AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.3 THE DEVELOPMENT OF UNDERSTANDING OF GENETICS AND EVOLUTION (PACK 2)

SCORE	PERCENTAGE
/233	%

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Q1.

The photographs show the flowers of two closely-related species of plant.

Species A



Species B



Images: © iStock/Thinkstock

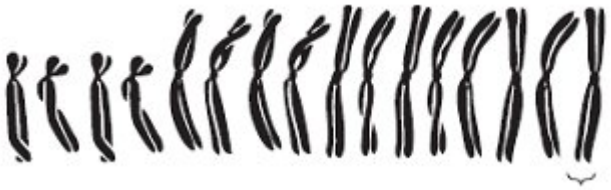
The drawings show chromosomes from one cell in the root of each plant during cell division.

Species A



One chromosome

Species B



One chromosome

(a) The drawings show that each chromosome has two strands of genetic material.

(i) How does a chromosome become two strands?

_____

_____

(1)

(ii) Explain why each chromosome must become two strands before the cell divides.

_____

_____

_____

_____

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(2)

(b) For sexual reproduction, the plants produce gametes.

(i) Name the type of cell division that produces gametes. _____

(1)

(ii) How many chromosomes would there be in a gamete from each of these two plant species?

Species A ☐ **Species B** ☐

(1)

(iii) It is possible for gametes from **Species A** to combine with gametes from **Species B** to produce healthy offspring plants.

How many chromosomes would there be in each cell of one of the offspring plants?

☐

(1)

(c) (i) Look back at the information at the start of the question and the information from part (b).

What evidence from these two pieces of information supports the belief that **Species A** and **Species B** evolved from a common ancestor?

_____

_____

_____

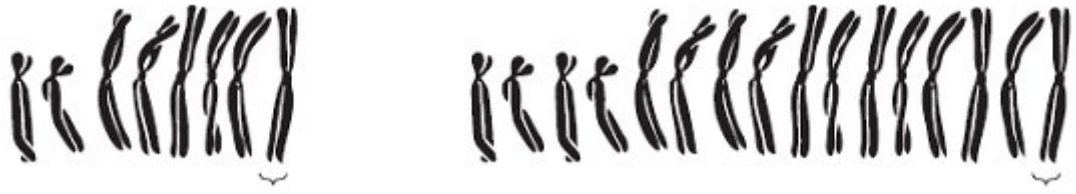
_____

(2)

(ii) For successful gamete production to take place, chromosomes that contain the same genes must pair up.

The drawings showing the chromosomes of **Species A** and of **Species B** are repeated below.

Species A **Species B**



The offspring plants cannot reproduce sexually.

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Suggest an explanation for this.

_____

_____

_____

_____

_____

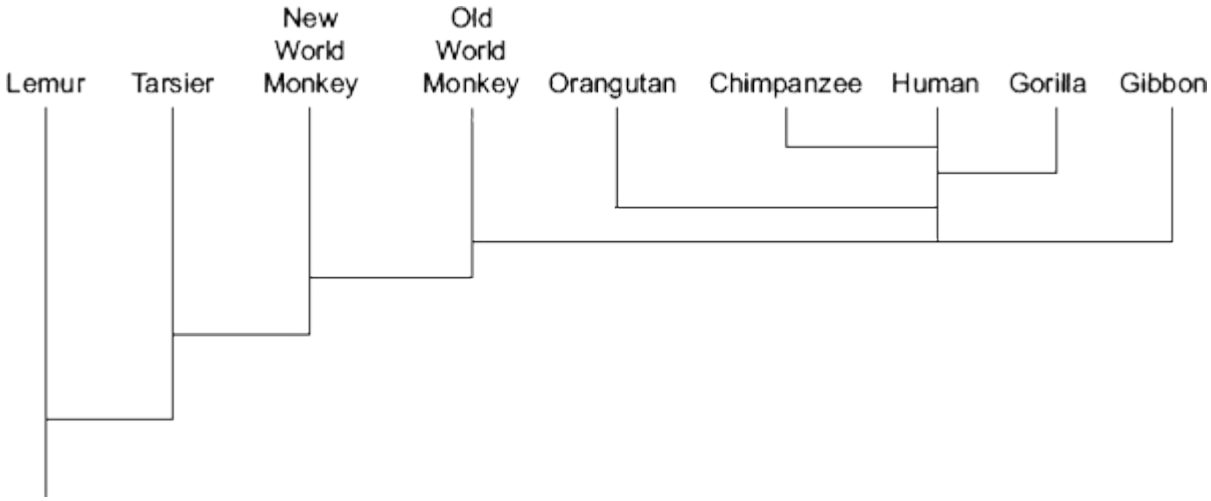
_____

(2)

(Total 10 marks)

Q2.

The diagram shows the evolution of a group called the primates.



(a) Which primate evolved first?

_____

(1)

(b) Name **two** primates that developed most recently from the same common ancestor as humans.

1. _____

2. _____

(2)

(c) (i) The theory of evolution by natural selection was suggested in the 1800s.

Which scientist suggested this theory?

_____

(1)

(ii) Use words from the box to complete the passage about natural selection.

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evolution	**environment**	**generation**
mutate	**survive**	**variation**

Individual organisms of a species may show a wide range of

_____ because of differences in their genes.

Individuals with characteristics most suited to the _____

are more likely to _____ and breed

successfully.

The genes that have helped these individuals to survive are then passed on to

the next _____

(4)

(Total 8 marks)

Q3.

The Blue-moon butterfly lives on a small island called Samoa, in the Pacific Ocean.



By Emoke Dénes [CC-BY-SA-2.5], via Wikimedia Commons

In 2006 Blue-moon butterflies almost became extinct.

Wolbachia bacteria killed males before they could hatch from eggs. Only females were resistant to the bacteria.

In 2006 the number of male Blue-moon butterflies had decreased to only 1 per cent of the population. Two years later, the number of males was equal to the number of females.

(a) Scientists believe that a change in a gene suddenly occurred to make some males resistant to the bacteria.

What scientific term describes a change in a gene?

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_____

(1)

(b) The numbers of male Blue-moon butterflies in the population increased quickly after the new form of the gene had appeared.

Suggest why.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 5 marks)

Q4.

An animal called *Tiktaalik* became extinct about 360 million years ago.

The photograph shows the fossilised skeleton of *Tiktaalik* and a model of what scientists think *Tiktaalik* looked like.

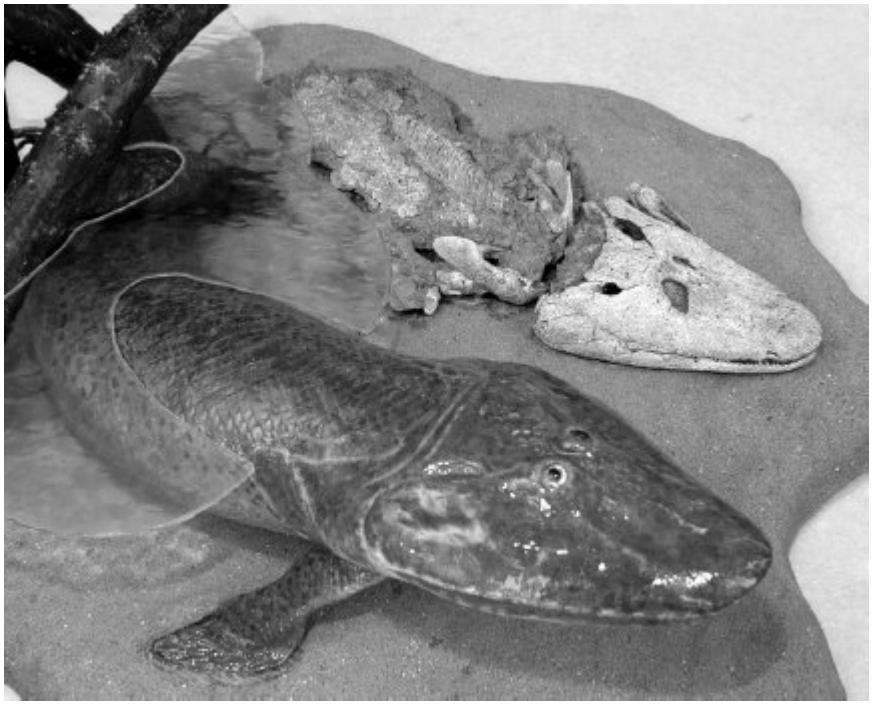


Image © University of Chicago, Shubin Lab. Model by Tyler Keillor

(a) Scientists found only the fossilised skeleton of *Tiktaalik*.

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Explain why.

_____

_____

_____

_____

(2)

(b) Scientists think that *Tiktaalik* lived mostly in water, but that it was one of the first animals to be able to move onto land.

Use evidence from the photograph to suggest why.

_____

_____

_____

_____

(2)

(Total 4 marks)

Q5.

When animals die, they usually fall to the ground and decay.
In 1977 the body of a baby mammoth was discovered.
The baby mammoth died 40 000 years ago and its body froze in ice.

