

A level Biology A
H420/03 Unified biology

Question Set 16

1 Icefish live in very cold water.

Icefish contain biological molecules that allow them to tolerate cold temperatures.

(a) Adaptations can be grouped into three general categories.

Which category of adaptation is represented by cold-tolerant molecules?

[1]

(b) One example of a cold-tolerant molecule present in icefish is a modified form of the protease enzyme trypsin.

Fig. 3 shows how trypsin is converted from a molecule called trypsinogen. This conversion occurs in the lumen of the small intestine

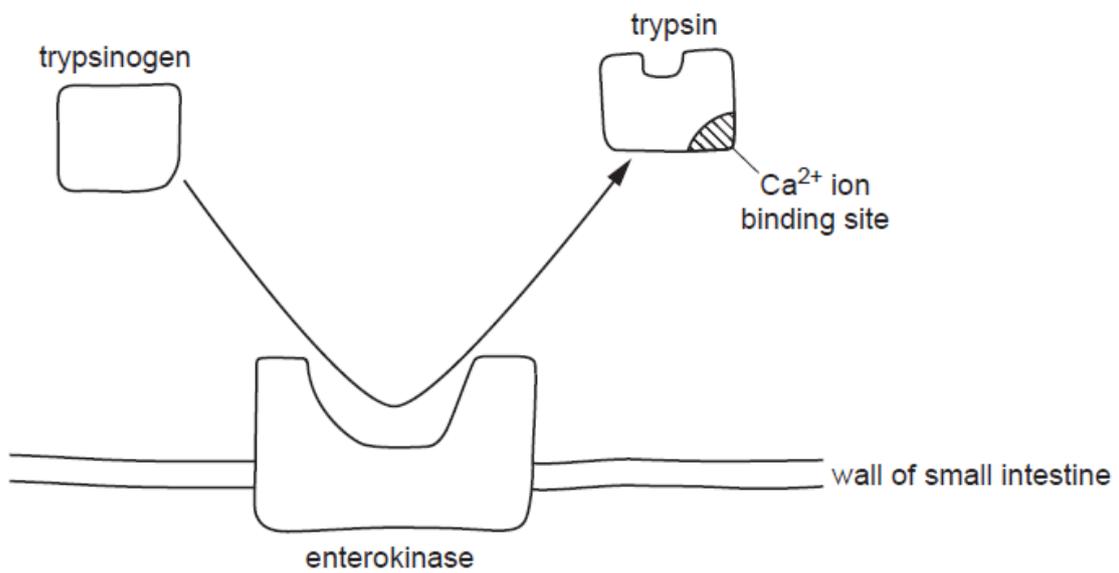


Fig. 3

State **two** conclusions that can be drawn from Fig. 3 about the roles of the molecules and ions that affect how trypsin functions.

1

2

[2]

(c) A group of students investigated the effect of temperature on the activity of two forms of trypsin: human trypsin and icefish trypsin.

Part of their method is shown below:

- use 10 cm³ of 5% trypsin solution for all trials
- measure enzyme activity at 10, 20, 30, 40 and 50 °C for both enzymes
- carry out each trial in the same pH buffer
- repeat the experiment 5 times at each temperature
- measure enzyme activity by recording the area of gelatine on a photographic film that is broken down over a set time period
- calculate the rate of enzyme activity at each temperature.

(i) Suggest **and** explain two improvements that would increase the validity of the students' investigation.

Improvement.....

Explanation.....

Improvement.....

Explanation.....

[4]

(ii) Suggest appropriate units to use to represent the rate of enzyme activity in this investigation.

[1]

- (iii) The students recorded the temperature that produced the fastest reaction rate in each of the five replicates. These results are shown in Table 3.

Replicate	Temperature that produced the fastest reaction rate (°C)	
	Human trypsin	Icefish trypsin
1	40	20
2	10	10
3	30	20
4	40	30
5	40	30
Mean =	32.0	22.0
Mode =	40	20 and 30
Median =	40	20

Table 3

One of the students made the following statement:

I think the mean is a more accurate measure than the median or mode for these results.

Evaluate the student's statement.

[2]

- (iv) The students wanted to know whether there was a difference between the reaction rates of the two forms of trypsin at 30°C.

They performed a statistical test on the mean of the five replicates for human trypsin and the five replicates for icefish trypsin.

Suggest the most appropriate statistical test for the students to use **and** explain why this test is appropriate.

[2]

Total Marks for Questions Set 16: 12

OCR

Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge