

**Q1.**

- (a) The genetic diversity of species is measured by comparing differences in the base sequence of DNA or differences in the base sequence of mRNA.

Give **two** other ways in which genetic diversity between species is measured.

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

Scientists investigated differences between 260 North American bird species by comparing the base sequence of a gene in mitochondrial DNA. They compared the gene base sequence of each bird with all of the other 259 species. For each comparison they calculated the percentage difference in base sequence.

- (b) **Figure 1** shows the base sequence for part of the gene in two species.

**Figure 1**

Species 1	A	G	C	T	G	C	C	T	A	G	A
Species 2	A	T	G	T	G	G	C	A	A	G	A

Calculate the percentage difference in base sequence for these base sequences.

Answer = \_\_\_\_\_%

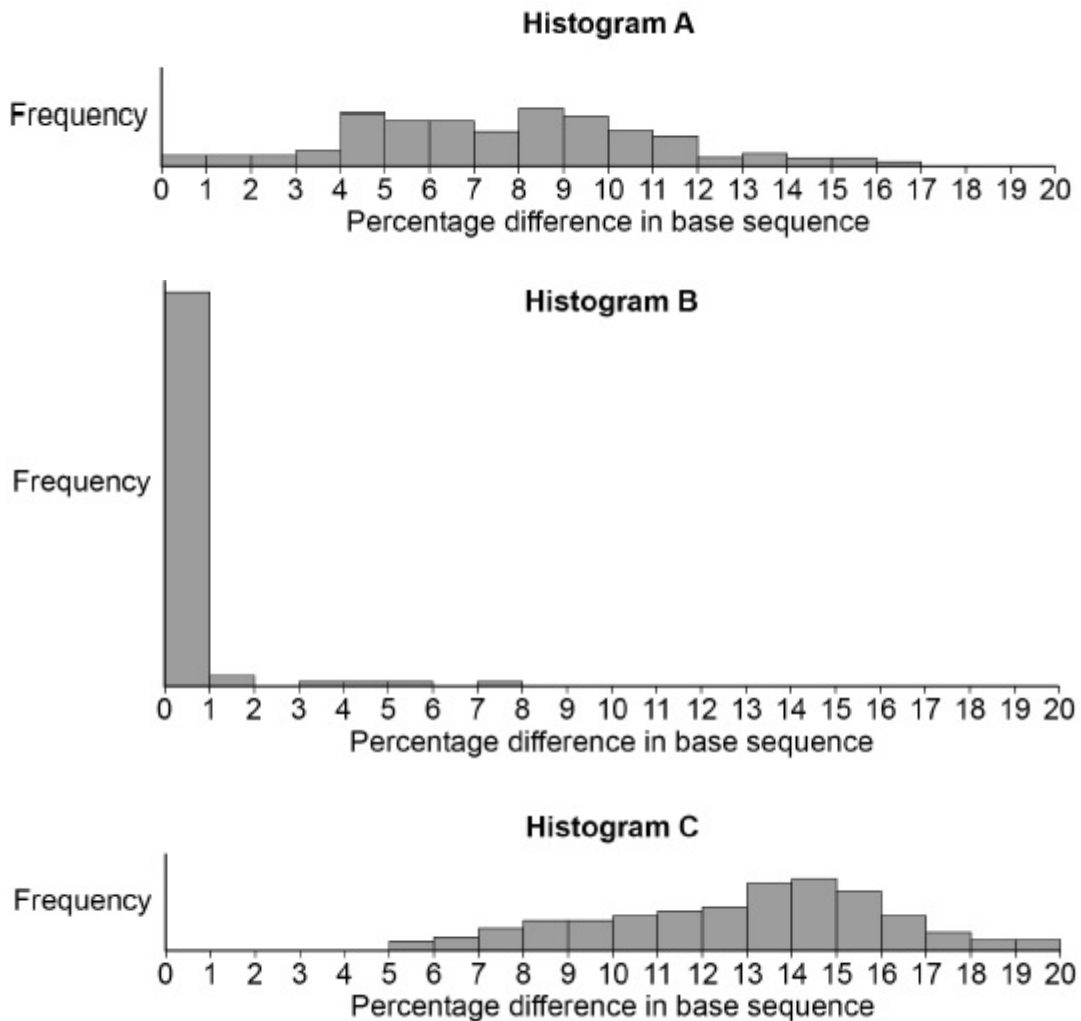
(1)

(c) The scientists compared base sequences in:

- birds of the same species
- birds of different species in the same genus
- birds of different species in the same family.

The scientists' results are shown in **Figure 2**.

**Figure 2**



- (c) Complete the table by writing **A**, **B** or **C** in the box to correctly match the statement to each histogram shown in **Figure 2**.

Statement	Histogram
Base sequences of birds of the same species.	
Base sequences of birds of the same genus.	
Base sequences of birds of the same family.	

(1)

- (d) To calculate the percentage difference in base sequences, the scientists first counted the number of bases and the number of base differences.

What statistical test should the scientists use to test whether the number of base differences between birds in histogram **A** and birds in histogram **C** is statistically significant?

Place a tick (✓) in the box against the statistical test you would use.

Justify your answer.

Chi-squared

Correlation coefficient

Student's t-test

Justification \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

(Total 6 marks)

Q2.