The picture shows the mammoth.



By Thomas Quine [CC BY-SA 2.0], via Wikimedia Commons

(a) Explain why the body of the baby mammoth did **not** decay.

_____

_____

_____

_____

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(2)

(b) Mammoths are closely related to modern elephants.
The pictures show these two animals.

What scientists think a mammoth looked like



By WolfmanSF (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Modern elephant



By Caitlin from Hertfordshire, UK [CC-BY-2.0], via Wikimedia Commons

Mammoths are *extinct*. What does *extinct* mean?

_____

_____

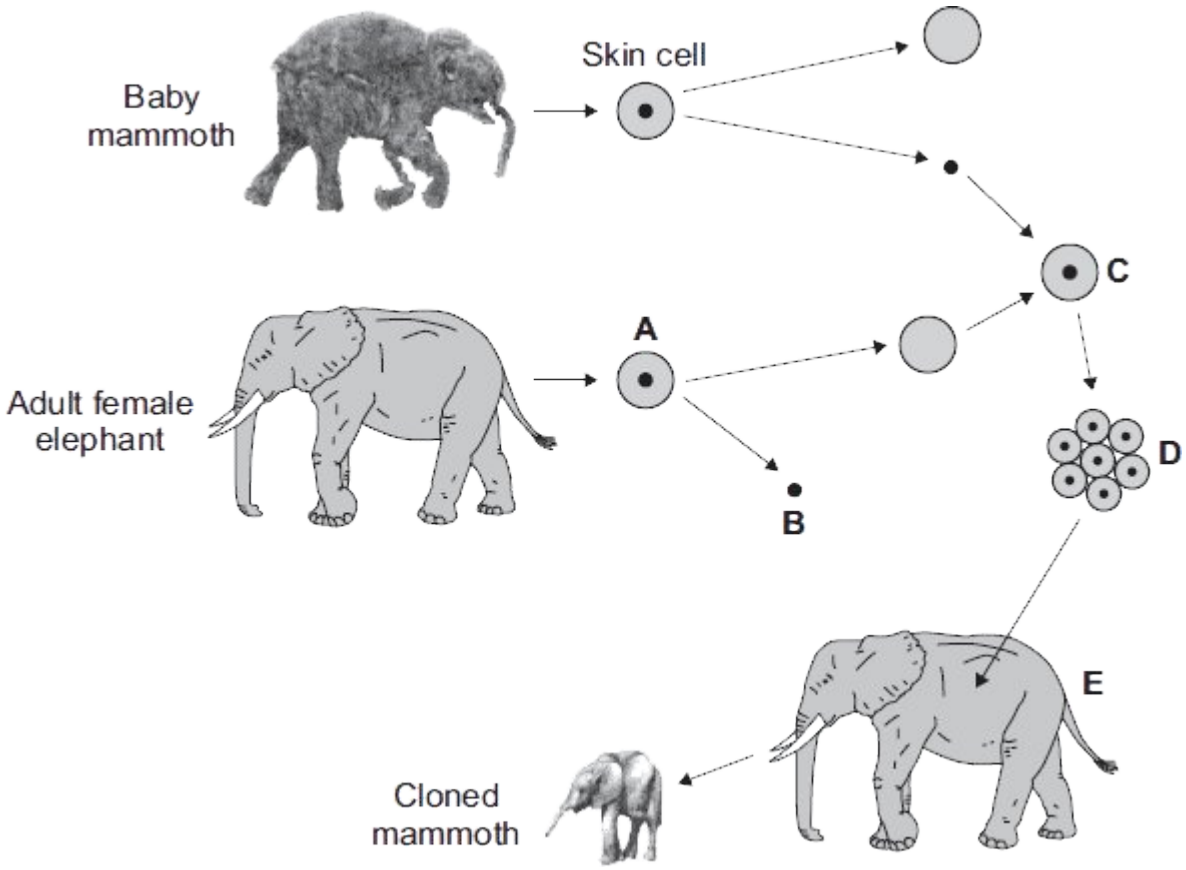
(1)

(c) Scientists believe they may be able to use adult cell cloning to recreate a living mammoth.

The scientists will use a skin cell from the baby mammoth.

The diagrams show how the skin cell will be used.

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In each question, draw a ring around the correct answer.

(i) What type of cell is cell **A**?

skin cell **egg cell** **sperm cell**

(1)

(ii) Part **B** is removed from cell **A**.

What part of the cell is part **B**?

nucleus **cytoplasm** **cell membrane**

(1)

(iii) After cell **C** is formed, it divides into embryo cells.

What is done to cell **C** to make it divide?

Cell **C** is

treated with enzymes.
mixed with sperm cells.
given an electric shock.

(1)

(iv) The embryo cells form a ball of cells. The ball of cells will be put into female elephant, **E**.

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Which part of elephant **E** is the ball of cells put into?

womb **stomach** **ovary**

(1)

(d) The scientists expect any offspring of the adult cell cloning to look like a mammoth and **not** like an elephant.

Why?

_____

_____

(1)

(Total 8 marks)

Q6.

People may be immunised against diseases using vaccines.

(a) (i) Which part of the vaccine stimulates the body's defence system?

_____

_____

_____

_____

(2)

(ii) A person has been vaccinated against measles. The person comes in contact with the measles pathogen. The person does **not** catch measles.

Explain why.

_____

_____

_____

_____

_____

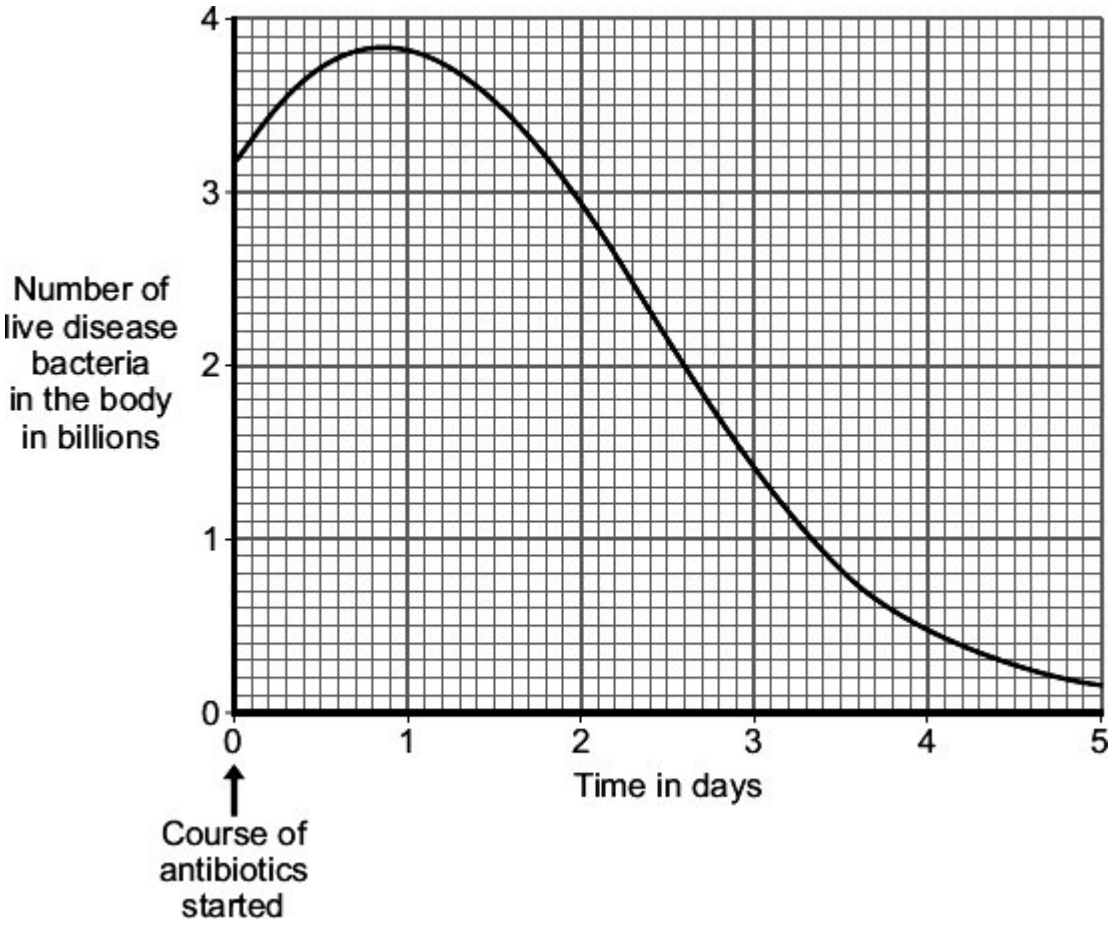
_____

(3)

(b) A man catches a disease. The man has **not** been immunised against this disease. A doctor gives the man a course of antibiotics.

The graph shows how the number of live disease bacteria in the body changes when the man is taking the antibiotics.

