AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.3 THE DEVELOPMENT OF UNDERSTANDING OF GENETICS AND EVOLUTION (PACK 3)

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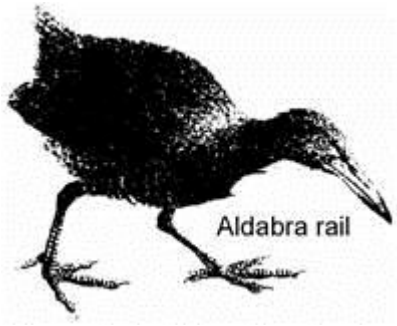
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Q1.

Flightless birds called Rails once inhabited 20 islands in the Pacific Ocean. During the last two centuries they have disappeared from 15 of these islands. The Aldabra Rail, shown below, is one of the few survivors. The island which it lives on is very remote.



Suggest **three** reasons why Rails have disappeared from 15 of the 20 islands they once inhabited.

1. _____

_____

2. _____

_____

3. _____

_____

(Total 3 marks)

Q2.

The picture shows the fossil remains of a bird.

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(a) Look carefully at the picture. Some parts of the bird were fossilised.

(i) What were these parts made of?

_____

(1)

(ii) Explain why these parts have been preserved.

_____

_____

_____

(2)

(iii) How can you tell that this fossil was a bird? (You might find information from page 20 of the Data Book helpful.)

_____

(1)

(b) This bird lived about 140 million years ago. This type of bird is now extinct.

(i) What does ‘extinct’ mean?

_____

(1)

(ii) Suggest **one** reason why this bird became extinct.

_____

_____

(1)

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(iii) Name **one** other example of an animal that became extinct many millions of years ago.

_____

(1)

(Total 7 marks)

Q3.

Read the extract.

Super-bug may hit the price of coffee

The coffee bean borer, a pest of the coffee crop, can be controlled by the pesticide endosulphan However, strains of the insect that are up to 100 times more resistant to the pesticide have emerged on the South Pacific island of New Caledonia.

For full resistance to be passed on to an offspring two copies of the new resistance allele should be inherited, one from each parent. There is much inbreeding with brother-sister matings happening in every generation, so it takes only a few generations before all the descendants of a single resistant female have inherited two copies of the resistance allele.

If this resistance spreads from New Caledonia, it will mean the loss of a major control method. This will present a serious threat to the international coffee industry.

(a) Suggest how the allele for resistance to endosulfan may have arisen.

_____

_____

(1)

(b) (i) How would you expect the proportion of normal coffee bean borers on New Caledonia to change over the next few years?

_____

(ii) Explain why this change will take place.

_____

_____

_____

_____

_____

_____

(3)

(c) Explain why “it takes only a few generations before all the descendants of a single resistant female have inherited two copies of the resistance allele.” (lines 6-8)

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(3)

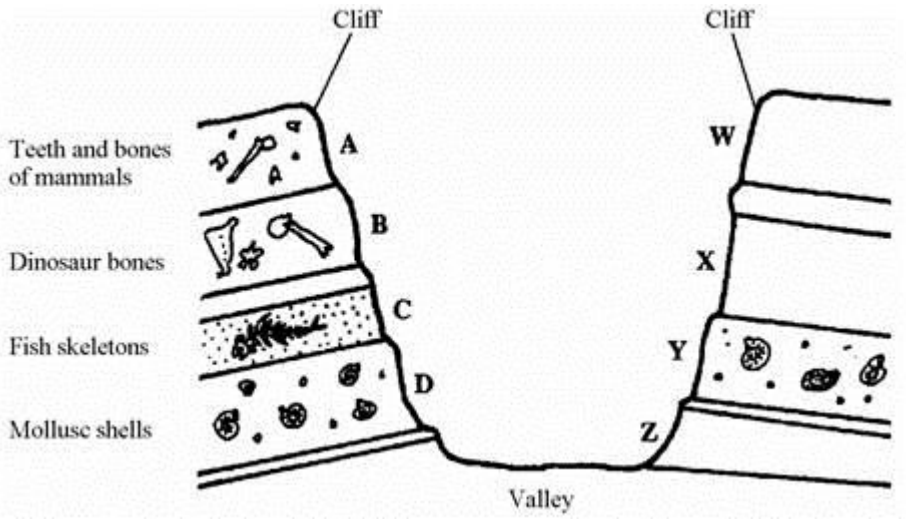
(Total 7 marks)

Q4.

The drawing shows some of the fossils found in the layers of rock in two cliffs.

The two cliffs are on opposite sides of a large valley.

Geologists think that the valley has been carved out by rivers, and that the order of rock layers has not changed.



