Q1. Charles Darwin proposed the theory of natural selection.

Many people at the time did not accept his theory.

(a) There was a different theory at the same time as Darwin's theory.

The different theory said that changes in an organism during its life could be inherited.

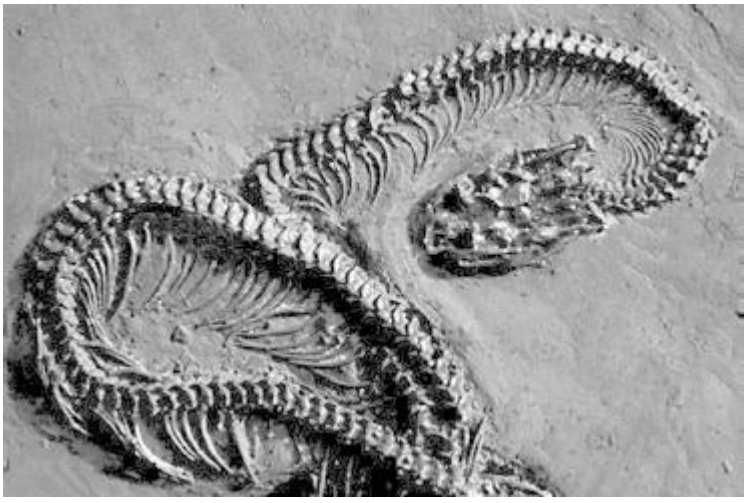
Who proposed this theory?

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(1)

(b) Studying fossils helps scientists understand how living things have evolved.

The diagram below shows a fossilised snake.



© Peter Menzel/Science Photo Library

Explain how the fossil in the diagram above may have formed.

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(3)

(c) There are many types of rat snake in the world.

The table below shows two types of rat snake.

	 © Kazzpix/iStock/Thinkstock	 © Talkir/iStock/Thinkstock
Type of snake	Japanese rat snake	Texas rat snake
Colour of snake	Green	Pale brown
Type of environment	Grass	Dry and dusty

The different types of rat snake have evolved from similar ancestors.

The rat snakes have evolved to to suit their environments.

Explain how the Japanese rat snake evolved to be different from the Texas rat snake.

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(4)

(d) Many species of snake have become extinct.

Give **one** reason why a species might become extinct.

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(1)
(Total 9 marks)

Q2.(a) Which of the following is the **best** definition of a species?

Tick (✓) **one** box.

Organisms with many features in common	☐
Organisms that live in the same habitat and eat the same food	☐
Organisms that reproduce together to form fertile offspring	☐

(1)

(b) **Figure 1** is a photograph of the Grand Canyon.

The layers of rock contain fossils.

Figure 1



© Sumikophoto/iStock/Thinkstock

Scientists found five fossils of different species of animal, **P**, **Q**, **R**, **S** and **T**, at the positions shown in **Figure 1.**

(i) What is the evidence in **Figure 1** that animals **P** and **Q** were alive at the same time?

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(1)

(ii) Was animal **R** alive at an earlier time or at a later time than animals **P** and **Q**?

Give the reason for your answer.

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(1)

(iii) Which **two** of the following would be evidence that animal **T** may have evolved from animal **S**?

