AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.2.1

Variation

Past-paper questions

Tier	**Higher**
Question groups	**10**
Available paper years	**2007–2022**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.2.1 Variation

Question 01

June 2007 | BLY1B | Original Q8 | Legacy

QUESTION EIGHT

The limbs of animals have changed during the course of evolution.

Diagram 1 shows the ancestral limb plan for the forelimbs of all vertebrates (animals with backbones).

Diagram 1

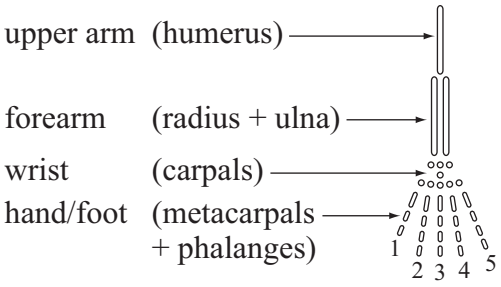
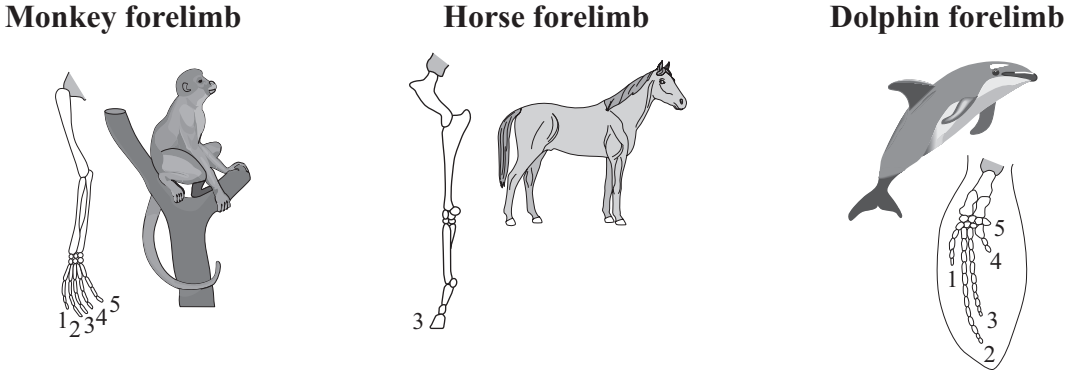


Diagram 2 shows the arrangement of the bones in the forelimbs of three mammals, a monkey, a horse and a dolphin.

Diagram 2



8A What does the pattern in the arrangement of the bones of the three mammals indicate about their evolutionary relationship?

1 They have adapted themselves to different forms of movement.

2 Mammals share a common ancestor with other vertebrates.

3 The bones remain in the same position in all vertebrates.

4 Evolution has caused the bones to change shape in different mammals.

4.6.2.1 Variation

Question 01 · continued

8B The bones of the front flippers of the dolphin are adapted for . . .

1 increasing surface area for exchange of gases.

2 supporting a large surface area of body tissue.

3 bearing the weight of the animal.

4 defending itself against predators.

8C The advantage to the horse of the evolution of its forelimbs is that . . .

1 its balance is improved.

2 the bones line up at the elbow joint.

3 the leg is longer so that the horse can run faster.

4 the carpals have become fused together.

8D Which process causes changes in the limb structure of animals?

1 competition

2 mutation

3 natural selection

4 variation

4.6.2.1 Variation

Question 02

June 2008 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

This question is about evolution.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A mutation

B natural selection

C extinction

D variation

Evolution occurs by . . . **1** . . . .

It is a very slow process.

Individual organisms of a particular species have differences in their genes, so may show a wide . . . **2** . . . .

These organisms breed and pass on their genes to the next generation, so passing on their useful characteristics.

More rapid change in a species may result from . . . **3** . . . .

A new disease might cause . . . **4** . . . of the species.

4.6.2.1 Variation

Question 03

November 2008 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about Darwin's and Lamarck's theories of evolution.