(a) (i) Which of the rock layers, **A**, **B**, **C** or **D**, is the oldest? _____

(1)

(ii) Give the letters of **two** layers of rock on opposite sides of the valley that are the same age.

_____ and _____

(1)

(b) How do fossils provide evidence for the theory of evolution?

_____

_____

_____

_____

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(2)
(Total 4 marks)

Q5.

The drawings show two forms of the peppered moth.



Pale form Dark form

In an investigation, pale and dark moths were placed in different positions on trees in two woods. One wood was in an industrial area where the bark was blackened by pollution. The other wood was unpolluted, and the tree bark was covered in pale mosses and lichen. After three days, the surviving moths were counted. The results are shown in the table.

WOOD	POSITION OF MOTH ON TREE	PERCENTAGE OF MOTHS EATEN BY BIRDS	
		PALE	DARK
Polluted	On main trunk	58	40
	Underside of branch	50	28
Unpolluted	On main trunk	32	62
	Underside of branch	26	40

(a) What can you tell from these results about the survival of the two types of moth in polluted and unpolluted woods, and in different positions on the tree?

_____

_____

_____

_____

_____

_____

(3)

(b) Explain how the results provide evidence for **one** theory of evolution.

_____

_____

_____

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_____

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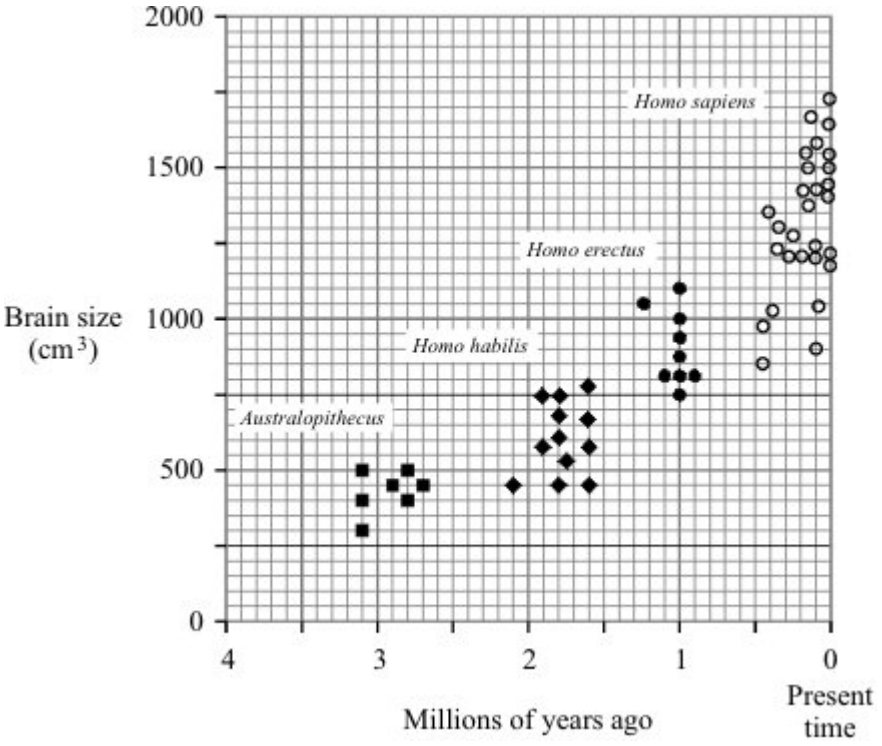
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(3)

(Total 6 marks)

Q6.

Modern humans belong to the species *Homo sapiens*. Many people think that modern humans evolved from more primitive species. Three of these primitive species were *Australopithecus*, *Homo habilis* and *Homo erectus*. These three species are now extinct. The graph shows the brain size of several specimens from each of the species.



(a) Estimate the mean brain size of *Homo habilis*.

_____ cm^3

(1)

(b) Suggest how we know about the brain size of *Australopithecus*.

_____

_____

_____

_____

(2)

(c) Suggest an explanation, in terms of natural selection, for the change in brain size during the evolution of *Homo sapiens*.