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(i) Four days after starting the course of antibiotics the man feels well again.
It is important that the man does **not** stop taking the antibiotics.

Explain why.

Use information from the graph.

_____

_____

_____

_____

(2)

(ii) Occasionally a new, resistant strain of a pathogen appears.

The new strain may spread rapidly.

Explain why.

_____

_____

_____

_____

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_____

_____

(3)

(Total 10 marks)

Q7.

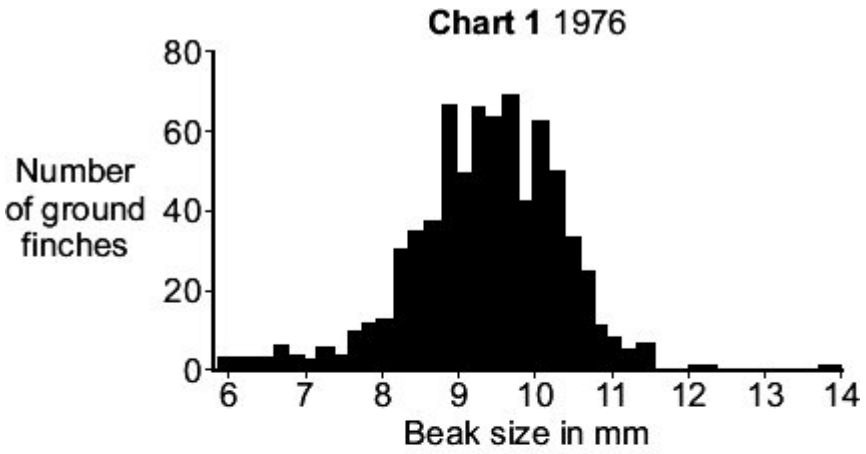
The Galapagos Islands are in the Pacific Ocean, 1400 km from South America.
A type of bird called a ground finch lives on the islands.
The picture shows a ground finch.

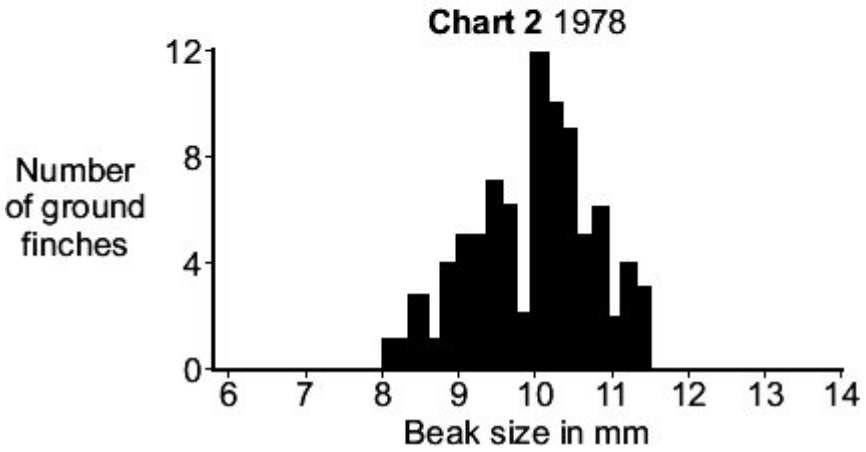


By Charlesjsharp (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

The size of the seeds the ground finch can eat depends upon the size of the beak.
To eat large seeds, a large beak is needed.
The bar charts show the sizes of the beaks of ground finches on **one** island, in 1976 and in 1978.

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(a) The population of the ground finches and their beak sizes changed between 1976 and 1978.

Describe these changes.

_____

_____

_____

_____

_____

_____

(3)

(b) In 1977 there was very little rain on the island. The lack of rain affected the seeds that the finches ate.
The table shows how the seeds were affected.

Year	Mean number of seeds per m^2	Mean mass of each seed in mg
1976	8.5	3.5

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1978	2.8	4.2

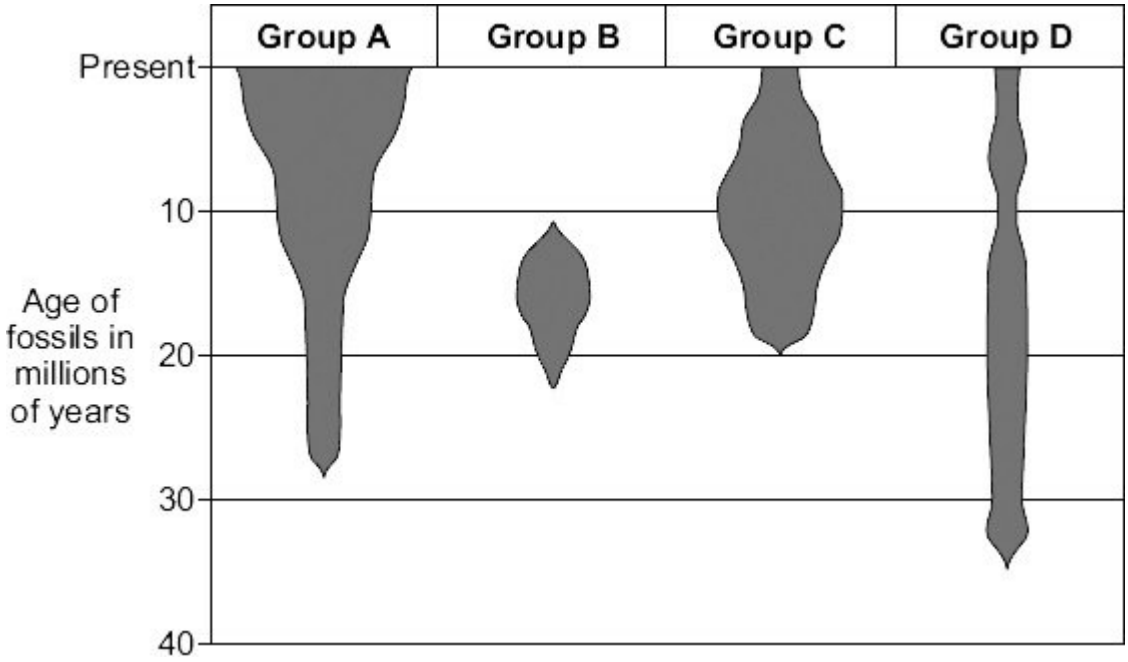
Suggest an explanation for the changes in beak sizes between 1976 and 1978.

(4)

(Total 7 marks)

Q8.

In the Grand Canyon, scientists have found fossils of several different groups of organisms.
The diagram shows the number and age of the fossils that the scientists found.
The width of each shaded area shows the number of fossils found.



(a) What is a fossil?

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_____

(2)

(b) (i) Which group of organisms, **A**, **B**, **C** or **D**, was the first to evolve?

(1)

(ii) Which group of organisms, **A**, **B**, **C** or **D**, is now extinct?

(1)

(iii) Give **one** environmental factor that might have caused this group of organisms to become extinct.

_____

_____

(1)

(c) Scientists suggested that, 10 million years ago, organisms of **Group C** were more common than organisms from any of the other groups.

What is the evidence for this in the diagram?

_____

_____

(1)

(d) The scientists suggested that the four groups of fossilised organisms evolved from a common ancestor.

Which of the following would provide the best evidence that their suggestion is correct?

Tick (✓) **one** box.

Statement	Tick (✓)
All the groups lived in the same area.	
Fossils from each group were found in the same rock layer.	
Members of the groups have similar physical structures.	

(1)

(Total 7 marks)

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Q9.

(a) How do fossils provide evidence that species alive today have evolved from simpler organisms?

_____

_____

_____

_____

_____

_____

(3)

(b) The photographs show two species of gull.