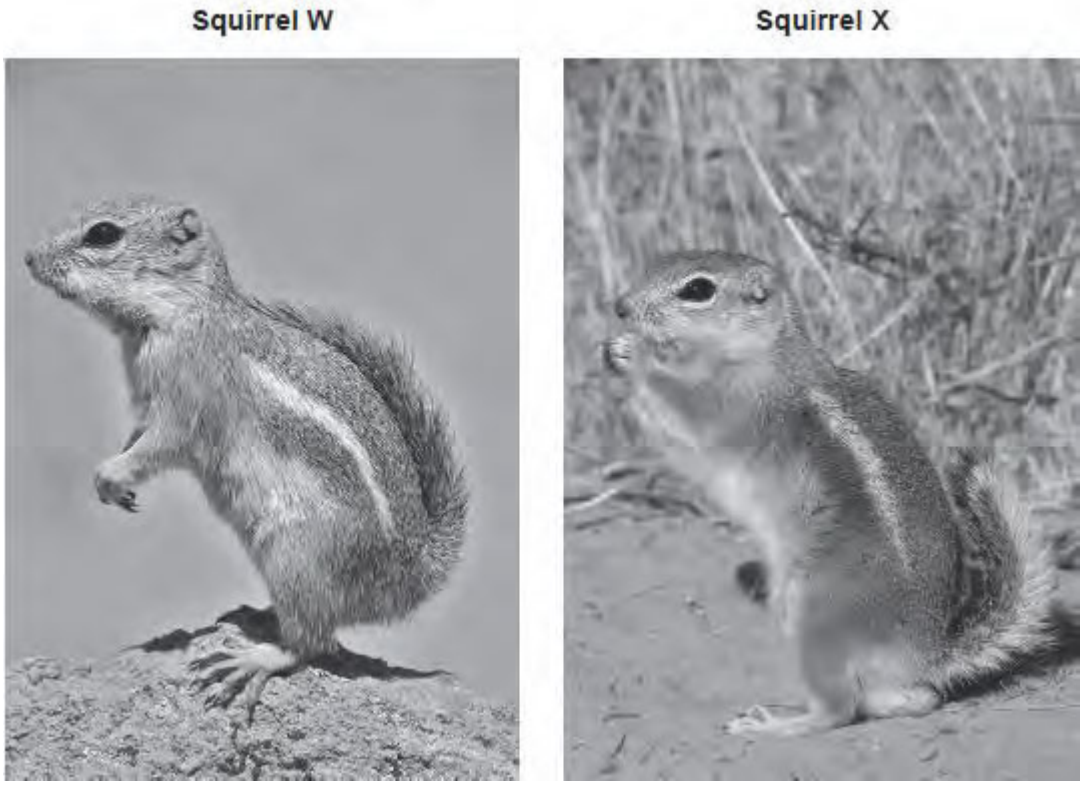
Tick (✓) **two** boxes.

The fossils of animals **S** and **T** have many features in common, but **T** is more complex than **S**.	☐
The fossils of animals **S** and **T** are the same size.	☐
The fossils of animals **S** and **T** have the same skin colour.	☐
The fossil of animal **S** was found in a deeper layer of rock than the fossil of animal **T**.	☐
The fossil of animal **T** is more similar to the fossil of animal **R** than to the fossil of animal **S**.	☐

(2)

(c) **Figure 2** shows two species of ground squirrel, **W** and **X**.

Figure 2



Squirrel **W** lives on the high ground to the south of the Grand Canyon.

Squirrel **X** lives on the high ground to the north of the Grand Canyon.

The land to the north of the Grand Canyon is about 300 metres higher than the land on the south side. The north side also has lower winter temperatures and has more rain and snow than the south side.

(i) The two species of squirrel are very similar.

Describe **one** way, which you can see in **Figure 2**, in which squirrel **X** is different from squirrel **W**.

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(1)

(ii) The Grand Canyon was formed about 6 million years ago.

Explain how the two different species of squirrel could have developed from a common ancestor.

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(6)

(iii) Squirrels **W** and **X** are separate species, but they are still very similar.

Suggest why the two species have **not** become more different over time.

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(2)

(Total 14 marks)

Q3. Antibiotics can be used to protect our bodies from pathogens.

(a) What is a pathogen?

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(1)

(b) Bacteria may become resistant to antibiotics.

How can doctors reduce the number of bacteria that become resistant to antibiotics?

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(2)

(c) Scientists grow microorganisms in industrial conditions at a higher temperature than is used in school laboratories.

(i) Which temperature would be most suitable for growing bacteria in industrial conditions?

Draw a ring around the correct answer.