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_____

_____

_____

_____

_____

(3)

(Total 6 marks)

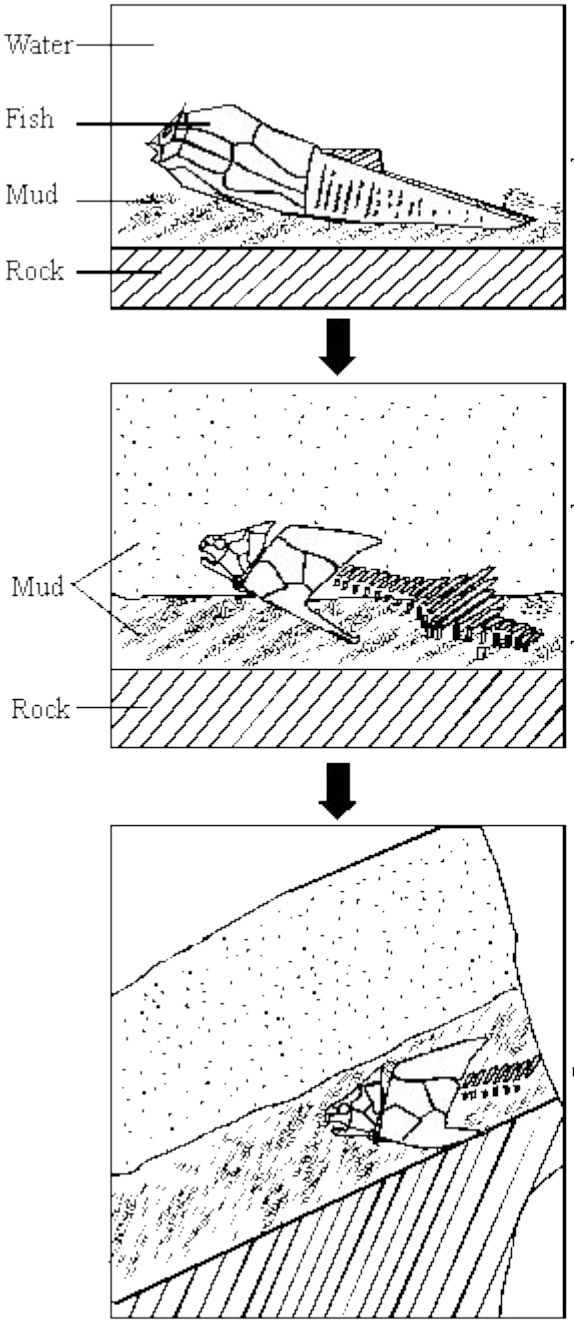
Q7.

Fossils give us evidence for the theory of evolution.

The diagrams show how a fish became a fossil.

(a) In the sentences below, cross out the two lines which are wrong in each box.

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(4)

(b) Give **one** way in which fossils provide evidence for the theory of evolution.

_____

_____

(1)

(Total 5 marks)

Q8.

Read the passage about antibiotics.

People do not always agree about the use of antibiotics in food production. If we put low doses of antibiotics in feed for animals such as cattle and

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sheep, it helps to produce high-quality, low-cost food. Antibiotics help to keep animals disease-free. They also help animals to grow. Animals get fatter quicker because they do not waste energy trying to overcome illness.

The use of antibiotics in livestock feed means that there is a higher risk of antibiotic-resistant bacteria developing. The rapid reproduction of bacteria means there is always a chance that a population of bacteria will develop which is antibiotic-resistant. These could be dangerous to human health.

(a) *To gain full marks for this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Explain how a population of antibiotic-resistant bacteria might develop from non-resistant bacteria.

_____

_____

_____

_____

_____

_____

(3)

(b) Do you think that farmers should be allowed to put low doses of antibiotics in animal feed? Explain the reasons for your answer.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q9.

A scientist called Lamarck proposed a theory of evolution. The passage gives Lamarck's explanation of the evolution of the long legs of wading birds.

Change occurs because an animal passes on to its offspring changes it acquires during its lifetime. The long legs of wading birds arose when those animals' ancestors responded to a need to feed on fish. In their attempt to get into deeper water, but still keep their bodies dry, they would stretch their legs to the full extent, making them slightly longer in the process. This trait would be passed on to the next generation, who would in turn stretch their legs. Over many generations, the wading birds' legs became much longer.

Darwin's theory of natural selection would give a different explanation for the

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evolution of the long legs of wading birds.

Describe the differences between Lamarck's and Darwin's explanations of the evolution of the long legs of wading birds.