Match statements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A observed that all species change over time

B had sufficient evidence to prove evolution

C thought that natural selection operated on variations present at birth

D thought that the changes that happen during an organism's lifetime are inherited by their offspring

1	only Darwin
2	only Lamarck
3	Darwin and Lamarck
4	neither Darwin nor Lamarck

4.6.2.1 Variation

Question 04

March 2009 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

There are several theories for the way in which evolution may have happened.

9A Lamarck's theory of evolution was based on the idea that . . .

1 organisms pass on the advantages that they acquire during their lifetime.

2 organisms acquire genes from their parents which may give them advantages.

3 the characteristics that organisms have are controlled by God.

4 offspring have a mixture of their parents' features.

9B In the 1860s there was much opposition to Darwin's theory of evolution.

Which of the following was **not** a reason for this opposition?

1 The theory conflicted with deeply held religious views.

2 Darwin did **not** have sufficient evidence to support his ideas.

3 Darwin was unable to make his ideas known to other scientists.

4 Nobody knew how inheritance worked.

9C When a new island is formed by volcanic action, the environment continues to undergo rapid change for many years. At first there will be no living things present.

A plant seed may be blown to the island by the wind. When this seed begins to grow, the plant may reproduce asexually.

What is the disadvantage of asexual reproduction to the plant species in this case?

1 Only one individual is needed for reproduction.

2 All the offspring will be genetically identical.

3 New plants will be produced quickly.

4 Dense groups of this species will reduce competition from other species.

4.6.2.1 Variation

9D Darwin's theory of evolution through natural selection was based on a number of events.

These events are outlined below.

- **P** Those individuals which are most suited to the environment survive.
- **Q** There is an increase in variation between members of the species.
- **R** Genes that improve survival chances are passed on to the next generation.
- **S** Mutation results in new forms of genes.

Which is the correct sequence for these events?

1 **P → R → S → Q**

2 **Q → R → P → S**

3 **S → Q → P → R**

4 **R → S → Q → P**

END OF TEST

4.6.2.1 Variation

Question 05

June 2009 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

There are several theories of how new species of plants and animals have developed.

The statements below outline four of these theories.

- Creationism: Each organism is made independently. Evolution does not occur. Gaps in the fossil record support this idea.
- Intelligent Design: Living things work in too complex a way for them to have evolved by chance. A higher being has designed all living things.
- Lamarckism: Changes occur during the lifetime of an individual. These changes can be passed on to offspring.
- Darwinism: Variation exists between members of a population. Only the organisms best suited to a habitat survive. Survivors pass on their advantages to their offspring.

Use the above information and your own knowledge and understanding to answer this question.

Match the theories, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A Creationism

B Intelligent Design

C Lamarckism

D Darwinism

The idea that Manx cats, which have no tails, are the offspring of a cat which originally lost its tail in an accident could be used to support . . . **1** . . . .

Unsuccessful competitors die and so do not reproduce, is part of the theory of . . . **2** . . . .

The complicated way in which cells work can be used to support . . . **3** . . . .

The observation that fossils of all the different kinds of animals appear suddenly in the rocks, with no evidence of ancestors, supports . . . **4** . . . .

4.6.2.1 Variation

Question 06

June 2011 | BLY1BP | Original Q1 | Legacy

QUESTION ONE

The modern theory of evolution is based mainly on Charles Darwin's work.

Match words, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the sentences.

A extinction

B mutation

C reproduction

D variation

The range of characteristics we can see in a species is known as . . . **1** . . . .

This range of characteristics has been brought about by . . . **2** . . . .

Characteristics that give advantages are passed on during . . . **3** . . . .

Characteristics that are disadvantages may result in . . . **4** . . . .