25 °C **40 °C** **100 °C**

(1)

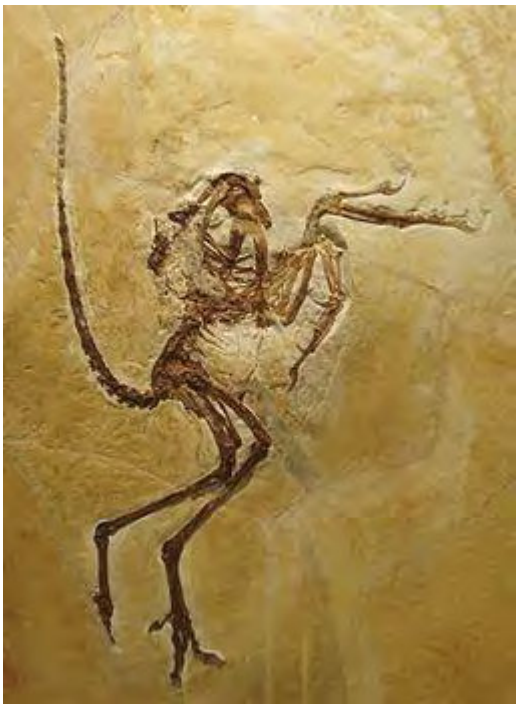
(ii) What is the advantage of using the temperature you gave in part (c)(i)?

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(1)
(Total 5 marks)

Q4. The photograph shows a fossil of a prehistoric bird called *Archaeopteryx*.



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(a) Describe **three** ways fossils can be made.

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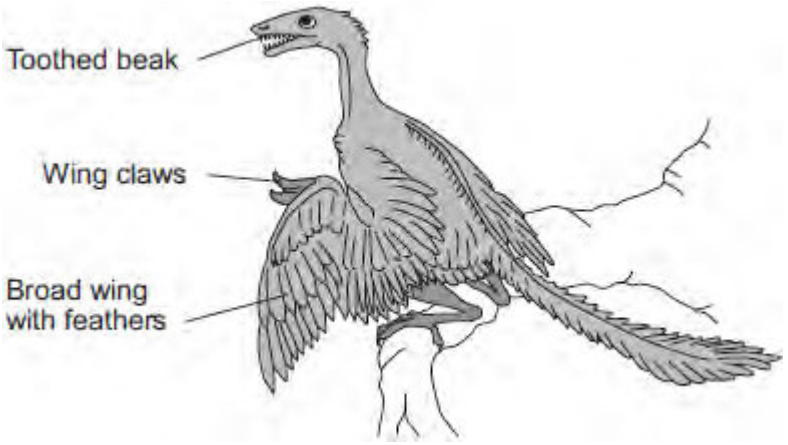
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(3)

(b) The drawing shows what an *Archaeopteryx* might have looked like when it was alive.

Scientists think that *Archaeopteryx* was a predator.



(i) Look at the drawing.

Write down **three** adaptations that might have helped *Archaeopteryx* to catch prey.

How would **each** adaptation have helped *Archaeopteryx* to catch prey?

Adaptation 1 .....

How it helps .....

.....

Adaptation 2 .....

How it helps .....

.....

Adaptation 3 .....

How it helps .....

.....

(3)

(ii) *Archaeopteryx* is now extinct.

Give **two** reasons why animals may become extinct.

1 .....

.....

2 .....

.....

(2)
(Total 8 marks)

Q5. Darwin's theory of evolution states that all species of living things have evolved from simple life forms.

Darwin's theory was published in 1859.

(a) Give **two** reasons why Darwin's theory was only slowly accepted.

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(2)

(b) Darwin observed birds called finches on the Galapagos Islands, 1000 km from the coast of South America.

He saw that the birds were similar to, but not the same as, birds he had seen on the mainland of South America.

Recent evidence suggests that 13 different species of finch on the islands evolved from 1 species of finch that arrived from the mainland about 1 million years ago.

Describe how a new finch species may have evolved from the original species of finch that arrived from the mainland.

