Questions are for both separate science and combined science students unless indicated in the question

Q1.

The theory of evolution states that organisms alive today evolved by natural selection from other species that are now extinct.

(a) Which **two** scientists proposed the theory of evolution by natural selection?

Tick (✓) **two** boxes. **(separate only)**

Alexander Fleming	☐
Alfred Russel Wallace	☐
Carl Linnaeus	☐
Carl Woese	☐
Charles Darwin	☐

(2)

Fossils provide evidence for evolution.

The figure below shows a fossil footprint of a dinosaur.

(b) What is a fossil?

_____

_____

_____

_____

(2)

(c) How was the fossil in the figure above formed?

Tick (✓) **one** box.

Body parts were replaced by minerals.	☐
The animal walked on mud.	☐
The animal was frozen in ice.	☐

(1)

(d) Dinosaurs are extinct.

Give **two** causes of extinction.

1 _____

_____

2 _____

_____

(2)

(e) Which **two** of the following provide evidence for evolution?

Tick (✓) **two** boxes.

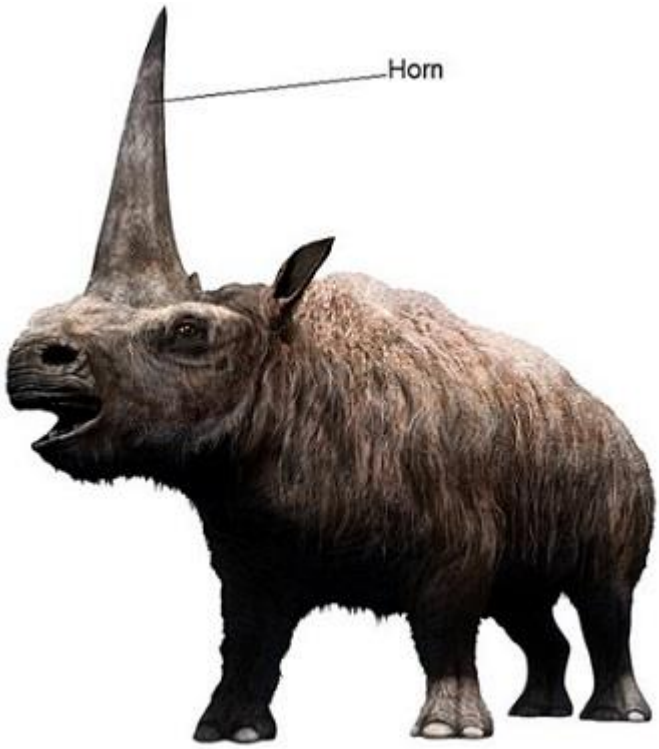
Bacteria can become resistant to an antibiotic.	☐
Early forms of life lived in the ocean.	☐
Older fossils are simpler than more recent ones.	☐
Older layers of rock are closer to the surface.	☐

(2)

(Total 9 marks)

Q2.

The image below shows what the extinct Siberian rhinoceros (*Elasmotherium sibiricum*) might have looked like.



(a) What is the genus of the Siberian rhinoceros?

Tick (✓) **one** box.

Elasmotherium ☐

Elasmotherium sibiricum ☐

sibiricum ☐

(1)

The 'three-domain system' of classification places all living organisms in one of three domains.

(b) Which domain was the Siberian rhinoceros in?

Tick (✓) **one** box.

Archaea ☐

Eukaryota ☐

Prokaryota ☐

(1)

(c) Who developed the 'three-domain system' of classification?

Tick (✓) **one** box.

Carl Woese ☐

Charles Darwin ☐

Gregor Mendel ☐

(1)

(d) The horn of the Siberian rhinoceros is estimated to have been 150 cm long.

Suggest **one** advantage of this adaptation to the Siberian rhinoceros.

_____

_____

(1)

(e) The only parts of the Siberian rhinoceros that have been found are fossilised bones.

Give **one** reason why **only** the bones of the body of the Siberian rhinoceros became fossils.