Herring gull (*Larus argentatus*)



By Ken Billington (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Lesser black-backed gull (*Larus fuscus*)

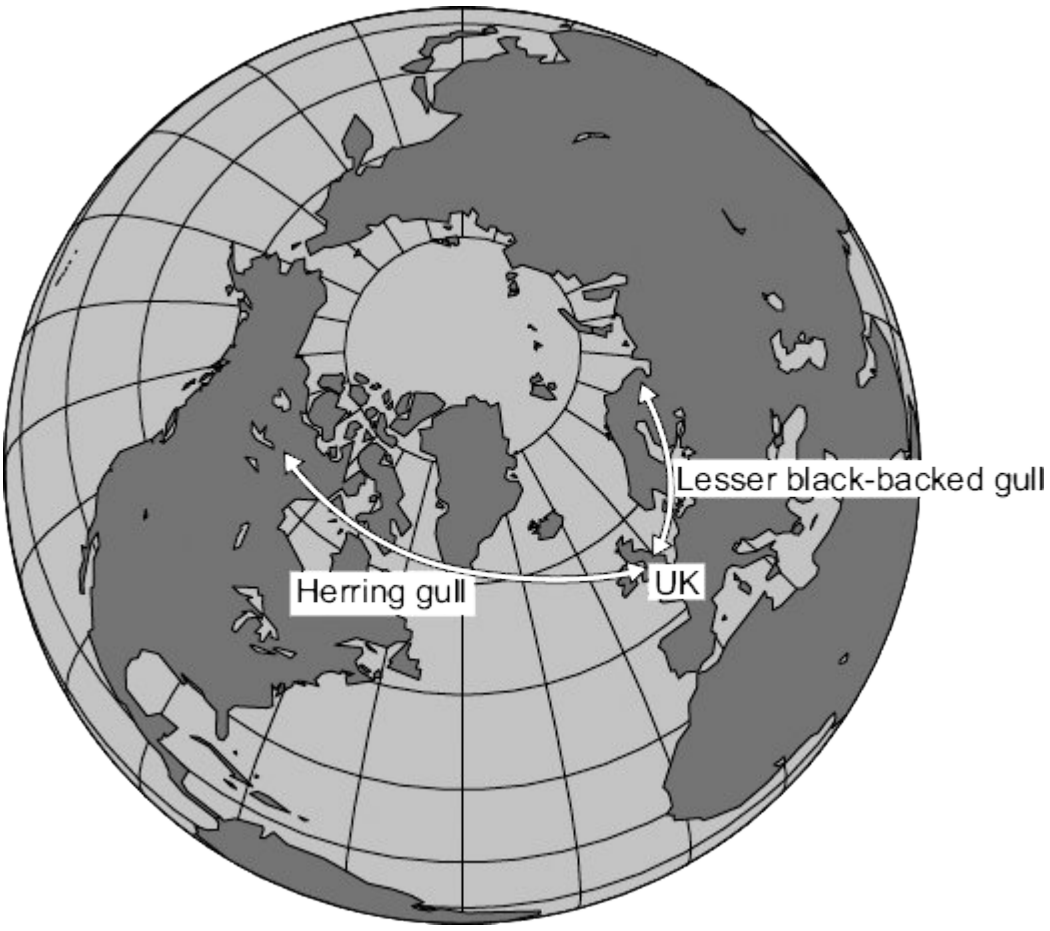


By Andreas Trepte (Own work) [CC-BY-SA-2.5], via Wikimedia Commons

Both species are now found in the UK but the two species cannot interbreed with each other. Scientists believe that these two species have evolved from a common ancestor.

The map below shows a view of the Earth from above the North Pole.
The map also shows where these two species are found.

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Suggest an explanation for the development of these different species.

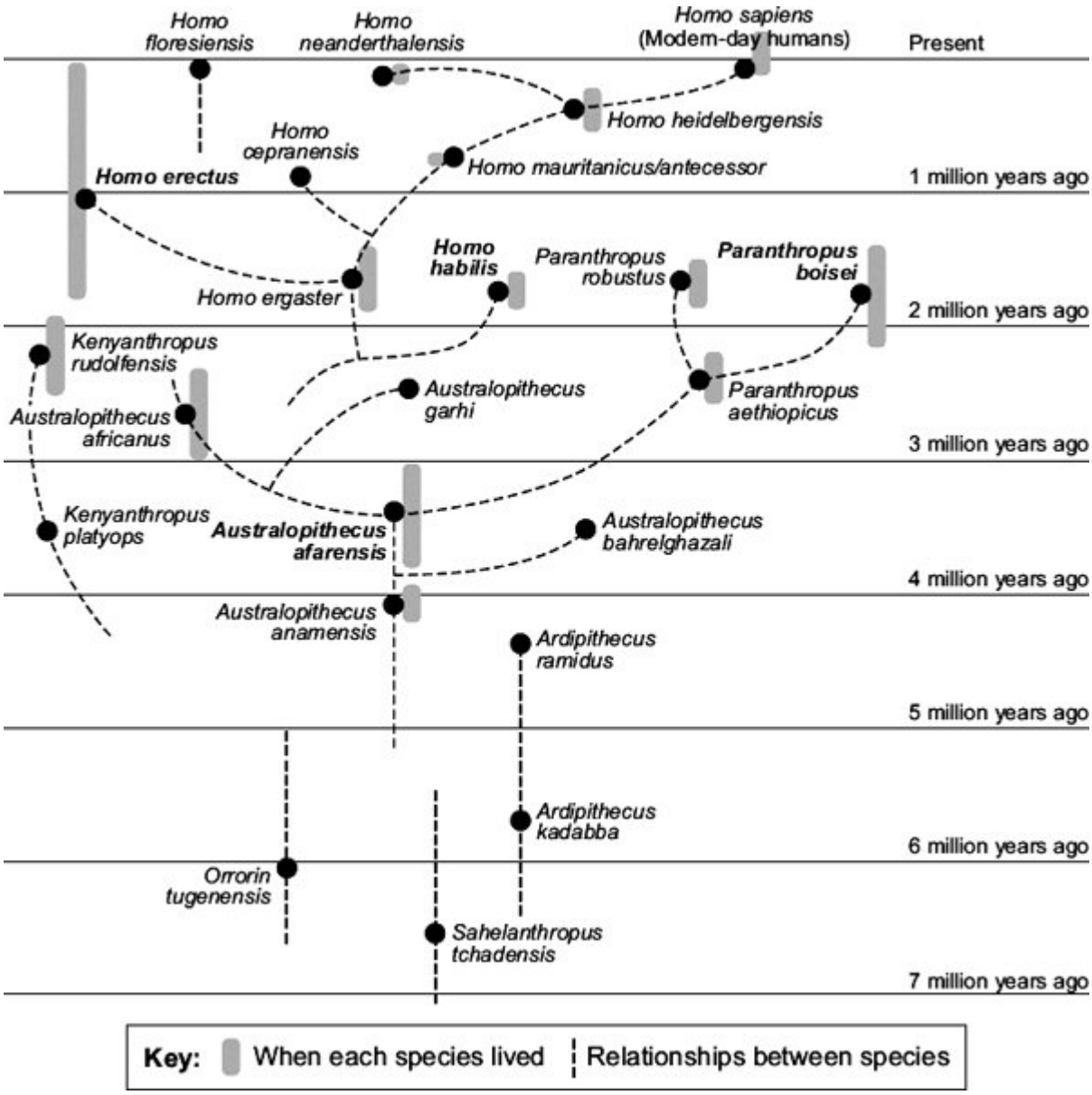
(6)
(Total 9 marks)

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Q10.

The diagram shows an evolutionary tree for humans.

The diagram is based on a study of fossils.



(a) When did *Australopithecus afarensis* first appear?

_____ million years ago.

(1)

(b) Which species was the direct ancestor of *Paranthropus boisei*?

_____

(1)

(c) Which species is most closely related to *Homo habilis?*

_____

(1)

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(d) About 250 fossils of *Homo erectus* have been found. About 50 of these fossils have been found in China.

A Chinese scientist has suggested the hypothesis that Chinese people evolved from *Homo erectus*.

Most scientists do **not** agree with this hypothesis.

Use the information above and information from the diagram to suggest **two** reasons why.

1. _____

_____

2. _____

_____

(2)

(e) Darwin suggested the theory of natural selection. It was a long time before this theory was accepted by most scientists.

Give **two** reasons why it took a long time.

1. _____

_____

2. _____

_____

(2)

(Total 7 marks)

Q11.

Many strains of bacteria have developed resistance to antibiotics.

The table shows the number of people infected with a resistant strain of one species of bacterium in the UK.

Year	2004	2005	2006	2007	2008
Number of people infected with the resistant strain	3499	3553	3767	3809	4131

(a) Calculate the percentage increase in the number of people infected with the resistant strain between 2004 and 2008.

Show clearly how you work out your answer.

_____

_____

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Percentage increase = _____

(2)

(b) Explain, in terms of natural selection, why the number of people infected with the resistant strain of the bacterium is increasing.

_____

_____

_____

_____

_____

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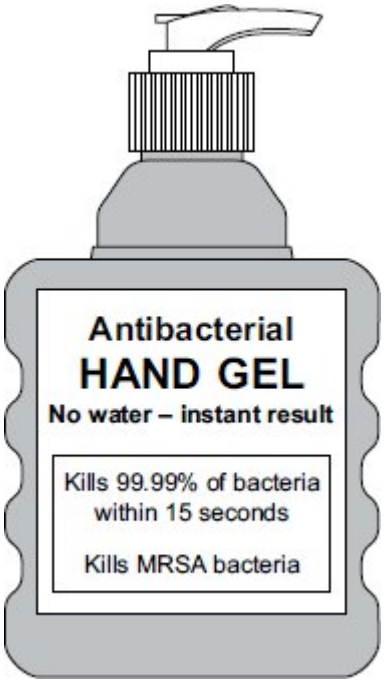
(3)

(Total 5 marks)

Q12.

MRSA strains of bacteria are causing problems in many hospitals.

(a) The diagram shows a hand-gel dispenser.



Hand-gel dispensers are now placed at the entrance of most hospital wards.

Explain why.