4.6.2.1 Variation

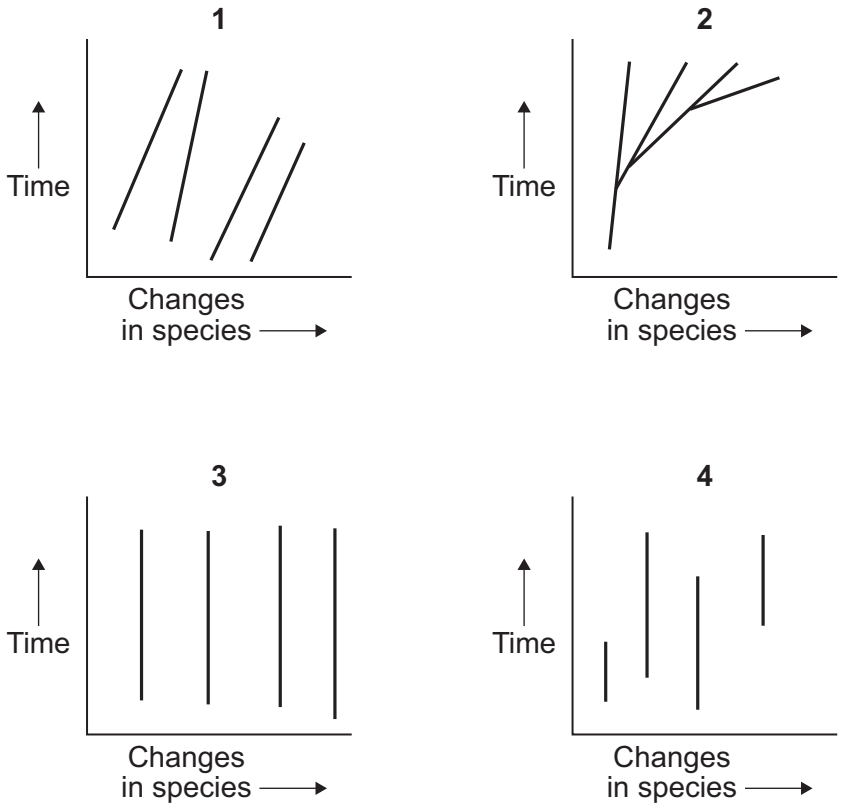
Question 07

June 2011 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

Evolution takes place when species change over time.

In each of the diagrams below, the four lines show the changes in four different species.



Match statements, **A**, **B**, **C** and **D**, with diagrams **1**–**4**.

A each of the four species changes slowly over time

B none of the four species changes over time and some species die out

C none of the four species changes over time

D new species evolve over time

4.6.2.1 Variation

Question 08

June 2011 | BLY1BP | Original Q9 | Legacy

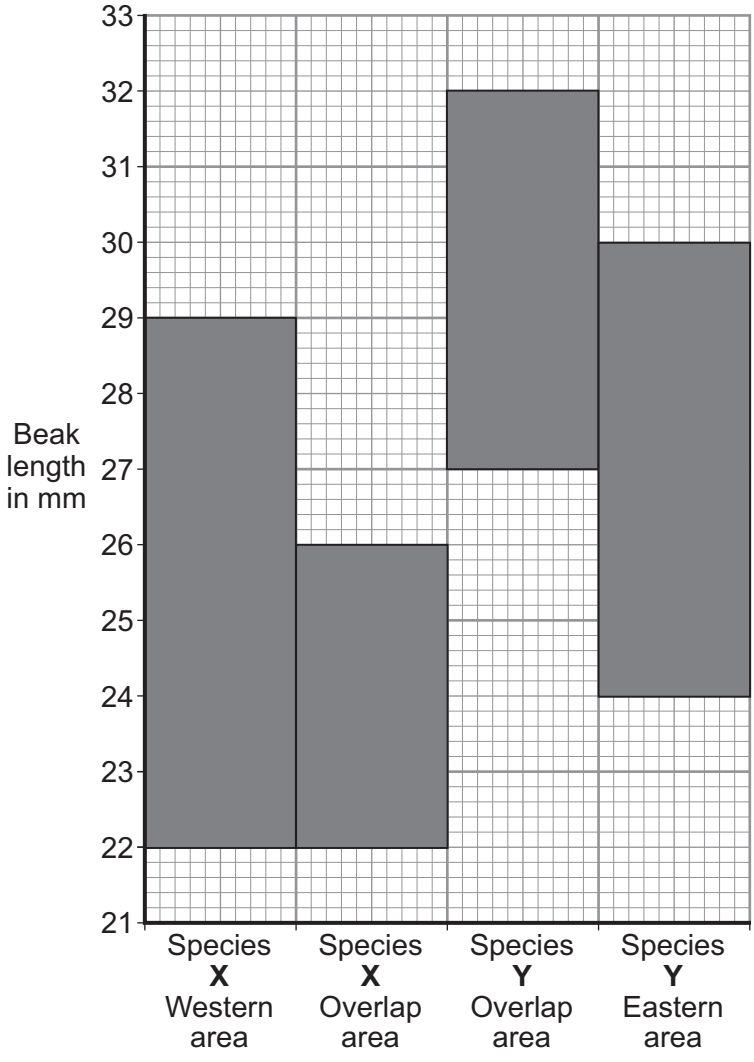
QUESTION NINE

Two species of nuthatch (small birds living on the ground) live in areas across central Asia. One species lives mainly in the west and the other species lives mainly in the east.

Some of each species live in the middle of the area. This region is called the overlap area. Both species feed on similar sized insects on the ground.

Scientists measured the beak lengths of all the birds of both species in the three areas.

The results in the graph show the ranges of beak lengths.



9A What is the range of beak length for species **Y**?

1 22 to 26 mm

2 22 to 29 mm

3 24 to 32 mm

4 27 to 32 mm

4.6.2.1 Variation

Question 08 · continued

9B Compared with the mean beak size in the non-overlap areas, . . .

1 the mean beak length of species **X** increases in the overlap area.

2 the mean beak length of species **Y** increases in the overlap area.

3 the mean beak length of both species increases in the overlap area.

4 the mean beak length of both species decreases in the overlap area.

9C The range of beak sizes for both species is different in the overlap area.

The most likely cause of this difference is . . .

1 increased competition for food.

2 competition for mates.

3 a different climate.

4 competition for places to build nests.

9D The change in beak length of species **X** and species **Y** has been caused by changes . . .

1 in the genetic material of the birds.

2 in the insect populations.

3 in the climate of the overlap area.

4 in the predators of the birds.

END OF TEST

4.6.2.1 Variation

Question 09

0 9 The Galapagos Islands are located in the Pacific Ocean.

Several species of birds called finches live on the Galapagos Islands.

These finches are very similar to each other.

Figure 15 shows two modern species of Galapagos finch and their classification.

Figure 15

Medium ground finch



Small ground finch



Classification group	Medium ground finch	Small ground finch
Kingdom	*Animalia*	*Animalia*
	Chordata	*Chordata*
Class	*Aves*	*Aves*
	Passeriformes	*Passeriformes*
	Thraupidae	*Thraupidae*
Genus	*Geospiza*	*Geospiza*
	fortis	*fuliginosa*

4.6.2.1 Variation

Question 09 · continued

0 9 . 1 Complete **Figure 15** to give the names of the missing classification groups.

[2 marks]

0 9 . 2 Give the binomial name of the medium ground finch.

Use information from **Figure 15**.

[1 mark]

Question 9 continues on the next page

In each species of finch, there is a variation in beak depth.

Figure 16 shows how beak depth is measured.

Figure 16

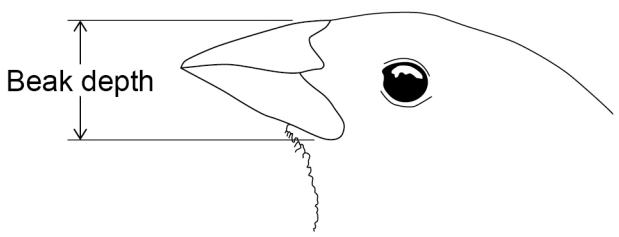
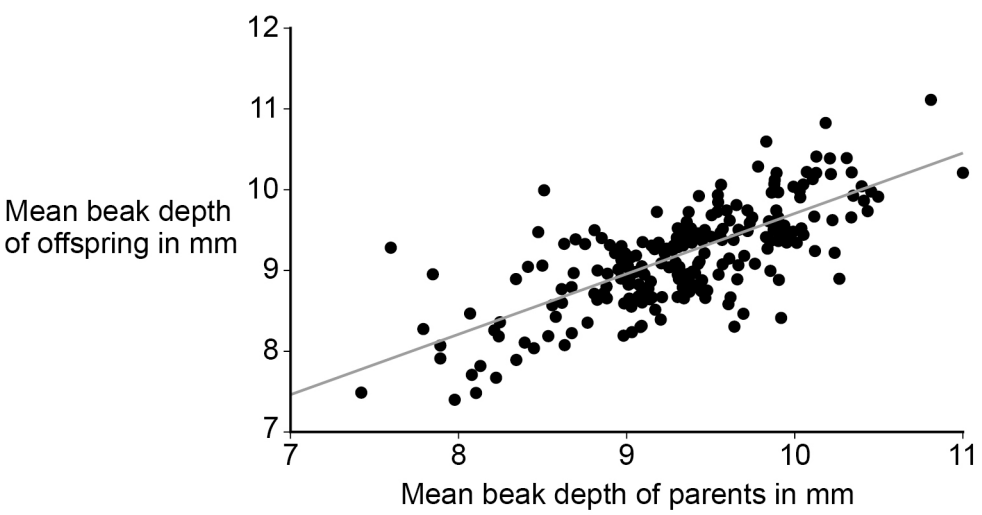


Figure 17 shows the relationship between the beak depth of parent birds and the beak depth of their offspring.

Figure 17



0 9 . 3 Give evidence from **Figure 17** that beak depth is an inherited characteristic.

[1 mark]

4.6.2.1 Variation

Question 09 · continued

0 9 . 4 Scientists suggested that more than one gene controls beak depth.

Give evidence from **Figure 17** to support the scientists' suggestion.

[1 mark]

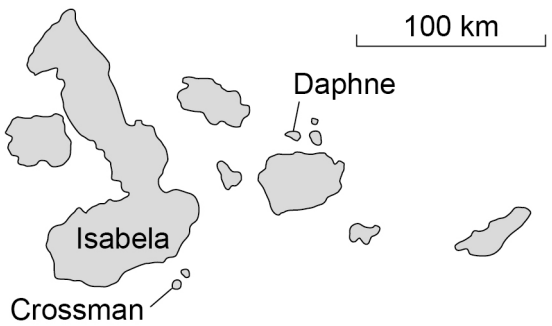
Question 9 continues on the next page

4.6.2.1 Variation

Question 09 · continued

Figure 18 is a map of the Galapagos Islands.

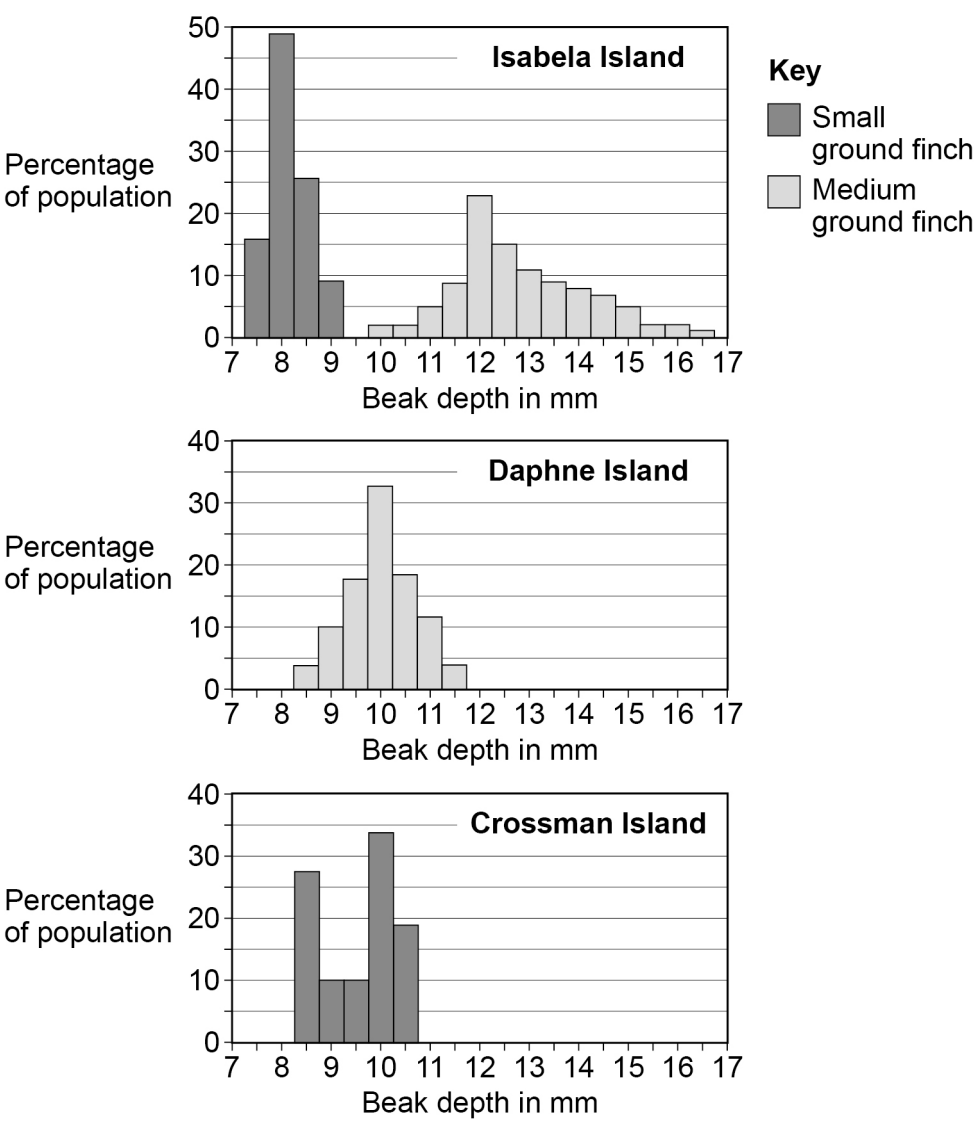
Figure 18



On Isabela Island, the medium ground finch **and** the small ground finch are found.
On Daphne Island, only the medium ground finch is found.
On Crossman Island, only the small ground finch is found.

Figure 19 shows how the beak depth of each species varies on each island.

Figure 19



4.6.2.1 Variation

Question 09 · continued

The medium ground finch and the small ground finch both feed on seeds.

The size of seeds eaten by each bird depends on the depth of the bird's beak.

0 9 . 5 The range of beak depth of **medium ground finches** on Isabela Island is different from the range on Daphne Island.

Explain what might have caused this difference.

[6 marks]

Question 9 continues on the next page

4.6.2.1 Variation

Question 09 · continued

0 9 . 6 **Figure 19** shows:

- the **two** species of finch live on Isabela Island
- only **one** of the species lives on Daphne Island
- only **one** of the species lives on Crossman Island.

Suggest why both species of finch are able to live on Isabela Island.

[2 marks]

13

4.6.2.1 Variation

Question 10

June 2022 | 8461/2H | Original Q8

0 8 An echidna is a mammal that lives in Australia.

Figure 10 shows an echidna.

Figure 10



Figure 11 shows how the body temperature of the echidna varies in warm weather and in cold weather.

Figure 11

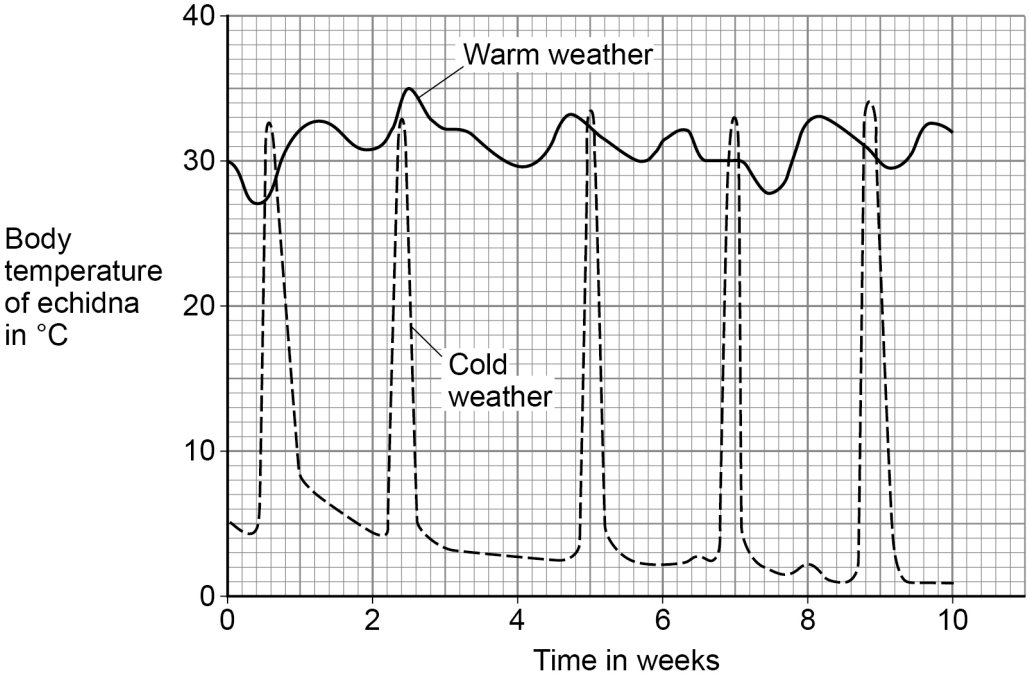
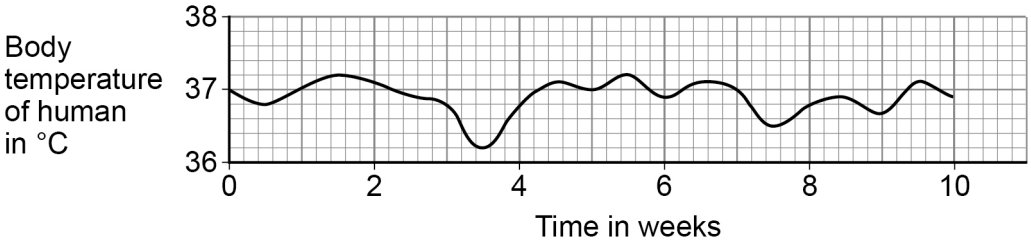


Figure 12 shows how human body temperature varies.

Figure 12



4.6.2.1 Variation

Question 10 · continued

0 8 . 1 Compare the variation in body temperature of the echidna in warm weather with the variation in body temperature of the human.

Use data from **Figure 11** and **Figure 12**.

[2 marks]

In the cold winter months, the echidna hibernates.

During hibernation:

- the echidna's body temperature decreases to below 5 °C
- the echidna sleeps for up to 17 days at a time
- the echidna's rate of metabolism slows down.

0 8 . 2 Explain why the decrease in body temperature is an advantage to the echidna during hibernation.

[2 marks]

Question 8 continues on the next page

4.6.2.1 Variation

Question 10 · continued

0 8 . 3 During hibernation the echidna wakes up several times.

Each time the echidna wakes up it becomes active and its body temperature increases to over 30 °C.

Explain why the echidna has a higher body temperature when it is active.

[2 marks]

0 8 . 4 An echidna can dilate and constrict blood vessels in its skin.

Explain how the **dilation** of blood vessels in the skin can help to decrease body temperature.

[3 marks]

4.6.2.1 Variation

Question 10 · continued

An athlete trained in a hot climate.

The athlete lost a large volume of water each day in sweat.

0 8 . 5 The athlete's energy intake each day from food was 20 000 kJ.

Evaporation of 1 cm^3 of sweat requires 2.5 kJ of energy.

40% of the athlete's daily energy intake was used to evaporate sweat.

Calculate the volume of sweat the athlete lost each day.

Give your answer in dm^3

1 dm^3 = 1 000 cm^3

[3 marks]

Volume of sweat lost in one day = _____ dm^3

0 8 . 6 Suggest why the athlete was advised to take salt tablets each day.

[1 mark]

13