<sup>3</sup> measuring cylinder
- syringes or 10 cm<sup>3</sup> measuring cylinders
- a glass rod
- a stopwatch
- starch solution
- amylase solution
- buffered solutions
- iodine solution
- thermometer

### Method

1. On a tile, label each well with the time (from 0 onwards) and add a drop of iodine solution to each well.
2. Prepare a range of temperatures of water baths (from 20 to 60°C) at fixed 10°C intervals.
3. Transfer 3 cm<sup>3</sup> of amylase into a labelled test tube and place in a water bath.
4. Transfer 3 cm<sup>3</sup> of starch solution into a labelled test tube and place in the same water bath.
5. Allow time (a few minutes) for the temperature to equilibrate, then mix the 2 solutions together by stirring with a glass rod and start timing immediately.
6. Use the glass rod to transfer a drop of the mixture to the well labelled '0' on the tile.
7. Repeat step 6 every minute, rinsing the glass rod in between every test, until the iodine solution remains brown and does not turn blue-black.
8. Record results in a table as seen below.
9. Calculate the rate of enzyme reaction by using 1/ time taken for iodine solution to remain brown.
10. Repeat steps 2-8 for other temperatures of water baths.
11. Plot a graph of the rate of enzyme reaction against temperature.



Temperature	Time taken for amylase to completely break down all the starch / s	Rate of reaction / s <sup>-1</sup>

### Controlled variables

- pH
- Volume and concentration of amylase solution
- Volume and concentration of starch solution
- Time interval between testing

### Sources of error

The intervals between testing samples may be too long to accurately measure the time taken for the starch to be completely broken down.

### Potential Hazards

Be careful using hot water.

If using a Bunsen burner tie long hair back and wear goggles.

Wear safety goggles when using iodine solution, amylase solution and hot water.