_____

_____

(1)

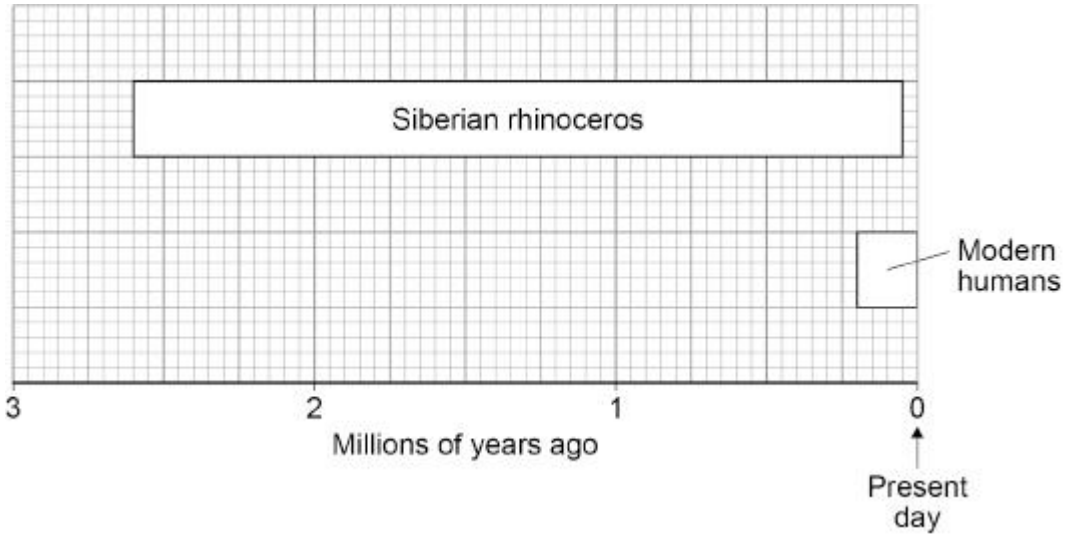
(f) Suggest how scientists can estimate when the Siberian rhinoceros was alive.

_____

_____

(1)

The below diagram shows when the Siberian rhinoceros existed and when modern humans existed.



(g) How many million years ago did the Siberian rhinoceros become extinct?

_____ million years ago

(1)

(h) Determine the time in years when both the Siberian rhinoceros and modern humans existed together.

Use the diagram above and your answer to Question (g).

_____

_____

_____

_____

Time = _____ years

(3)

(i) Suggest **two** factors that may have caused the extinction of the Siberian rhinoceros.

1 _____

_____

2 _____

_____

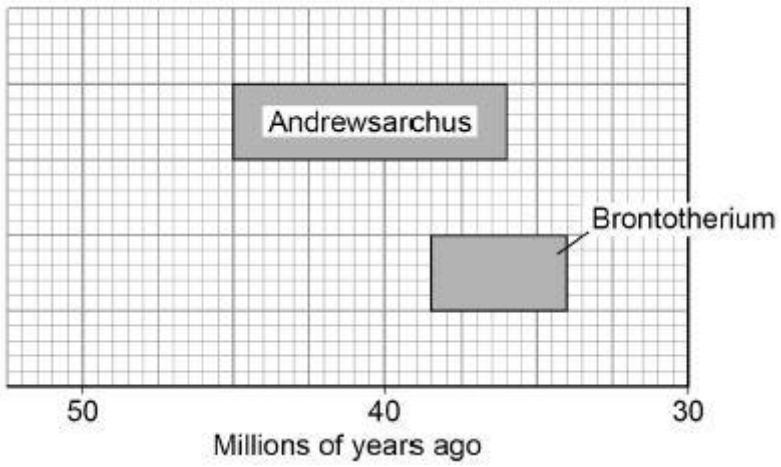
(2)

(Total 12 marks)

Q3.

Figure 1 shows when two mammals existed in Asia.

Figure 1



(a) Determine the number of years both Andrewsarchus and Brontotherium existed together.

_____

_____

_____

Time = _____ years

(2)

(b) The oldest fossils of human ancestors found in this area are 700 000 years old.

Andrewsarchus was a carnivore and Brontotherium was a herbivore.

Suggest how the extinction of Andrewsarchus could have resulted in the extinction of Brontotherium.

_____

_____

_____

_____

_____

_____

_____

(3)

(c) Information about extinct animals is often **not** clear because the fossil record is incomplete.

Give **three** reasons why the fossil record is **not** clear for older species.

