

Edexcel Biology IGCSE

2.12: Enzymes and Temperature

Practical notes



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 cm³ measuring cylinder
- syringes or 10 cm³ 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 cm³ of amylase into a labelled test tube and place in a water bath.
4. Transfer 3 cm³ 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^{-1}

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.