_____

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_____

_____

_____

(2)

(b) Explain, as fully as you can, how MRSA strains of bacteria became difficult to treat.

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q13.

Soay sheep live wild on an island off the north coast of Scotland. No people live on the island.



By Owen Jones = Jonesor [CC-BY-SA-2.5], via Wikimedia Commons

Over the last 25 years, the average height and mass of the wild Soay sheep have decreased.

The scientists think that climate change might have affected the size of the sheep.

Suggest an explanation for the evolution of the wild Soay sheep over the last 25 years.

_____

_____

_____

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_____

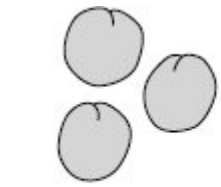
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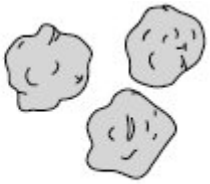
(Total 4 marks)

Q14.

In the 1860s, Gregor Mendel studied inheritance in nearly 30 000 pea plants. Pea plants can produce either round seeds or wrinkled seeds.



Round pea seeds



Wrinkled pea seeds

(a) Mendel crossed plants that always produced round seeds with plants that always produced wrinkled seeds.

He found that all the seeds produced from the cross were round.

Use the symbol **A** to represent the dominant allele and **a** to represent the recessive allele.

Which alleles did the seeds from the cross have?

_____

(1)

(b) Mendel grew hundreds of plants from the seeds of the offspring.
He crossed these plants with each other.

(i) Mendel's crosses produced 5496 round pea seeds and 1832 wrinkled pea seeds.

Explain why Mendel's crosses gave him these results.

In your answer you should use:

- a genetic diagram
- the symbols **A** and **a**.

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(3)

(ii) One of Mendel's crosses produced 19 round seeds and 16 wrinkled seeds.

These numbers do **not** match the expected ratio of round and wrinkled seeds.

Suggest why.

_____

_____

(1)

(c) The importance of Mendel's discovery was not recognised until many years after his death.

Give **one** reason why.

_____

_____

(1)

(Total 6 marks)

Q15.

Charles Darwin proposed the theory of natural selection.

(a) What is meant by natural selection?

_____

_____

_____

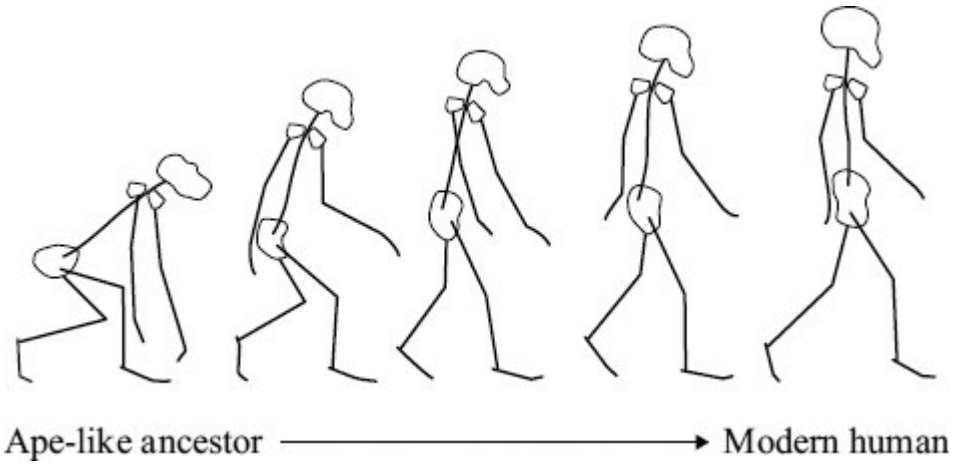
_____

(2)

(b) The drawings show stages in the evolution of the human skeleton.

All the drawings are to the same scale.

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Use information from the drawings to describe **two** trends in the evolution of the human skeleton.

1. _____

_____

2. _____

_____

(2)

(c) Darwin said that humans had evolved from ape-like ancestors.

Many people disagreed with him at the time.

Give **two** reasons why.

1. _____

_____

2. _____

_____

(2)

(d) Lamarck's theory of evolution stated that useful changes which occur in an organism during its lifetime will be inherited by its offspring.

Give **one** way in which Darwin's theory differs from Lamarck's.

_____

_____

(1)

(Total 7 marks)

Q16.

The photograph shows an *Anolis* lizard. This lizard lives on a tiny island.

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By Paul Hirst (Phirst) (Own work) [CC-BY-SA-2.5], via Wikimedia Commons

Scientists investigated how the leg length of the *Anolis* lizards affected their survival. At the start of the investigation the *Anolis* lizards had a large range of leg lengths.

- The scientists placed six *Curly-tailed* lizards onto the island.
- The *Curly-tail* lizard is a predator of the *Anolis* lizard.
- After one year the population of *Anolis* lizards had halved.
- Nearly all the remaining *Anolis* lizards had long legs.

(a) Why did the population of *Anolis* lizards halve?

_____

_____

(1)

(b) The remaining *Anolis* lizards had long legs.

Suggest an explanation for this.

_____

_____

_____

_____

_____

(2)

(c) Answer each of these questions by placing a tick (✓) in the correct box.

(i) Which theory is supported by evidence from this investigation?

Global warming ☐

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Natural selection ☐

Sustainability ☐

(1)

(ii) Which scientist proposed this theory?

Darwin ☐

Lamarck ☐

Semmelweiss ☐

(1)

(Total 5 marks)

Q17.

The photograph shows some flamingos.



By Charles J Sharp (Own work) [GFDL, CC-BY-SA-3.0 or CC-BY-2.5], via Wikimedia Commons

- Flamingos feed on organisms that live in mud at the bottom of lakes.
- Leopards prey on flamingos.
- Flamingos find it difficult to fly if their feathers get wet.

Flamingos have evolved very long legs.

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How would each of the following theories explain the evolution of these long legs?

(a) Darwin's theory

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(b) Lamarck's theory.

_____

_____

_____

_____

_____

_____

(2)

(Total 5 marks)

Q18.

Animals have adaptations that enable them to survive.

(a) The photograph shows an echidna.

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The echidna has pointed spines on its back.

Explain how these spines might help the echidna to survive.

_____

_____

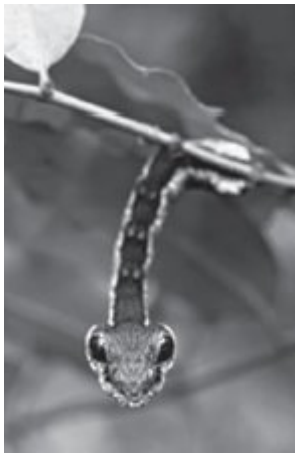
_____

_____

_____

(2)

(b) The photograph shows a caterpillar.



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© S.J. Krasemann / Peter Arnold / Still Pictures

Explain how the caterpillar's appearance might help it to survive.

_____

_____

_____

_____

_____

(2)

(c) Draw a ring around the correct answer to complete each sentence.

(i) Evolution can be explained by a theory called

genetic engineering
mutation
natural selection

.

(1)

(ii) This theory was suggested by a scientist called Charles

Darwin
Lamarck
Semmelweiss

.

(1)

(iii) This scientist said that all living things have evolved from

monkeys
dinosaurs
simple life forms

.

(1)

(d) Many religious people oppose the theory of evolution.

Give **one** reason why.

_____

_____

(1)

(Total 8 marks)

Q19.

Some organisms are in danger of extinction.
The photograph shows an African elephant feeding on tree leaves.

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(a) Read the information about elephants and humans in Africa.

- The African elephant is the largest land animal.
- The African elephant feeds on lots of leaves.
- Adult African elephants have no natural predators.
- Elephants are killed by poachers for their ivory tusks.
- African elephants live for about 70 years.
- Most African elephants live in large herds.
- Land available to elephants is disappearing rapidly.

The African elephant is now extinct in many parts of Africa.

Use information from the list to give **three** reasons why.

1. _____

_____

2. _____

_____

3. _____

_____

(3)

(b) Organisms that are in danger of extinction can be cloned.

List A gives the names of three different cloning techniques.

List B gives information about these techniques.

Draw a line from each technique in **List A** to the correct information about it in **List B**.

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List A Technique	List B Information
	Small groups of cells from parts of a plant are grown on a special jelly.
Adult cell cloning	
	Cells from a developing animal are separated before they become specialised and then placed into host mothers.
Embryo transplanting	
	Genes are cut out from chromosomes and inserted into other organisms.
Tissue culture	
	A nucleus is removed from an unfertilised egg cell. The nucleus from a body cell is inserted into the egg cell. An electric shock causes the egg to start to divide.

(3)

(Total 6 marks)

Q20.

The dodo is an extinct bird. The drawing shows an artist's impression of the bird.



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The dodo lived on a small island in the middle of the Indian Ocean. Its ancestors were pigeon-like birds which flew to the island millions of years ago. There were no predators on the island. There was a lot of fruit on the ground. This fruit became the main diet of the birds. Gradually, the birds became much heavier, lost their ability to fly and evolved into the dodo.

(a) Suggest an explanation for the evolution of the pigeon-like ancestor into the flightless dodo.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(b) The dodo became extinct about 80 years after Dutch sailors first discovered the island in the eighteenth century.

Scientists are uncertain about the reasons for the dodo's extinction.

Suggest an explanation for this uncertainty.

_____

_____

(1)

(Total 5 marks)

Q21.

In the 1850s, Gregor Mendel carried out breeding experiments using peas.

(a) The importance of Mendel's work was not recognised until the early 1900s.

Explain why.

_____

_____

_____

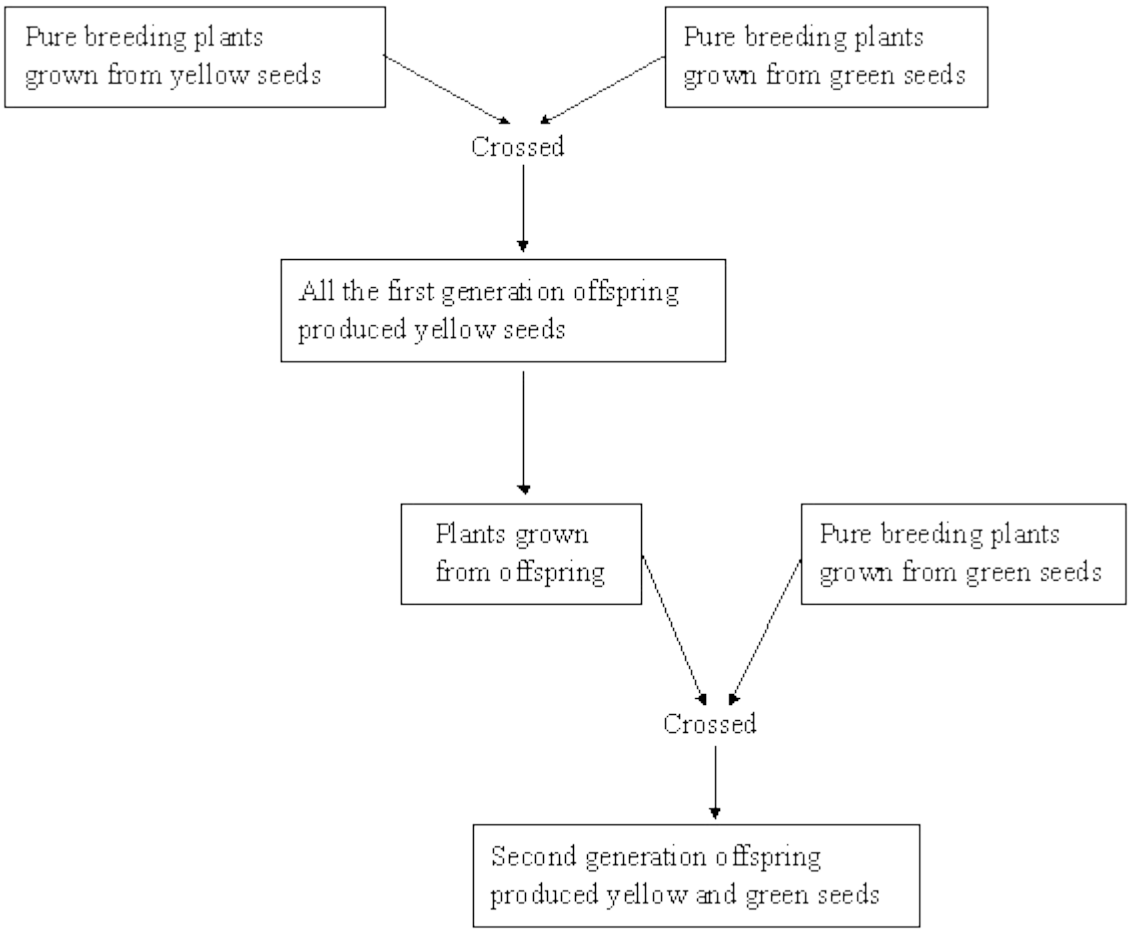
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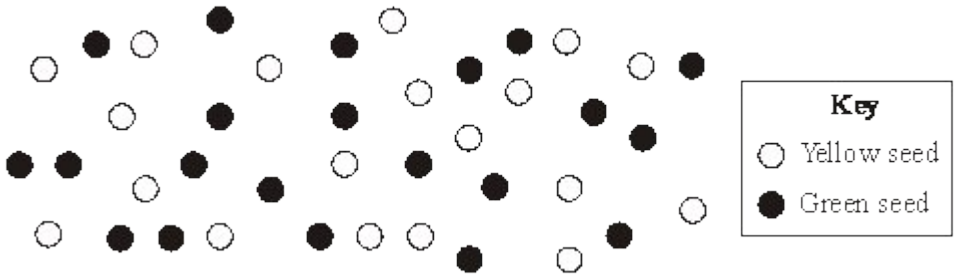
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(b) A student repeated one of Mendel's experiments.

The flow chart shows her procedure.



The diagram shows a representative sample of seeds produced by second generation plants.



(i) Describe how the student could obtain a sample that is representative of seeds produced by the second generation.

_____

_____

(1)

(ii) What was the approximate ratio of yellow seeds to green seeds in the seeds produced by the second generation?

_____

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(1)

(iii) Seed colour in peas is controlled by a single gene which has two alleles.

Use a genetic diagram to show why this ratio of yellow seeds to green seeds was produced by the second generation.

Use the symbol **A** to represent the dominant allele, and **a** to represent the recessive allele.

(4)

(Total 8 marks)

Q22.

The diagram shows an evolutionary tree for a group of animals called primates.

The names of extinct animals are printed in italics *e.g. Nycticeboides*.

The drawings show animals that are alive today.

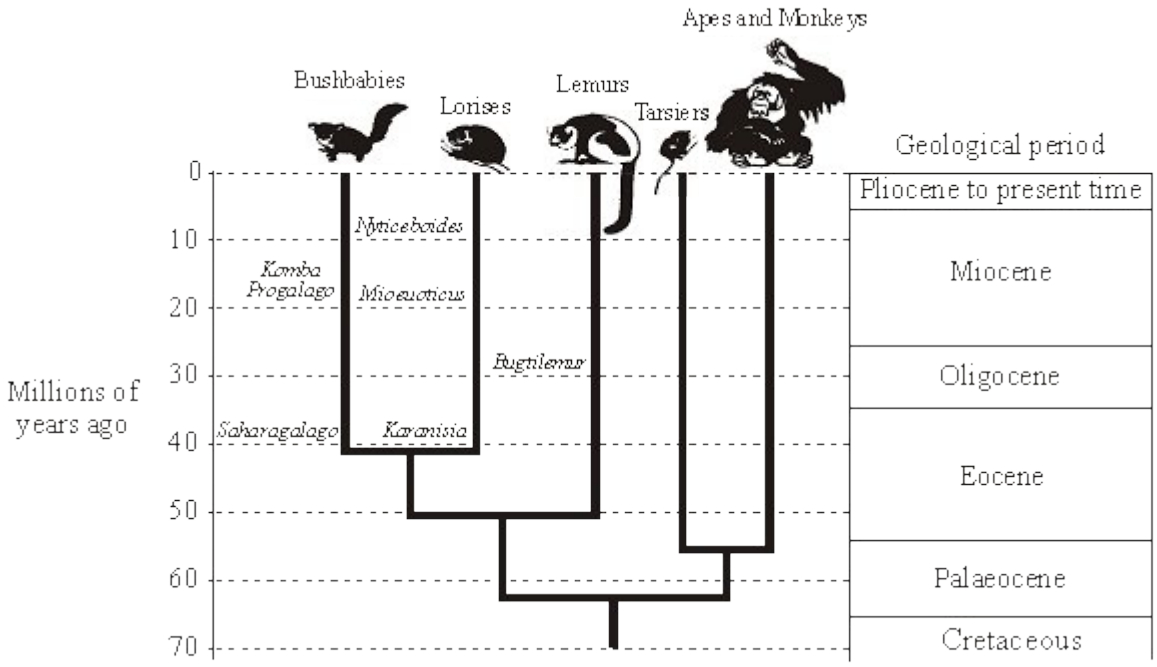


Illustration by Lucrezia Beerli-Bieler

(a) (i) How many million years ago did *Karanisia* first appear?

_____ millions of years ago.

(1)

(ii) During which geological period did the Apes and Monkeys begin to evolve?

_____

(1)

(iii) Which group of primates alive today are the closest relatives of the Lorises?

_____

(1)

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(b) Darwin was the first scientist to state that humans and other primates had common ancestors.

Many people were against Darwin's ideas at that time.

Give **two** reasons why they were against his ideas.

1. _____

_____

2. _____

_____

(2)

(Total 5 marks)

Q23.