1 _____

_____

2 _____

_____

3 _____

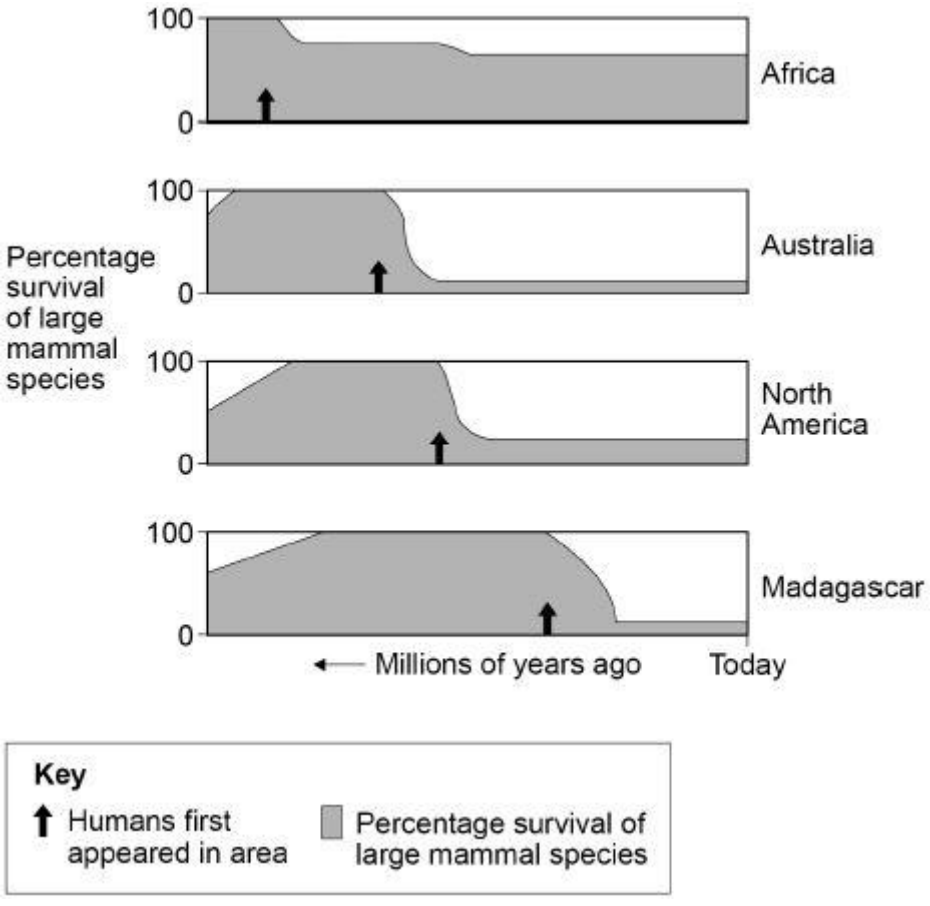
_____

(3)

Figure 2 shows the percentage (%) survival of large mammal species in four areas of the world.

The time at which humans first appeared in each of the four areas is also shown.

Figure 2



A mass extinction is a rapid decrease in biodiversity on Earth.

(d) A student stated:

'The data in **Figure 2** shows that humans caused mass extinctions.'

Evaluate the student's statement.

(6)

(e) Give **one** disadvantage and **one** advantage of mass extinction events.

Answer in terms of evolution.

Disadvantage

Advantage

(2)

(Total 16 marks)

Q4.

Figure 1 shows a flightless bird called the dodo (*Raphus cucullatus*).

Figure 1

The dodo:

- was 1 m tall
- had a mass of 20 kg
- lived in rainforests on a tropical island
- ate fruits
- made its nest on the ground.

A female dodo laid only one egg each year.

Humans arrived on the island in the year 1507. By 1681 the dodo was extinct.

(a) What is the genus of the dodo?

Tick (✓) **one** box.

Animal ☐

Bird ☐

Raphus ☐

(1)

(b) Before the arrival of humans, there were no other large animals living on the island.

Suggest **two** reasons why the dodo became extinct soon after the arrival of humans.

1 _____

_____

2 _____

_____

(2)

Today, humans are cutting down large areas of tropical rainforests.

(c) Suggest **one** use of the land after the trees have been removed.

_____

_____

(1)

(d) Why does the removal of trees cause an increase in carbon dioxide in the atmosphere?

Tick (✓) **two** boxes.

There are fewer animals. ☐

There is less photosynthesis. ☐

There is less respiration. ☐

The soil dries out. ☐

The trees are burned. ☐

(2)

(e) What effect would an increase in carbon dioxide in the atmosphere have on global air temperature?

Tick (✓) **one** box.

Decrease ☐

Increase ☐

Stay the same ☐

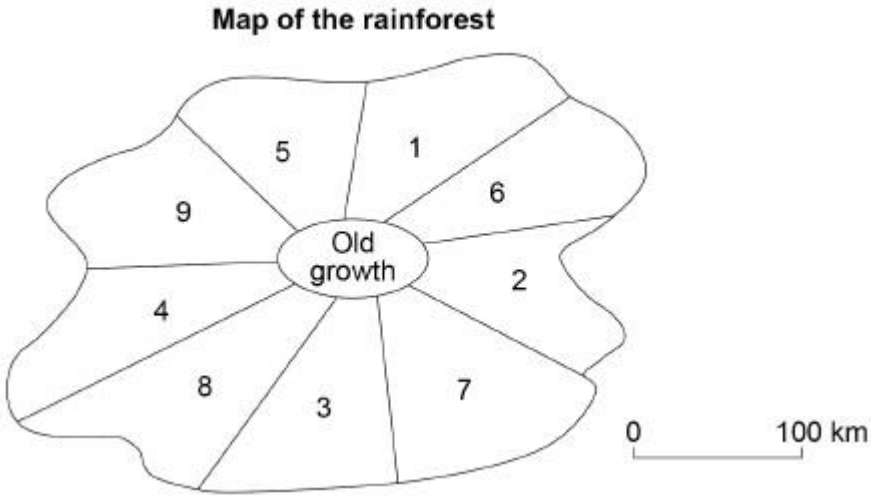
(1)

'Sustainable forestry' reduces the harmful effects of cutting down trees on the environment.

Figure 2 shows a method of 'sustainable forestry'.

Numbers 1–9 show different parts of a rainforest.

Figure 2



The trees are cut down in the sequence 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9

- The trees are cut down in only one area at any one time.
- It takes 30 years to cut down the trees in each area.
- The trees in the 'Old growth' area are never cut down.

(f) How many years would it take to cut down the trees in all of the numbered areas in **Figure 2**?

_____

_____

_____

Number of years = _____

(2)

(g) The rainforest contains:

- 750 species of trees
- 400 species of birds

- 150 species of butterflies
- many other species of plants and animals.

Explain how the pattern of cutting down trees shown in **Figure 2** stops the biodiversity of the rainforest being reduced.

(4)

(Total 13 marks)

Q5.

Fossils give evidence about organisms that lived a long time ago.

(a) Scientists have found very few fossils of the earliest life forms.

Give **one** reason why.

(1)

Below is a photograph of a fossilised fish.

(b) Suggest how the fossil in the photograph above was formed.

_____

_____

_____

_____

(2)

(c) The species of fish shown in the photograph above is now extinct.

Give **two** possible causes of extinction.

1.

_____

_____

2.

_____

_____

(2)

Modern fish species have evolved from fish that lived a long time ago.

Evolution is caused by mutation and natural selection.

(d) What is a mutation?

Tick **one** box.

A change in a gene ☐

Accidental damage to an organism ☐

An organism with a new characteristic ☐

The loss of a species ☐

(1)

(e) Describe the process of natural selection.

_____

_____

_____

_____

_____

_____

(3)

(Total 9 marks)

Q6.

Fossils provide evidence about organisms that lived a long time ago.

(a) Give **one** way a fossil may be formed.

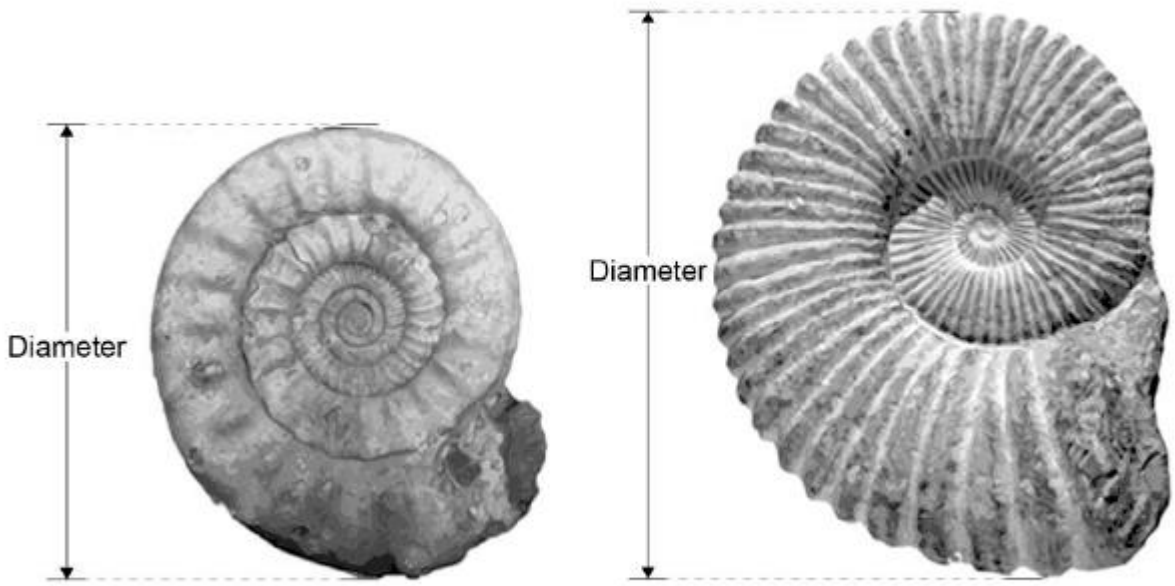
_____

_____

(1)

Figure 1 shows the fossils of two species of ammonite.

Figure 1



Ammonite **P** (scale: x 1) Ammonite **Q** (scale: x ½)

(b) Use a ruler to measure the diameter of **P** and the diameter of **Q** in millimetres.

Diameter of **P** = _____ mm

Diameter of **Q** = _____ mm

(1)

(c) Calculate the diameter of the real fossil of ammonite **Q**.

Use your answer to part (b) and the scale factor given in **Figure 1**.

_____

_____

Diameter of the real fossil of ammonite **Q** = _____ mm

(1)

(d) How many times larger is ammonite **Q** compared to ammonite **P**?

Tick **one** box.

0.4 ☐ 0.8 ☐ 1.25 ☐ 2.5 ☐

(1)

(e) Describe **two** ways the fossil of ammonite **Q** is different from the fossil of

ammonite **P**.

Do **not** give answers referring to size.

1.

_____

_____

2.

_____

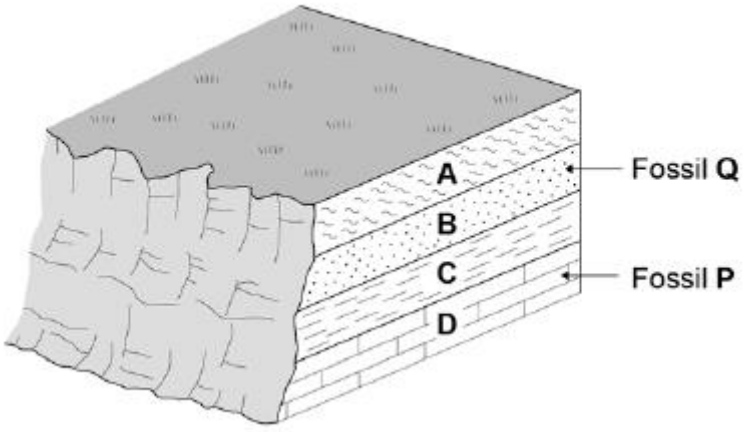
_____

(2)

(f) **Figure 2** shows:

- four layers of rock, **A**, **B**, **C** and **D**
- where the fossils of ammonites **P** and **Q** were found.

Figure 2



Which statement is evidence that ammonite **Q** may have evolved from ammonite **P**?

Tick **one** box.

P and **Q** are both found in limestone. ☐

Q was found in newer rocks than **P**. ☐

P is a darker colour than **Q**. ☐

Q has a smaller mass than **P**. ☐

(1)

(g) Suggest how long ago ammonites **P** and **Q** were alive.

Tick **one** box.

100 years ☐

1000 years ☐

100 million years ☐

100 billion years ☐

(1)

(h) Ammonites are now extinct.

Suggest **three** possible causes of extinction.

1.

_____

_____

2.

_____

_____

3.

_____

_____

(3)

(i) Give **one** reason why scientists cannot be sure about what caused the ammonites to become extinct.

_____

_____

(1)

(Total 12 marks)

Q7.

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.

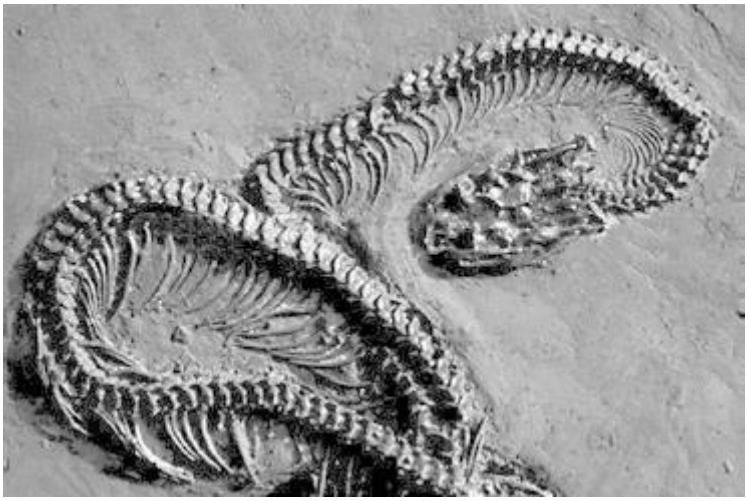
Who proposed this theory? **(separate only)**

_____

(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.

_____

_____

_____

_____

_____

_____

(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. **(separate only)**

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(d) Many species of snake have become extinct.

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

_____

_____

(1)

(Total 9 marks)

Q8.

Darwin's theory of natural selection states that all living things have evolved from simple life forms.

(a) Use the correct answer from the box to complete the sentence. **(separate only)**

three billion	three million	three thousand

Darwin's theory states that life began on Earth _____ years ago.

(1)

(b) Life evolved due to changes in genes. Changes in genes cause variation.

Complete the sentences.

Changes in genes are called _____ .

Individuals with characteristics most suited to the environment are more likely

to survive and _____ .

(2)

(Total 3 marks)

Q9.

Over millions of years:

- new groups of organisms have evolved
- other groups of organisms have become extinct.

(a) If an asteroid collided with the Earth, large amounts of dust and water vapour would be thrown up into the air. This would mean less light and heat would reach the Earth's surface from the Sun.

(i) A reduced amount of light and heat could have caused the extinction of plants.

Suggest how.

_____

_____

(1)

(ii) How could the extinction of plants have caused the extinction of some animals?

_____

_____

(1)

(iii) Give **two** reasons, other than collision with an asteroid, why groups of animals may become extinct.

1.

_____

_____

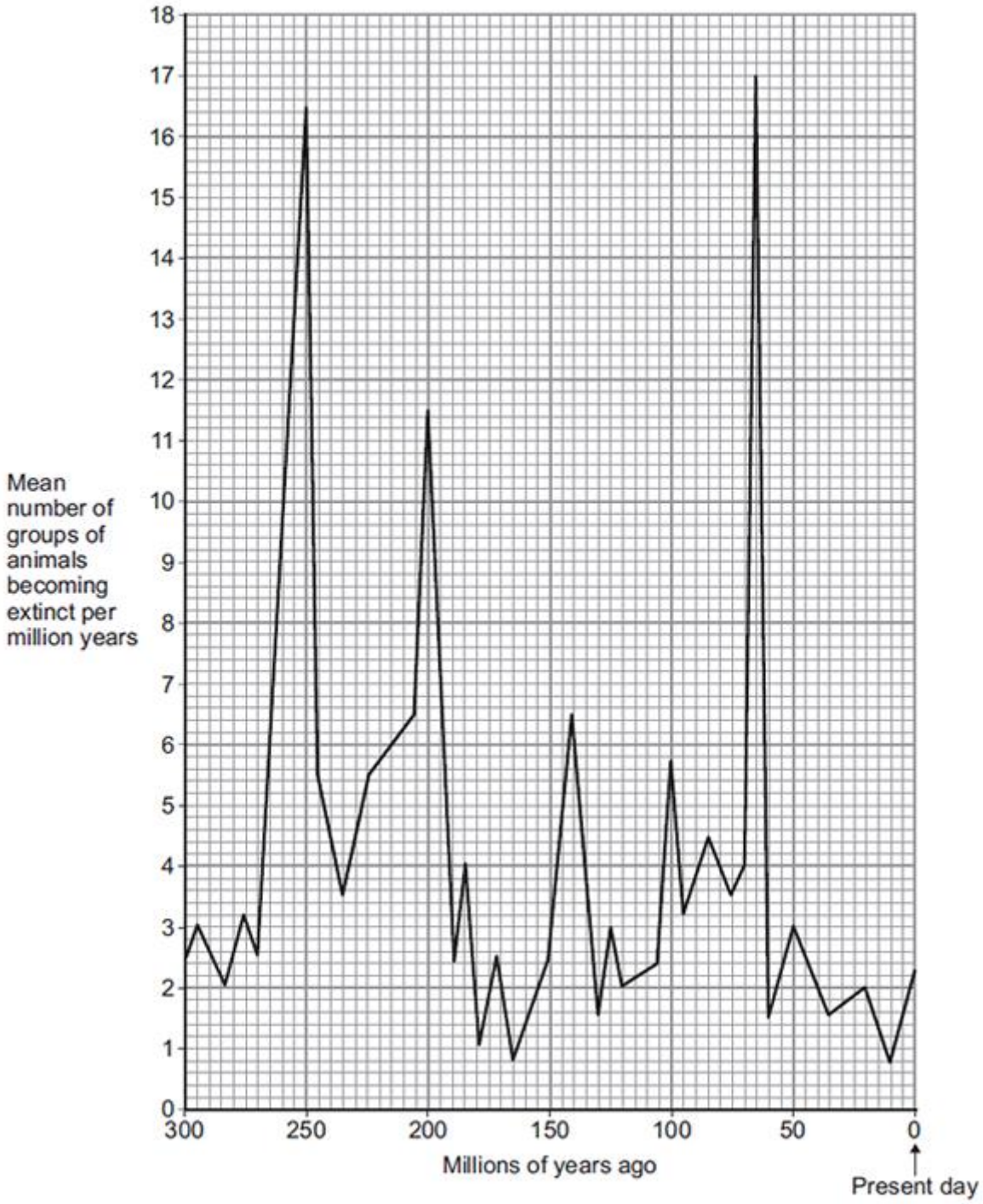
2.

_____

_____

(2)

(b) The graph shows how the rate of extinction of groups of animals has varied over the past 300 million years.



(i) If more than 10 groups of animals become extinct in a 1 million year period, scientists call this a 'mass extinction'.

How many mass extinctions occurred over the past 300 million years?

_____

(1)

(ii) How do we know what types of animals lived hundreds of millions of years ago?

_____

_____

(1)

(c) Use information from the graph to answer part (i) and (ii).

(i) How many years ago did the most recent mass extinction of animals occur?

Tick (✓) **one** box.

50 million years ago ☐

65 million years ago ☐

250 million years ago ☐

(1)

(ii) What was the mean number of groups of animals becoming extinct per million years in the most recent mass extinction?

_____ groups per million years

(1)

(iii) Why are scientists not sure how many groups of animals became extinct in the most recent mass extinction?

_____

_____

(1)

(Total 9 marks)

Q10.

Figure 1 is a map showing a group of islands in the Pacific Ocean, near the coast of California, USA.

Figure 1

A species of fox, called the Island Fox, lives on each of the six islands shown in **Figure 1**.

Figure 2 shows an Island Fox.

Figure 2

© GaryKavanagh/iStock

The foxes on each island are slightly different from those on the other islands.

The Island Foxes are similar to another species of fox, called the Grey Fox.

The Grey Fox lives in mainland California.

(a) Suggest how scientists could prove that the six types of Island Fox belong to the same species.

_____

_____

_____

_____

(2)

(b) Scientists believe that ancestors of the modern Island Fox first colonised what is now Santa Cruz Island during the last Ice Age, approximately 16 000 years ago. At that time, lowered sea levels made the three northernmost islands into a single island and the distance between this island and the mainland was reduced to about 8 km.

(i) How could the Island Fox have developed into a completely different species from the mainland Grey Fox? **(separate only)**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(ii) Suggest why the Island Foxes have developed into different varieties of the same species instead of six different species.

_____

_____

_____

(1)

(Total 8 marks)