_____

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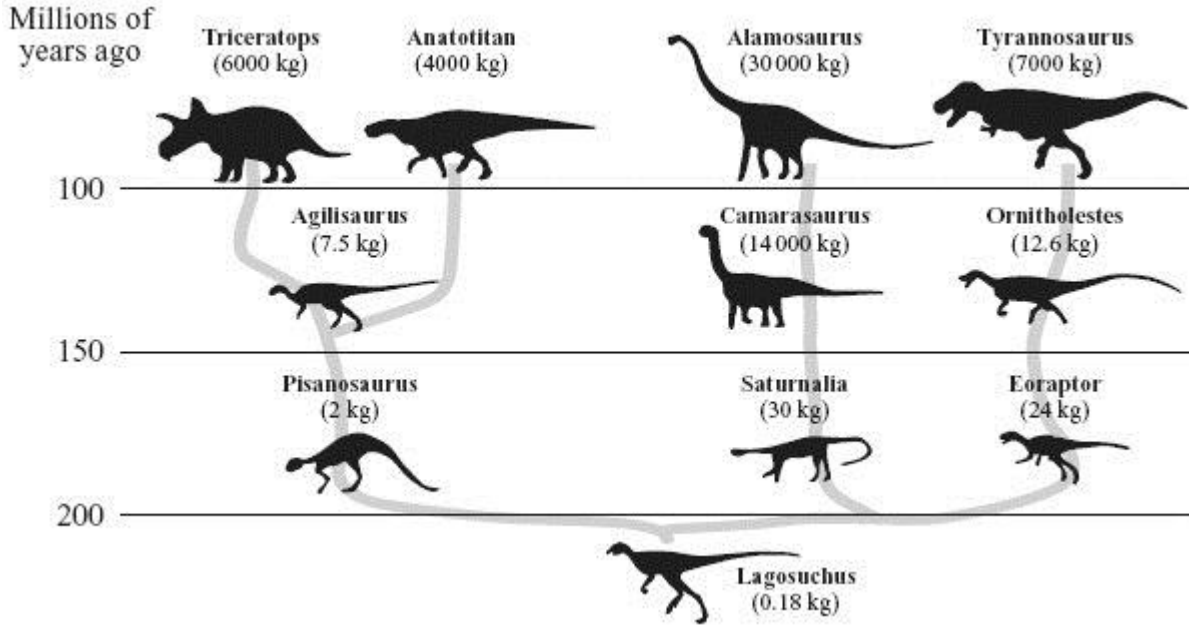
_____

(Total 4 marks)

Q10.

The diagram shows a timeline for the evolution of some dinosaurs.

The mass of each dinosaur is shown in the brackets by its name.



(a) Name **one** dinosaur which lived between 100 and 150 million years ago.

_____

(1)

(b) Which dinosaur did Ornitholestes evolve from?

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_____

(1)

(c) Apart from body size and mass, give **one other** difference between Lagosuchus and Alamosaurus.

_____

_____

(1)

(d) (i) Which dinosaur had the largest mass?

_____

(1)

(ii) What happened to the mass of dinosaurs during evolution?

_____

_____

(1)

(e) We know about dinosaurs from their fossils.

Describe **one** way in which fossils are formed

_____

_____

(1)

(f) Complete the sentence by using the correct words from the box.

billion	**complex**	**large**	**million**	**simple**	**thousand**

The theory of evolution states that all species of living things have evolved from _____ life forms which first developed more than three _____ years ago.

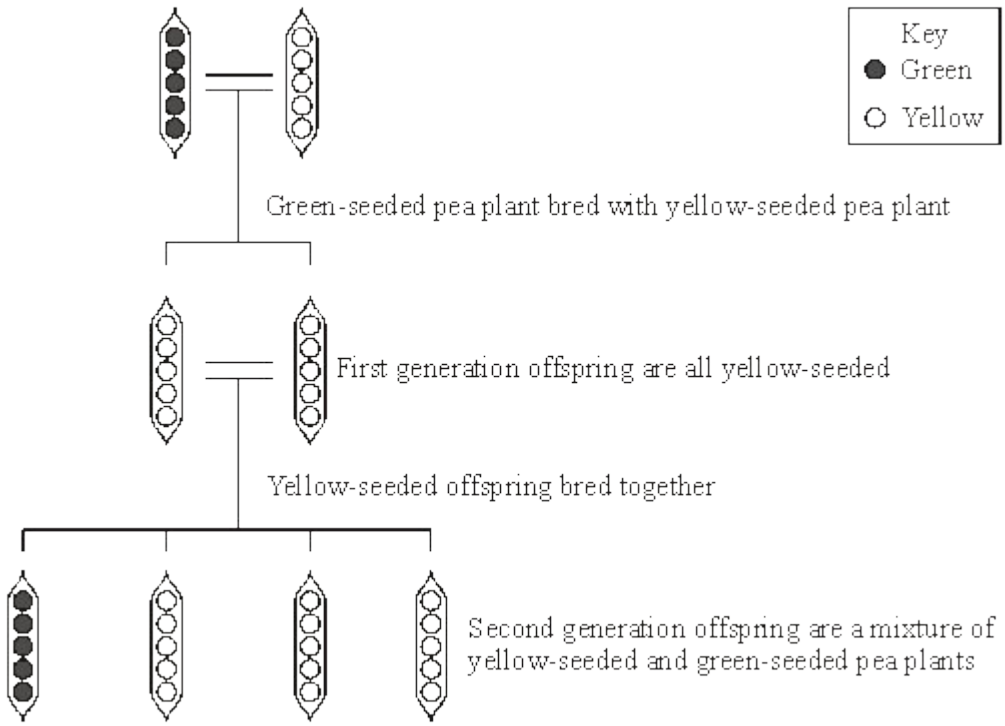
(2)

(Total 8 marks)

Q11.

