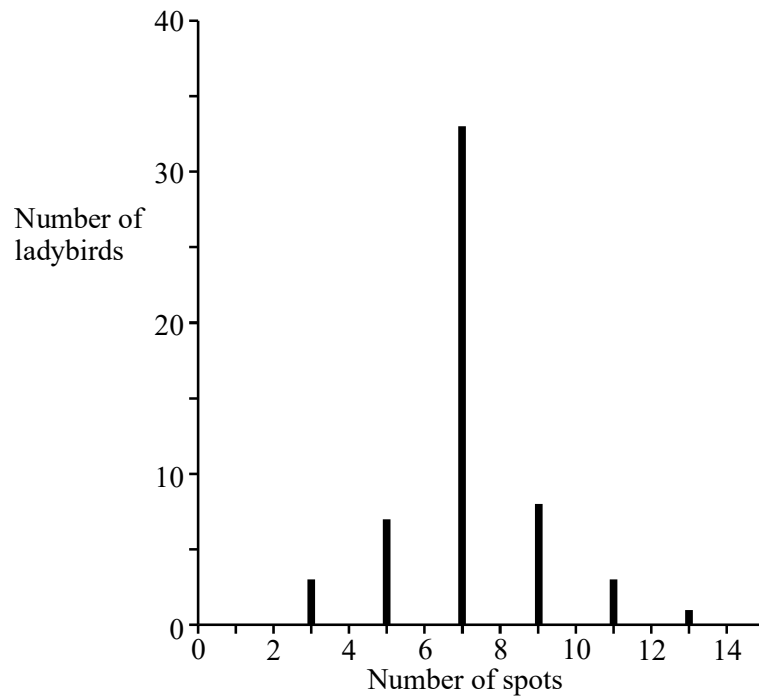


1. The graph shows variation in the number of spots on the wing-cases of a species of ladybird.



- (a) The number of spots on the wing cases of this species of ladybird is determined by genes. What does the graph suggest about the genetic control of spot number in this species?

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 .....

(1)

- (b) Give **one** piece of evidence from the graph that variation in the number of spots is normally distributed.

.....  
 .....

(1)

- (c) The population of ladybirds from which this sample was taken is undergoing stabilising selection. Describe how stabilising selection will affect the mean and standard deviation. Give the reason for your answer.

Mean .....

Standard deviation .....

Reason .....

.....

.....

.....

(3)  
(Total 5 marks)

2. This question should be written in continuous prose, where appropriate. Quality of Written Communication will be assessed in these answers.

- (a) Use your knowledge of classification to arrange *class*, *phylum*, *genus* and *family* in order of decreasing number of species.

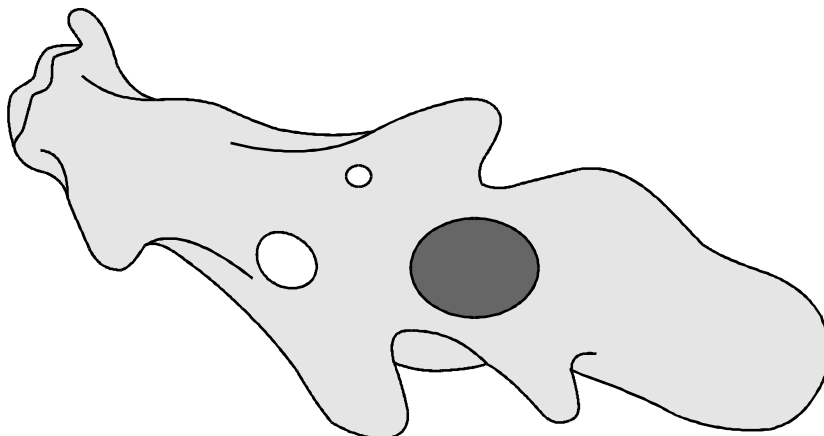
largest number of  
species

smallest number of  
species

.....

(1)

- (b) The diagram shows an amoeba. This is a single-celled organism.



Amoeba is classified as a protist. Giving a different answer in each case, explain why it is **not**

(i) a prokaryote;

.....  
.....

(ii) a fungus.

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.....

(2)

(c) Cytochrome c is a protein involved in one of the reactions of aerobic respiration in a mitochondrion. The molecular structure of cytochrome c from different species has been analysed. More similarities are present in the structure of cytochrome c in closely related species than in distantly related species.

(i) Explain what is meant when two species are described as being *closely related*.

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(1)

- (ii) A difference in the molecular structure of cytochrome c may arise in a small population that becomes geographically isolated. Explain how the difference may arise and how it may spread in the population.

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(4)  
(Total 8 marks)

- 3. (a) Explain how crossing over can contribute to genetic variation.

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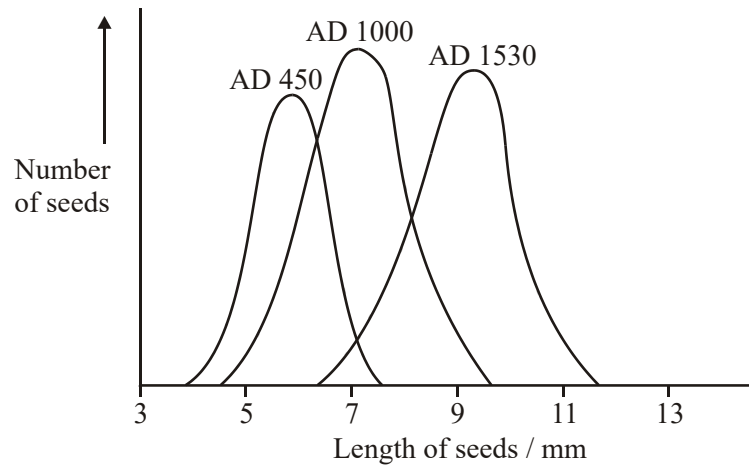
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(3)

- (b) Maize seeds were an important food crop for the people who lived in Peru. The seeds could be kept for long periods. Each year, some were sown to grow the next crop. Archaeologists have found well-preserved stores. The graph shows the lengths of seeds collected from three stores of different ages.



- (i) Within each store the maize seeds showed a range of different lengths. Explain **one** cause of this variation.

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(2)

- (ii) Use your knowledge of genetics and selection to explain the changes in the mean length of the seeds between AD 450 and AD 1530.

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(4)  
(Total 9 marks)