Pathogenic bacteria and viruses may make us feel ill if they enter our bodies.

(a) Why do bacteria and viruses make us feel ill?

Bacteria _____

_____

Viruses _____

_____

(2)

(b) Most drugs that kill bacteria cannot be used to treat viral infections.

Explain why.

_____

_____

_____

_____

_____

_____

(2)

(c) Antibiotic-resistant strains of bacteria are causing problems in most hospitals.

Explain, as fully as you can, why there has been a large increase in the number of antibiotic-resistant strains of bacteria.

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(4)

(Total 8 marks)

Q24.

The photograph shows a Crossbill.



A Crossbill feeds by using its bill (beak) to force apart the scales on conifer cones. It then uses its tongue to extract the seeds. If the bill is clipped it grows back again.

Scientists were interested in the evolution of the bill of the Crossbill.

In an investigation, they clipped the bills of several Crossbills so that their bills no longer crossed.

They observed that Crossbills with clipped bills took much longer to get seeds.

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Use information from the investigation to suggest an explanation for the evolution of the bill in the Crossbill.

In your explanation, use the ideas of *selection*, *competition* and *mutation*.

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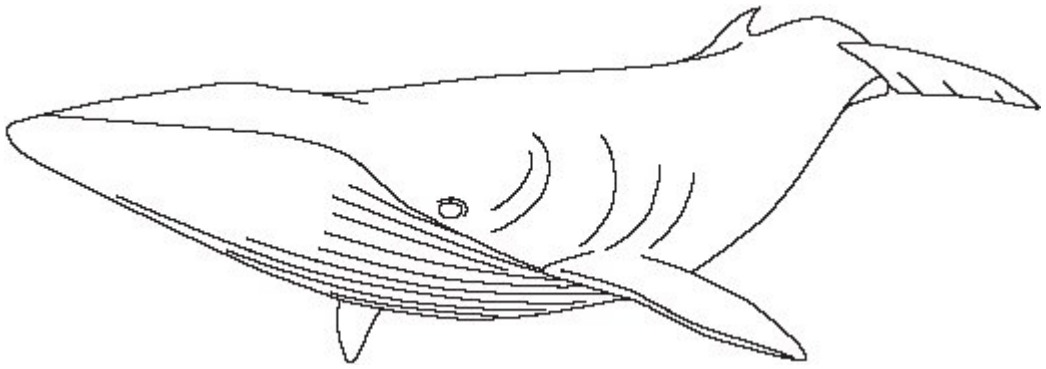
_____

(Total 4 marks)

Q25.

(a) **Figure 1** shows a minke whale. Whales live in the sea.

Figure 1



Write down **two** ways in which the body of the whale is adapted for swimming.

1. _____

_____

2. _____

_____

(2)

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(b) **Figure 2** shows the skeleton of a minke whale.

Figure 2

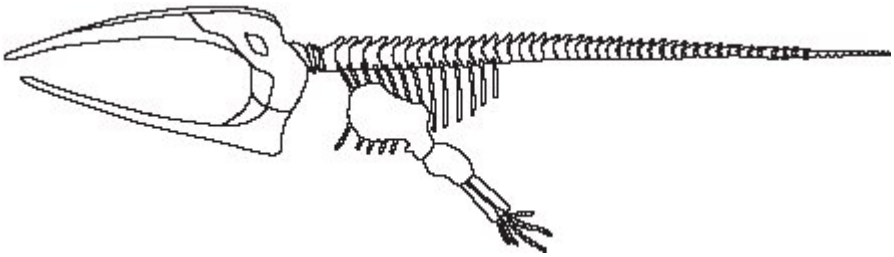
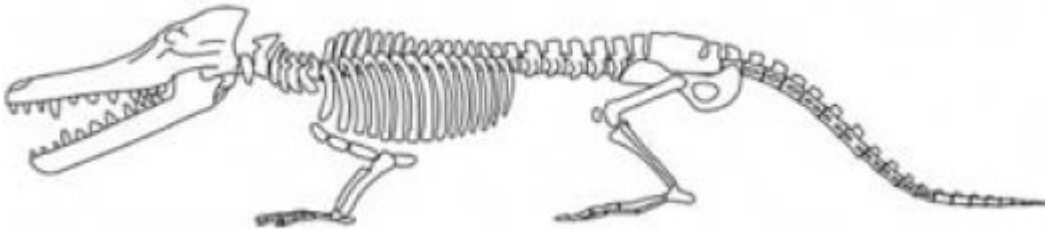


Figure 3 shows the fossil skeleton of an extinct whale.

Figure 3



Hans G Thewissen/ The Thewissen Lab

(i) Apart from size, give **two** differences between the skeleton of the minke whale and the fossil skeleton of the extinct whale.

1. _____

_____

2. _____

_____

(2)

(ii) In each of the sentences below, draw a ring around the correct answer.

Life on Earth first developed more than three | billion / million / thousand | years ago.

Fossils | disprove / give evidence for / prove | the theory of evolution.

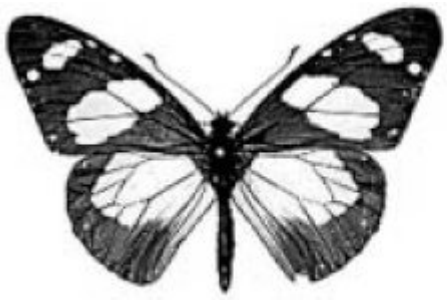
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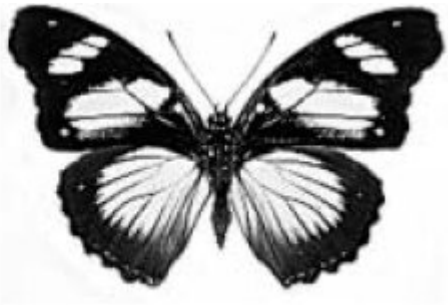
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Q26.

The drawings show two different species of butterfly.



Amauris



Hypolimnas

- Both species can be eaten by most birds.
- *Amauris* has a foul taste which birds do not like, so birds have learned not to prey on it.
- *Hypolimnas* does **not** have a foul taste but most birds do not prey on it.

(a) Suggest why most birds do **not** prey on *Hypolimnas*.

_____

_____

_____

_____

(2)

(b) Suggest an explanation, in terms of natural selection, for the markings on the wings of *Hypolimnas*.

_____

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(3)

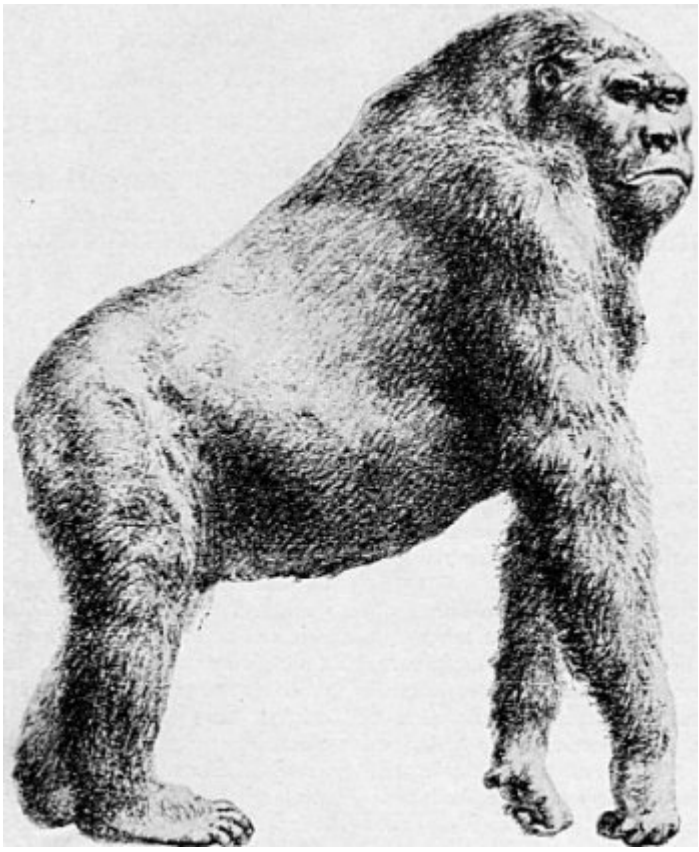
(Total 5 marks)

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Q27.

Read the article from a recent newspaper.

'King Kong' with inch-wide teeth who walked alongside early man.



Gigantopithecus blackii, R F Zallinger

The largest ape that walked on Earth was a prehistoric animal that weighed up to 540 kg. It was 3 metres tall and had inch-wide teeth. This giant ape roamed bamboo forests until 100 000 years ago. It is quite likely that the giant ape lived at the same time as early humans.

(a) What evidence might scientists have that the great ape existed?

_____

_____

(1)

(b) The drawing is an artist's impression of what the giant ape might have looked like.

Why do scientists not know exactly what the animal looked like?

_____

_____

(1)

(c) Scientists do not know why this giant ape became extinct.