**Table 1** shows how a bird called the bluethroat (*Luscinia svecica*) is classified by biologists.

**Table 1**

Taxon	Name of taxon
Domain	Eukaryota
	Animalia
	Chordata
	Aves
	Passeriformes
	Muscicapidae
Genus	
Species	

(a) Complete **Table 1** by filling the seven blank spaces with the correct terms.

(2)

A group of scientists investigated genetic diversity in different species of bird. For each species, the scientists:

- collected feathers from a large number of birds
- extracted DNA from cells attached to each feather
- analysed the samples of DNA to find genetic diversity.

**Table 2** summarises their results.

**Table 2**

Species of bird	Number of genes examined	Number of genes examined that showed genetic diversity
Willow flycatcher	708	197
House finch	269	80
Bluethroat	232	81

(b) In this investigation, what is meant by **genetic diversity**?

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(1)

(c) The scientists concluded that the bluethroat showed greater genetic diversity than the willow flycatcher. Explain why they reached this conclusion. Use calculations to support your answer.

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(2)

(Total 5 marks)

**Q3.**

The table shows the taxons and the names of the taxons used to classify one species of otter. They are **not** in the correct order.

	Taxon	Name of taxon
<b>J</b>	Family	Mustelidae
<b>K</b>	Kingdom	Animalia
<b>L</b>	Genus	Lutra
<b>M</b>	Class	Mammalia
<b>N</b>	Order	Carnivora
<b>O</b>	Phylum	Chordata
<b>P</b>	Domain	Eukarya
<b>Q</b>	Species	lutra

(a) Put letters from the table above into the boxes in the correct order. Some boxes have been completed for you.

		<b>O</b>	<b>M</b>			<b>L</b>	<b>Q</b>
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(1)

(b) Give the scientific name of this otter.

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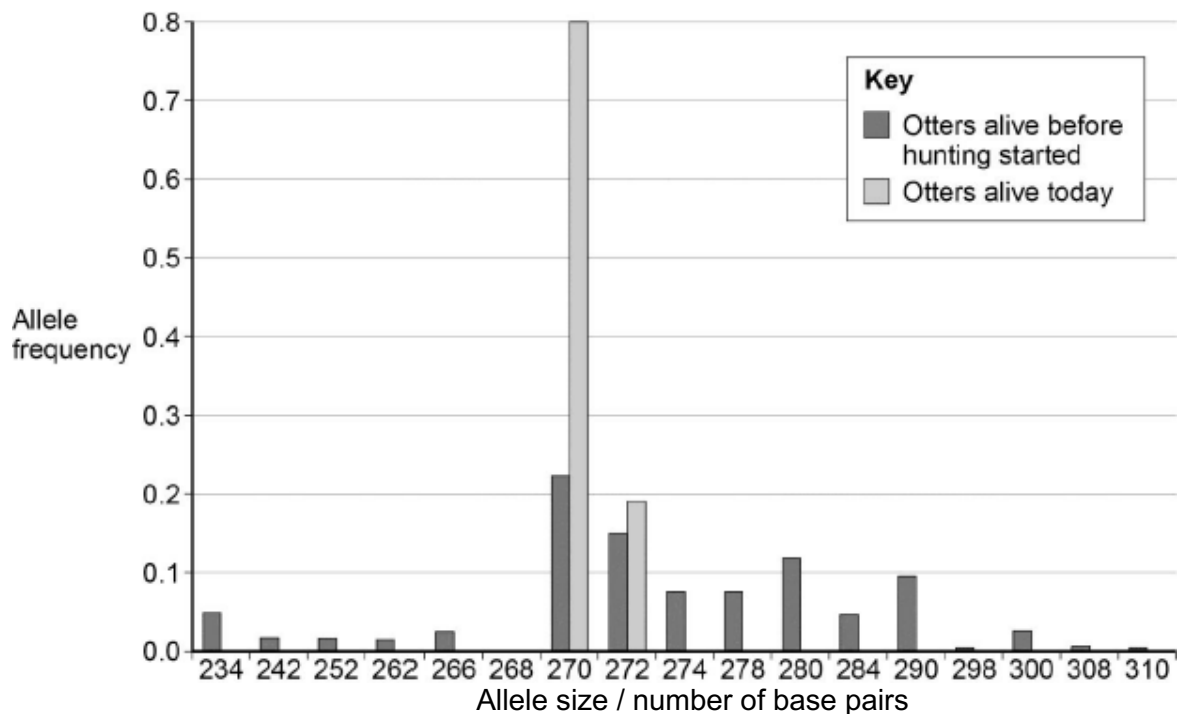
(1)

Scientists investigated the effect of hunting on the genetic diversity of otters. Otters are animals that were killed in very large numbers for their fur in the past.

The scientists obtained DNA from otters alive today and otters that were alive before hunting started.

For each sample of DNA, they recorded the number of base pairs in alleles of the same gene. Mutations change the numbers of base pairs over time.

The figure below shows the scientists' results.



(c) The scientists obtained DNA from otters that were alive before hunting started.

Suggest **one** source of this DNA.

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(1)

- (d) What can you conclude about the effect of hunting on genetic diversity in otters? Use data from the figure above to support your answer.

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(2)

- (e) Some populations of animals that have never been hunted show very low levels of genetic diversity.

Other than hunting, suggest **two** reasons why populations might show very low levels of genetic diversity.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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(2)

(Total 7 marks)