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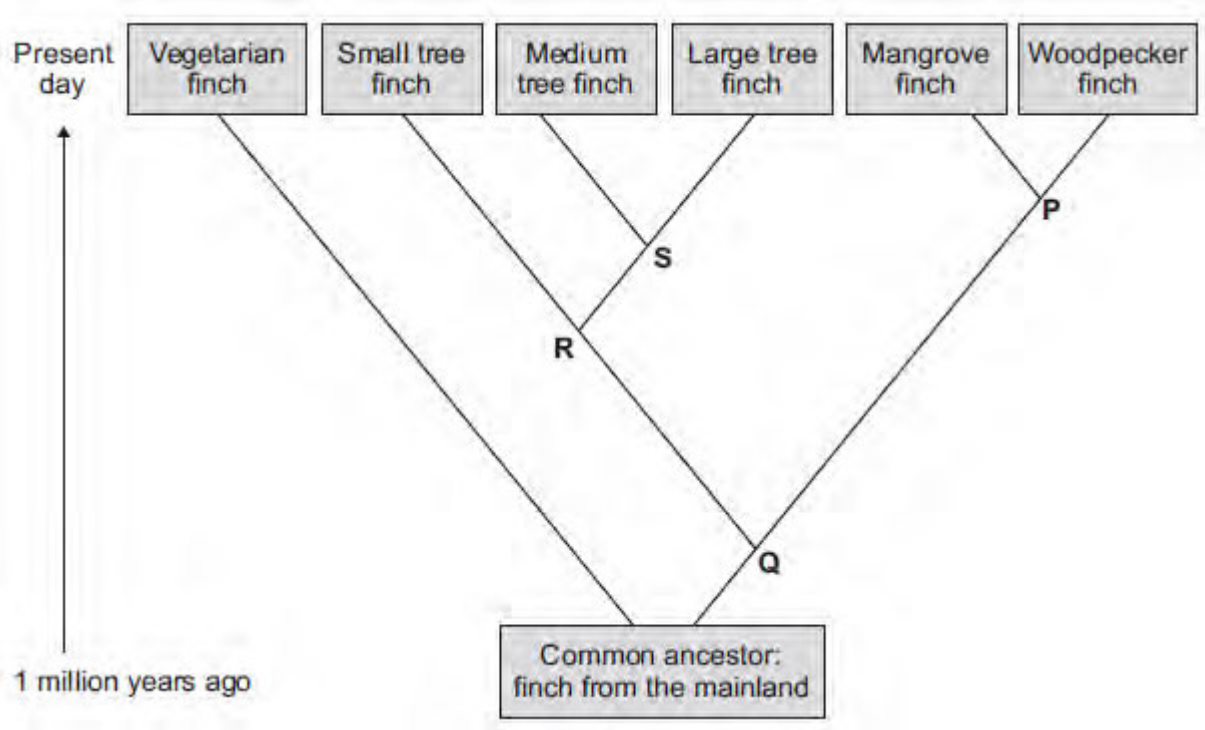
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(4)

(c) The diagram below shows the evolutionary tree for some Galapagos finches.



(i) Which type of present-day finch is **least** closely related to all the others?

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(1)

(ii) Which branching point, **P, Q, R** or **S**, on the diagram above shows the most recent common ancestor of all the **tree finches**?

Write the correct answer in the box. ☐

(1)

(iii) Which **two** finches have the most recent common ancestor?

1 .....

2 .....

(1)

(Total 9 marks)

Q6. The MMR vaccine is used to protect against measles.

(a) Apart from measles, which **two** other diseases does the MMR vaccine protect against?

..... and .....

(1)

(b) Read the information.

Measles is a dangerous disease caused by a virus. Normally, MMR vaccinations are given at 1 year old and again at 4 years old. Each vaccination is 90% effective in protecting against the measles virus. In April 2013, there were 630 cases of measles in children aged 4 and over in a small area of the UK. Of these cases, 504 children had not been vaccinated against MMR at all and only a few had been given a second vaccination.

(i) Calculate the percentage of the children who caught measles in April 2013 who had **not** been vaccinated against MMR.

.....

.....

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Percentage = ...

(2)

(ii) Suggest **one** advantage to the population as a whole of children having the second MMR vaccination.

.....

(1)

(c) (i) What does a vaccine contain?

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(1)

(ii) Explain how a vaccination prevents infection.

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(3)

(d) (i) Antibiotics can only be used to treat some infections.

Explain why antibiotics **cannot** be used to treat measles.

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(2)

(ii) Why do antibiotics become less useful at treating an infection if the antibiotic is

overused?

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(1)
(Total 11 marks)