The diagram shows one of the experiments performed by a scientist called Mendel in the 1850s. He bred pea plants which had different coloured pea seeds.

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(a) Use words from the box to help you to explain the results of this experiment.

dominant	**factor**	**recessive**

_____

_____

_____

_____

_____

_____

(3)

(b) Mendel explained these results in terms of *inherited factors*.

(i) What do we now call *inherited factors*?

_____

(1)

(ii) Where, in a cell, are these *inherited factors* found?

_____

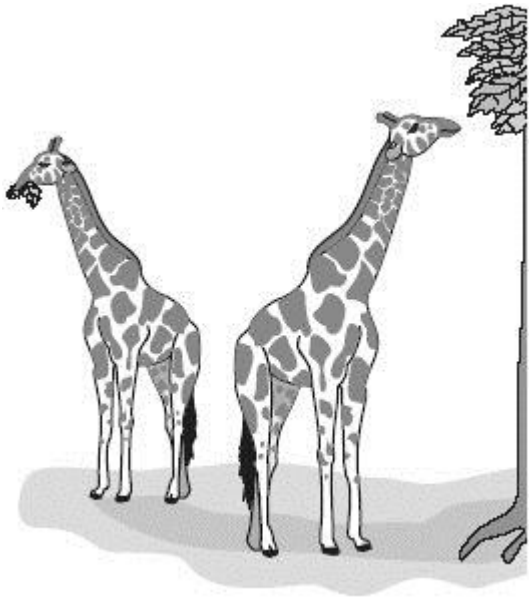
(1)

(Total 5 marks)

Q12.

Giraffes feed on the leaves of trees and other plants in areas of Africa.

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Lamarck explained the evolution of the long neck of the giraffe in terms of the animals stretching their necks to eat leaves from tall trees.

Darwin also explained the evolution of the long neck in terms of getting leaves from tall trees.

Neither scientist used any evidence to support their explanation.

Recently, scientists have tried to explain how the long neck of the giraffe might have evolved.

These are some of their observations.

- Giraffes spend almost all of the dry season, when food is scarce, feeding from low bushes.
- Only in the wet season do they feed from tall trees when new leaves are plentiful.
- Females spend over 50 % of their time feeding with their necks horizontal. Both sexes feed faster and most often with their necks bent.
- Long giraffe necks are very important in male-to-male combat. Males fight each other with their long, powerful necks!
- Female giraffes prefer male giraffes with longer necks.

(a) Do the observations support or reject the explanation that the long neck of the giraffe evolved to get leaves from tall trees? Explain the reasons for your answer.

_____

_____

_____

_____

_____

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_____

(2)

(b) Use the recent observations to give another explanation for the evolution of the long neck of the male giraffe.

_____

_____

_____

_____

_____

_____

(2)

(Total 4 marks)

Q13.

The peppered moth is an example of a mutation which gives the mutant variety an advantage in certain environmental conditions.

Normally the peppered moth is light coloured.

In 1848 the first dark form of the peppered moth was caught in the Manchester area. By 1895, 98% of the population was the dark form. In an area where a smokeless zone was established in 1972 the percentage of light-coloured peppered moths changed. In 1961 it was 5.2% but in 1974 it had risen to 10.5%.

Use the information above to explain the term *natural selection.*

_____

_____

_____

_____

_____

_____

(Total 4 marks)

Q14.

One of Mendel's original experiments was to cross pure-breeding, red-flowering pea plants with pure-breeding white-flowering pea plants. The next year he grew the seed he had collected. This first generation, $\mathbf{F_1}$, of pea plants all had red flowers. Mendel then made each flower on these plants self-pollinate. He collected the seed from these flowers and grew them. The second generation, $\mathbf{F_2}$, gave the following result:

705 red-flowering plants and 224 white-flowering plants.

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(a) Which flower colour is due to the recessive allele?

_____

(1)

(b) Draw a genetic diagram to show the inheritance of flower colour in the first generation ($\mathbf{F_1}$) of plants.

