

Biology - Key stage 4
Ecology

Decay Required Practical

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Hypothesis - Independent practice

Complete the sentences below:

I predict that as temperature gets very _____ then the rate of decay will _____.

This will happen because ...



Hypothesis - Independent practice answers

Complete the sentences below:

I predict that as temperature gets very **high** then the rate of decay will **decrease**.

This will happen because **enzymes are denatured at high temperatures and they will no longer be able to work so respiration and other reactions will stop happening decreasing the rate of decay.**



Variables - Independent practice

I predict that as temperature gets very high then the rate of decay will decrease.

State what the independent and dependent variables would be in this investigation.



Variables - Independent practice answers

I predict that as temperature gets very high then the rate of decay will decrease.

Independent variable = temperature

Dependent variable = rate of decay



Independent practice

Complete a table like the one on the next slide to explain why each step is important.



Method step	Reason
Add phenolphthalein to a boiling tube with 5 cm ³ milk	
Add 7 cm ³ sodium carbonate solution to the milk tube	
Put the tubes in a beaker of water of 10 °C and leave for 5 minutes	
Add lipase to the milk mixture and start the stopwatch. Time until the colour changes from purple to yellow.	
Repeat steps 1-5 using temperatures of 20-60 °C going up in 10 °C each time	
Keep the volume of lipase the same (1 cm ³), the volume of milk (5 cm ³) the same and the number of drops of indicator the same	



Independent practice - answers

- 1. phenolphthalein is an indicator and will show the change in pH**
- 2. To make the mixture alkaline to begin with to see a clear colour change**
- 3. To allow the liquids to come to temperature**
- 4. This gives a rate of reaction**
- 5. This is the independent variable and a minimum of 5 readings are needed**
- 6. These are control variables to make sure the conclusion is valid**



Results - Independent practice

Calculate the mean averages for the data.

Temperature in °C	Time in seconds			
	Repeat 1	Repeat 2	Repeat 3	Mean
15	87	93	91	
30	40	38	42	
45	29	33	32	
60	130	138	135	
75	610	598	607	



Results - Independent practice answers

Calculate the mean averages for the data.

Temperature in °C	Time in seconds			
	Repeat 1	Repeat 2	Repeat 3	Mean
15	87	93	91	90
30	40	38	42	40
45	29	33	32	31
60	130	138	135	134
75	610	598	607	605



Rate of decay - Independent practice

Calculate the rate of decay for the other temperatures in the results table:

Temperature in °C	Time in seconds	Rate (1÷time)
15	90	0.010
30	40	
45	31	
60	134	
75	605	



Rate of decay - Independent practice

answers

Calculate the rate of decay for the other temperatures in the results table:

Temperature in °C	Time in seconds	Rate (1÷time)
15	90	0.010
30	40	0.025
45	31	0.032
60	134	0.007
75	605	0.002



Independent practice

1. Why does the milk and indicator mixture change colour as the milk decays?
2. Describe the effect of temperature on the rate of decay of milk by lipase.
3. Explain the result at 75 °C.
4. Suggest an improvement to the experiment that would allow you to pinpoint the optimum temperature for decay.



Independent practice - answers

1. Why does the milk and indicator mixture change colour as the milk decays?

The colour changes as the fats are digested because fatty acids are produced and this lowers the pH. The solution was alkaline to start with, so when enough acids have been produced, the mixture turns acidic and the phenolphthalein loses its pink colour.



Independent practice - answers

2. Describe the effect of temperature on the rate of decay of milk by lipase.

As the temperature is increased, the rate of decay increases. For example, at 10 °C the rate was 0.010, but at 45 °C it was 0.032. However, after 45 °C the rate drops rapidly.



Independent practice - answers

3. Explain the result at 75 °C.

The enzyme was denatured, meaning the shape of the active site was permanently damaged and the substrate (the fat) could not bind. So the fats were not being digested by the lipase.



Independent practice - answers

4. Suggest an improvement to the experiment that would allow you to pinpoint the optimum temperature for decay.

Repeat the experiment using a range of temperatures with smaller intervals around the optimum for these results (e.g between 40 and 50, going up 1 degree each time).

