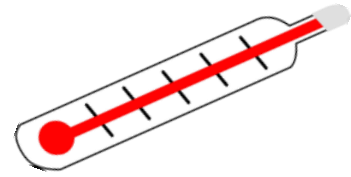


## Student instruction sheet 1

You are investigating how a named factor affects the breaking down of starch into glucose by the enzyme amylase.

The factor you will be investigating is: **temperature**



1. Prepare your solutions. Put 10 ml of starch solution into each of three different test tubes. Put 1 ml of amylase solution into each of three different test tubes.
2. Place one amylase test tube and one starch test tube into each of the water baths. They need to be in there for a minimum of 10 minutes.
3. While they are in the water bath, prepare your dimple tray with iodine solution. Place drops in each of the dimples then mix together your final 2 tubes and start the timer. Immediately take a small sample and place in a dimple on your dimple tray and repeat every 30 seconds. When the solution has turned back to the original colour of the iodine solution, stop the timer.
4. Follow step 3 with the solutions that have been in the water bath and note your results below.

Temperature (°C)	Time taken for solution to turn back to original colour (s)

- a. What has happened? *Describe - say what you see!*
- b. Why might this have happened? *Explain - use your science!*
- c. How could you improve this investigation and develop it further? *Evaluate - be critical!*

## Student instruction sheet 2

You are investigating how a named factor affects the breaking down of starch into glucose by the enzyme amylase.



The factor you will be investigating is: **substrate concentration**

1. Prepare your solutions. Put 1ml of amylase solution into each of four different test tubes. Then make up the following starch solutions.

Test tube	Substrate concentration	Volume of starch solution (ml)	Volume of distilled water (ml)
1	100%	10	0
2	80%	8	2
3	50%	5	5
4	20%	2	8

2. Prepare your dimple tray with iodine solution. Place drops in each of the dimples.
3. Mix together one of your amylase test tubes and test tube 1 and start the timer. Immediately take a small sample and place in a dimple on your dimple tray. Repeat every 30 seconds and when the solution has turned back to the original colour of the iodine solution, stop the timer.
4. Follow step 3 with the remaining test tubes and note your results below.

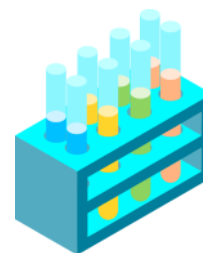
Substrate concentration (%)	Time taken for solution to turn back to original colour (s)
100	
80	
50	
20	

- a. What has happened? *Describe - say what you see!*
- b. Why might this have happened? *Explain - use your science!*
- c. How could you improve this investigation and develop it further? *Evaluate - be critical!*

## Student instruction sheet 3

You are investigating how a named factor affects the breaking down of starch into glucose by the enzyme amylase.

The factor you will be investigating is: **enzyme concentration**



1. Prepare your solutions. Place 10 ml of starch solution into each of four different test tubes. Then make up the following amylase solutions.

Test tube	Enzyme concentration (%)	Volume of amylase solution (ml)	Volume of distilled water (ml)
1	100	2	0
2	50	1	1
Control	0	0	2

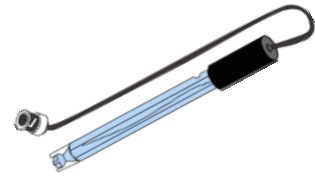
2. Prepare your dimple tray with iodine solution. Place drops in each of the dimples.
3. Mix together one of your starch solution test tubes and test tube 1 and start the timer. Immediately take a small sample and place in a dimple on your dimple tray. Repeat every 30 seconds and when the solution has turned back to the original colour of the iodine solution, stop the timer.
4. Follow step 3 with the remaining test tubes and note your results below.

Enzyme concentration (%)	Time taken for solution to turn back to original colour (s)
100	
50	
0	

- a. What has happened? Describe - say what you see!
- b. Why might this have happened? Explain - use your science!
- c. How could you improve this investigation and develop it further? Evaluate - be critical!

## Student instruction sheet 4

You are investigating how a named factor affects the breaking down of starch into glucose by the enzyme amylase.



The factor you will be investigating is: **pH**

1. Prepare your solutions. Place 2 ml of amylase solution into 3 different test tubes. Add 1 ml of each of the pH buffers to these test tubes and give the amylase 5 minutes to act.
2. While waiting for your enzyme to adjust to its new pH, place 10ml of starch solution into 3 other test tubes and prepare your dimple tray with iodine solution. Place drops in each of the dimples.
3. Mix together one of your amylase test tubes and starch solution test tubes and start the timer. Immediately take a small sample and place in a dimple on your dimple tray. Repeat every 30 seconds and when the solution has turned back to the original colour of the iodine solution, stop the timer.
4. Follow Point 3 with the remaining test tubes and note your results below.

pH	Time taken for solution to turn back to original colour (s)

- a. What has happened? Describe - say what you see!
- b. Why might this have happened? Explain - use your science!
- c. How could you improve this investigation and develop it further? Evaluate - be critical!

### Teaching notes

The student sheets can be used to accompany standard amylase practical investigations into factors that affect the action of enzymes.