Use the letters **r** and **R** to represent the alleles for flower colour.

(3)

(c) Explain why Mendel made the first generation of plants self-pollinate.

_____

_____

_____

(2)

(d) If Mendel had taken any two of his white-flowering peas and crossed them, what would have been the colour of the flowers of the next generation of plants?

_____

(1)

(e) It is very difficult to get red-flowering pea plants that breed true. Explain why you cannot guarantee to breed, by self-pollination, pea plants that only have red flowers.

_____

_____

_____

_____

(2)

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(Total 9 marks)

Q15.

Choose words from this list to complete the sentences below.

coal **dinosaurs** **extinct** **fossils** **rocks**

Many animals and plants which once existed have died out.

They are now _____ .

We know about them because their remains formed

_____ which are found in _____ .

(Total 4 marks)

Q16.

Choose words from this list to complete the sentences below.

bones extinct fossils
muscles rocks

In the past some types of animals and plants have died out.

They have become _____ .

We know about these animals and plants because we find them as _____ .

Sometimes the hard parts of animals such as _____ did not decay.

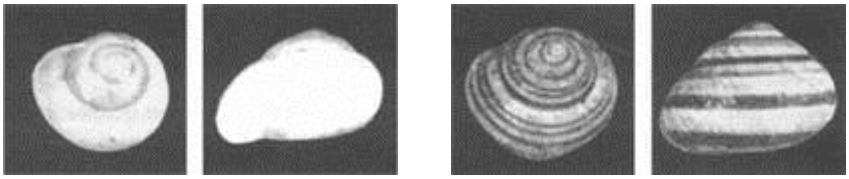
In other cases the bodies of animals and plants were replaced by minerals.

You can still see their shape in _____ .

(Total 4 marks)

Q17.

Cepaea nemoralis is a snail which is found on sand dunes. It may have a plain or banded shell. The snails are found on grass stalks and leaves.



Plain Banded

A scientist collected young unbanded snails and kept them until they were fully grown and mated them.

The eggs laid produced 35 unbanded and 12 banded snails.

(a) Explain these figures as fully as you can. You may use a genetic diagram if you wish to make your answer clearer.

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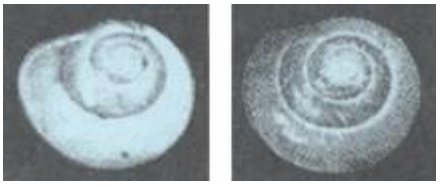
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_____

(7)



Variation in colour



Variation in banding

(b) The snail shells show a lot of variation in colour. They are yellowy/green, brown, pink or cream. The banding varies from a single wide band to a mixture of thick and thin bands.

Describe briefly the factors which have produced this variation and explain how these factors may themselves have arisen.

_____

_____

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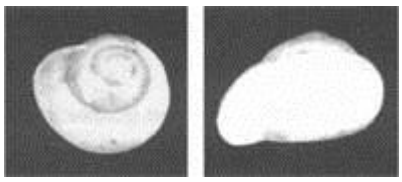
(4)

(Total 11 marks)

Q18.

Cepaea nemoralis is a snail which is found on sand dunes. It may have a plain or banded shell. The snails are found on grass stalks and leaves.

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Plain



Banded

When a scientist collected snails on the sand dunes he got 450 banded
280 unbanded.

Snails are eaten by birds. Sand dunes have clumps of grasses growing on them.

Suggest why there were more banded than unbanded snails on the sand dunes.

_____

_____

_____

_____

_____

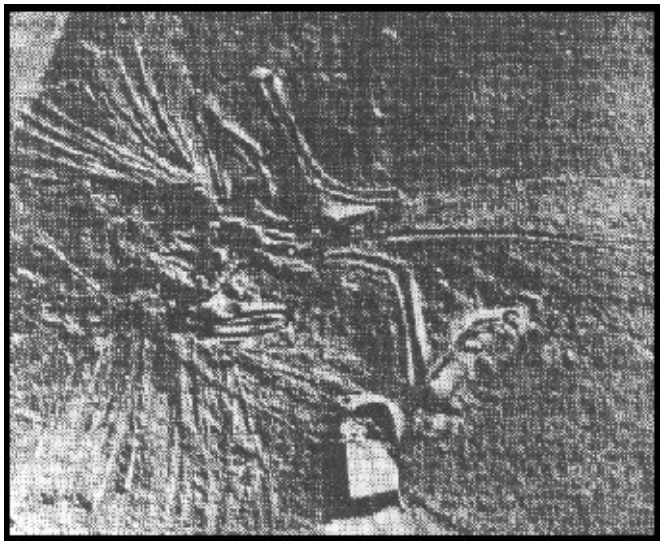
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(Total 4 marks)

Q19.

