

Topic 2 – Practical 2

Investigating the effect of temperature on enzyme activity

Safety

- Amylase is an irritant.
- Normal laboratory safety procedures should be followed. Wear eye protection when handling iodine solution and amylase.
- Rinse the skin if iodine or amylase come into contact with it.

Apparatus and materials

- 30 cm³ 5% amylase solution
- iodine solution
- 30 cm³ 1% starch solution
- eight test tubes and rack
- pen to mark test tubes
- water baths at 0°C, 25°C, 35°C and 60°C
- two 5 cm³ syringes
- dropping pipette
- four stopwatches

Introduction

Amylase is an enzyme found in the mouth (salivary amylase) and in the small intestine (pancreatic amylase). Amylase catalyses the breakdown of starch to the sugar maltose. In this practical, you will investigate the effect of temperature on the action of amylase. Starch turns a blue–black colour when the indicator iodine is added. Maltose has no reaction with iodine.

Procedure

- 1 Label eight test tubes S1, S2, S3, S4 and A1, A2, A3, A4.
- 2 Use a syringe to place 10 cm³ starch solution into test tubes S1, S2, S3 and S4. Add five drops of iodine solution so that the starch turns blue–black in colour.
- 3 Use a clean syringe to place 2 cm³ of amylase solution into the test tubes A1, A2, A3 and A4.
- 4 Place the test tubes in the water baths as follows:
S1 and A1 in the water bath at 0°C
S2 and A2 in the water bath at 25°C
S3 and A3 in the water bath at 35°C
S4 and A4 in the water bath at 60°C
- 5 Leave the tubes for 10–15 minutes so that they reach the same temperature as the water baths.
- 6 Pour the amylase from tube A1 into tube S1 and mix quickly, replace the tube in the water bath and start a stopwatch.
- 7 Repeat step 6 for the other three pairs of tubes.
- 8 Note the time taken for the blue–black colour to disappear, in each case.

Questions and further work

- 1 At which temperature was starch broken down by amylase most quickly?

- 2 If starch was not broken down by amylase in one or more of the tubes, explain why not.

- 3 Suggest a suitable control for the experiment. Why is it important to have a control?

- 4 Plan an investigation to determine the optimum temperature for amylase activity.