The picture shows a fossil.



(a) (i) What is a fossil?

_____

_____

_____

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(3)

(ii) Describe **one** way in which fossils are formed.

_____

_____

_____

(2)

(b) We only know about extinct animals and plants because they have left fossils. What does the word "extinct" mean?

_____

_____

(1)

(Total 6 marks)

Q20.

Many islands in the Indian and Pacific oceans have or used to have large flightless birds like the dodo on Mauritius and the kiwi on New Zealand.



* Scientists think that birds on these islands came from elsewhere.
* Birds were able to fly to the islands.
* Birds living on islands may get blown out to sea and drown.
* Flying uses up lots of energy.
* Large birds find it difficult to fly.
* Islands in the middle of oceans had no mammal predators.

(a) Use this information to suggest how flightless birds evolved on different islands.

_____

_____

_____

_____

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_____

_____

_____

(6)

(b) This evolution of the kiwi could not have occurred unless there was some variation between the birds.

Suggest **two** factors which could produce this range of variation.

1. _____

_____

2. _____

_____

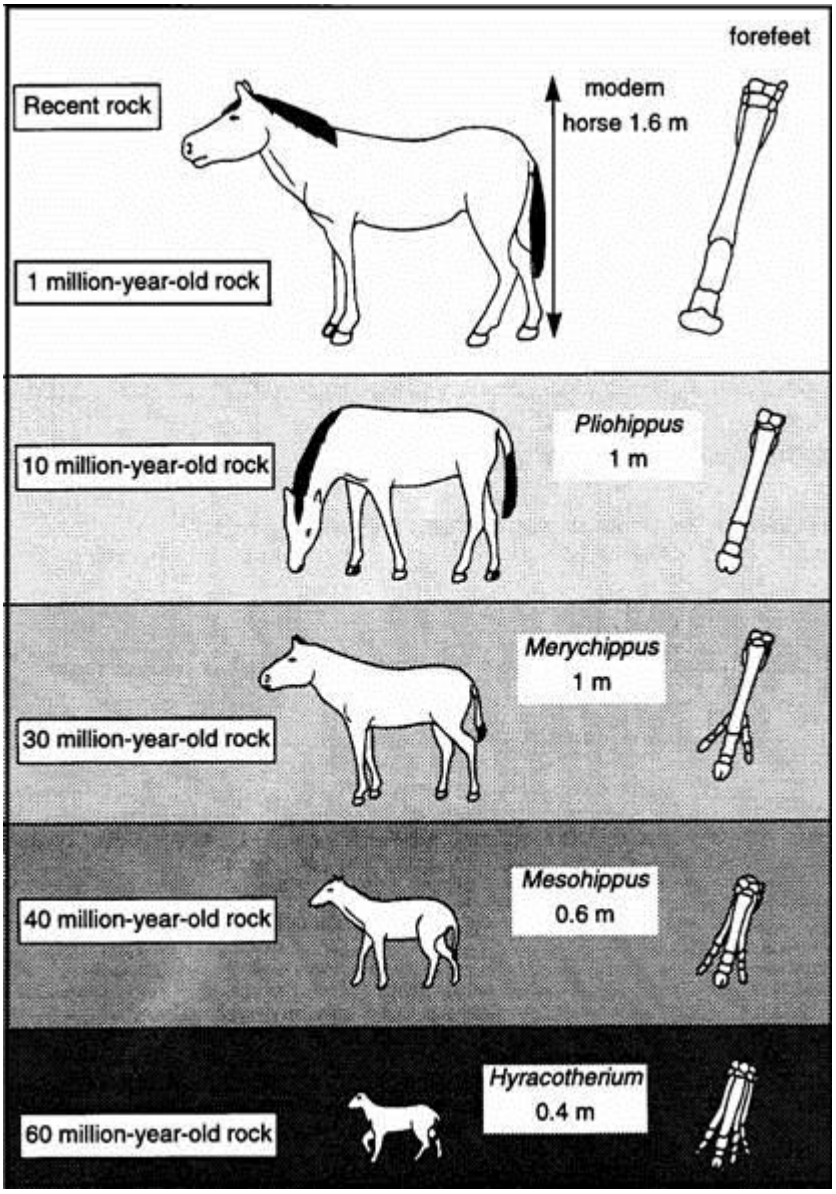
(2)

(Total 8 marks)

Q21.

The diagrams show fossil animals found in rocks of different ages. Scientists have used this information to work out how the modern horse evolved.

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(a) *Mesohippus* became extinct over thirty million years ago. Use information from the diagrams to suggest **two** reasons why this happened.

1. _____

_____

2. _____

_____

(2)

(b) (i) How do scientists know how big these early horses were?

_____

_____

(1)

(ii) How do scientists know when they lived?

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_____

_____

(1)

(c) Explain how the information in the diagrams supports the theory of evolution.

_____

_____

_____

(3)

(Total 7 marks)

Q22.

For many years scientists studied the organisms in an area of grassland.

One of the animals was a species of black fly. In this population only one allele **B** existed for colour. All the flies were homozygous **BB**.

A mutation occurred which produced a new recessive allele **b** which could produce a green colour.

(a) Draw **two** genetic diagrams to show how the single **b** allele in just one fly was able to produce homozygous **bb** green flies in two generations.

First generation

Second generation

(4)

(b) Although this new allele was recessive and the mutation only occurred once, a large proportion of the fly population was soon green.

Suggest in terms of natural selection why the recessive **b** allele was able to spread through the population.

_____

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_____

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_____

_____

(3)

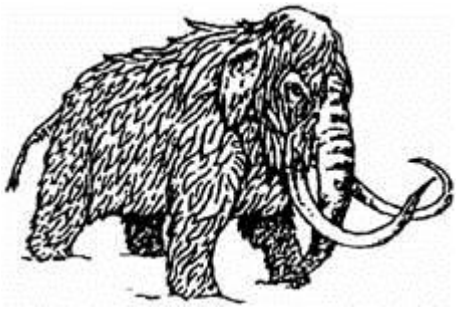
(Total 7 marks)

Q23.

When animals die, bacteria make them decay.
Warmth, moisture and oxygen are needed for this to happen.

(a) (i) In northern Russia whole bodies of mammoths have been found in the frozen soils.

Explain why they did not decay.

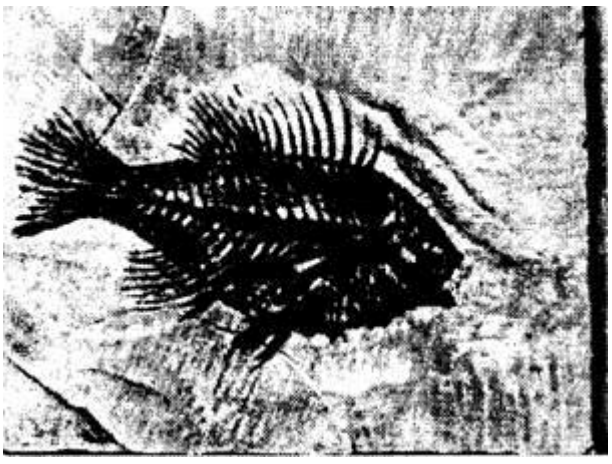


_____

_____

(1)

(ii) Fish fossils have been found in mudstone rock. Explain why they did not decay?



_____

_____

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(2)

(b) Some of the mammoths had flint weapons in their bodies.

Suggest **two** things that this tells us about human evolution.

1. _____

2. _____

(2)

(c) Mammoths are now extinct. Suggest **two** reasons for this.

1. _____

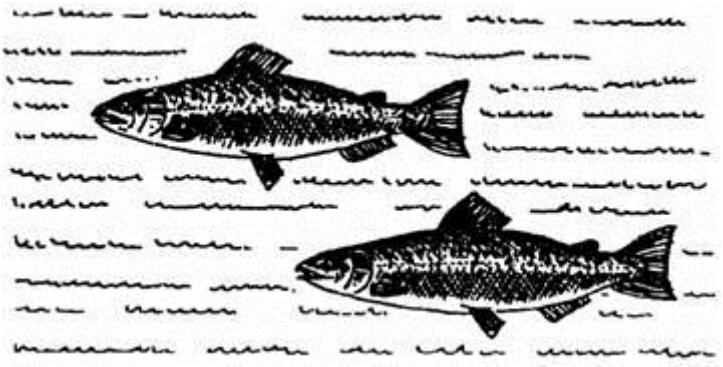
2. _____

(2)

(Total 7 marks)

Q24.

Wild salmon hatch from eggs laid in rivers. The small salmon then swim downstream to the sea. After 3-4 years they return to breed, usually in the same river in which they were hatched. If fish return to a different river they do not breed as successfully as those returning to the same one. This means that each river has its own breeding population of salmon. Each breeding population is slightly different from all the others.



Use the idea of natural selection to explain how each river has its own breeding population.

_____

_____

_____

_____

_____

(Total 4 marks)

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