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Suggest **two** reasons why this giant ape became extinct.

1. _____

_____

2. _____

_____

(2)

(Total 4 marks)

Q28.

(a) (i) Some diseases can be tackled by using antibiotics and vaccination. Explain fully why antibiotics cannot be used to cure viral diseases.

_____

_____

_____

_____

(2)

(ii) A recent study found that babies in 90 % of hospitals are infected with the MRSA bacterium.

Explain how the MRSA bacterium has developed resistance to antibiotics.

_____

_____

_____

_____

(2)

(b) A person can be immunised against a disease by injecting them with an inactive form of a pathogen.

Explain how this makes the person immune to the disease.

_____

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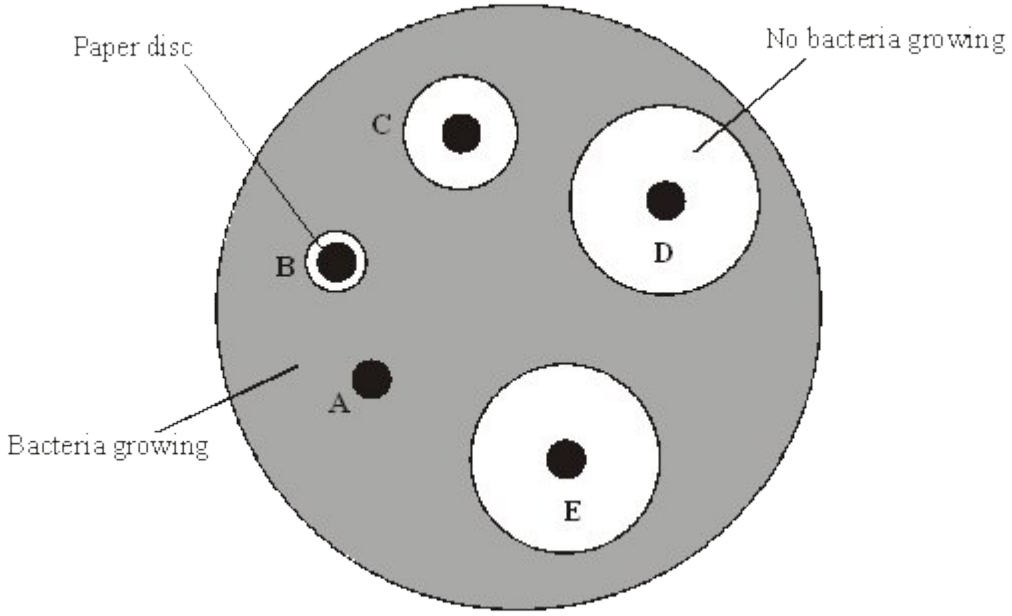
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(3)
(Total 7 marks)

Q29.

An investigator placed paper discs containing different concentrations of an antibiotic onto a culture of bacteria in a petri dish.

After an incubation period of two days, the dish looked like this.



(a) Explain why there are areas around some of the paper discs where no bacteria are growing.

_____

_____

(2)

(b) The concentration of the antibiotic on the paper discs is given in the table, along with the diameter of the circles where no bacteria are growing.

Disc	Concentration of the antibiotic in units	Diameter of circle where no bacteria are growing, in mm
A	0	0
B	2	8
C	4	14
D	6	26
E	10	26

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What effect does an increase in the concentration of the antibiotic have on the growth of the bacteria?

_____

_____

_____

(2)

(c) When students carry out this experiment, they need to take several safety precautions.

The precautions include:

- passing inoculating loops through a flame
- sealing the lid of the petri dish with tape
- incubating at a maximum temperature of 25 °C.

Explain why each of these precautions is necessary.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

(5)

(d) Scientists are concerned that many bacteria are developing resistance to antibiotics.

Suggest **two** ways by which this problem could be limited.

_____

_____

_____

_____

(2)

(Total 11 marks)

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Q30.

The vole is a small, mouse-like animal. Voles found on some cold islands to the north of Scotland are much larger than voles found in warmer areas such as southern France. Explain how natural selection may have caused the northern voles to be larger in size.

_____

_____

_____

_____

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_____

_____

(Total 5 marks)

Q31.

Doctors give antibiotics to patients to kill bacteria in their bodies.

Explain how the overuse of antibiotics has led to the evolution of antibiotic-resistant bacteria.

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

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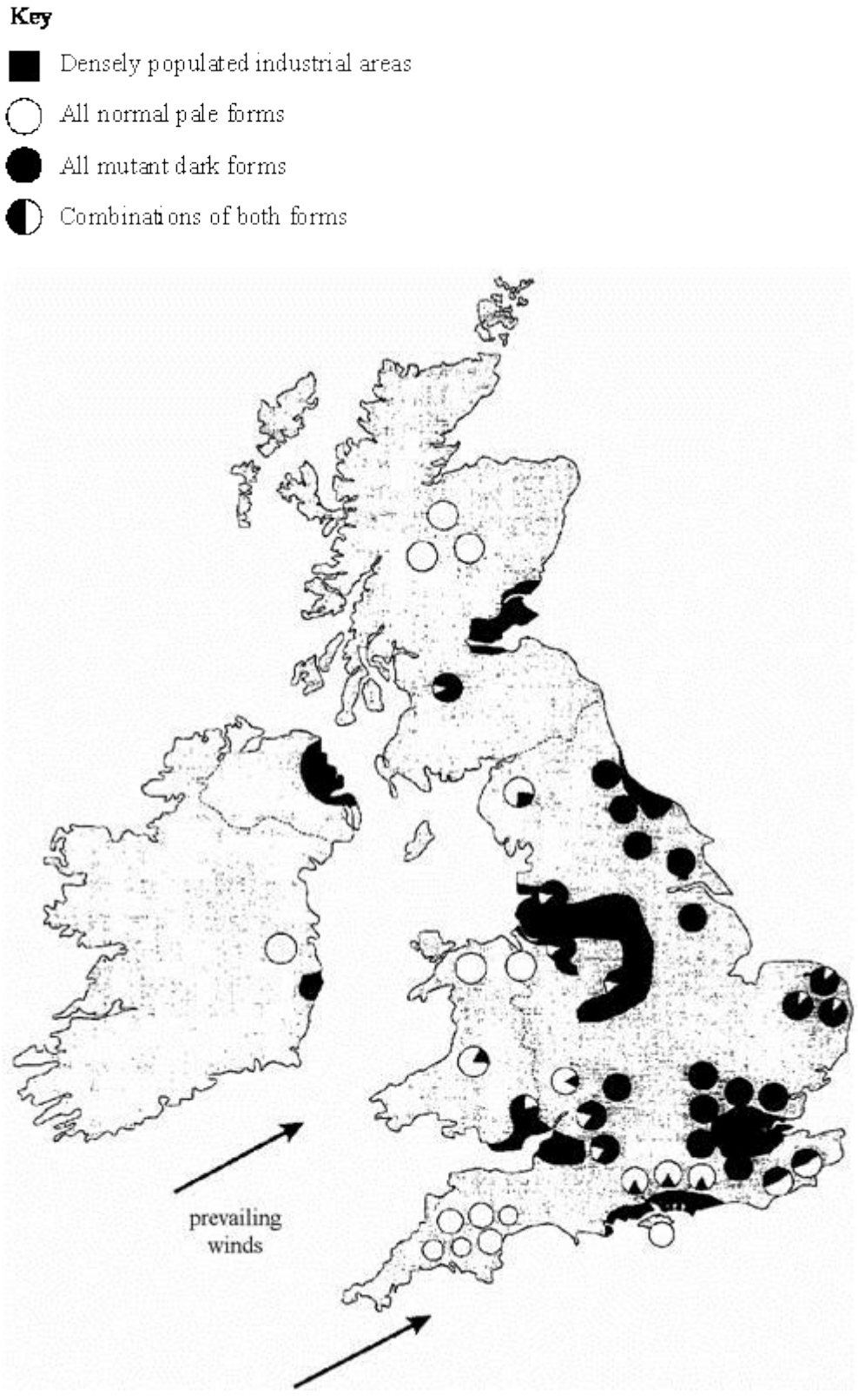
(Total 3 marks)

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Q32.

The map shows:

the most densely populated industrial areas;
the frequency of pale and dark forms of the peppered moth;
the direction of the prevailing winds in the British Isles.



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Peppered moths usually rest on trees covered with lichen, and they are preyed upon by many birds. In areas of low air pollution the lichen on trees is usually pale in colour. In areas of high air pollution the lichen turns black.

(a) (i) State a pattern of the distribution of the mutant dark form shown on the map.

_____

_____

(1)

(ii) Suggest a reason for your pattern.

_____

_____

(1)

(b) The dark form of peppered moth developed after a *mutation* in the pale form. What is a *mutation?*

_____

_____

(1)

(c) Using the idea of Natural Selection explain why the dark form of the moth is restricted to the areas shown.

_____

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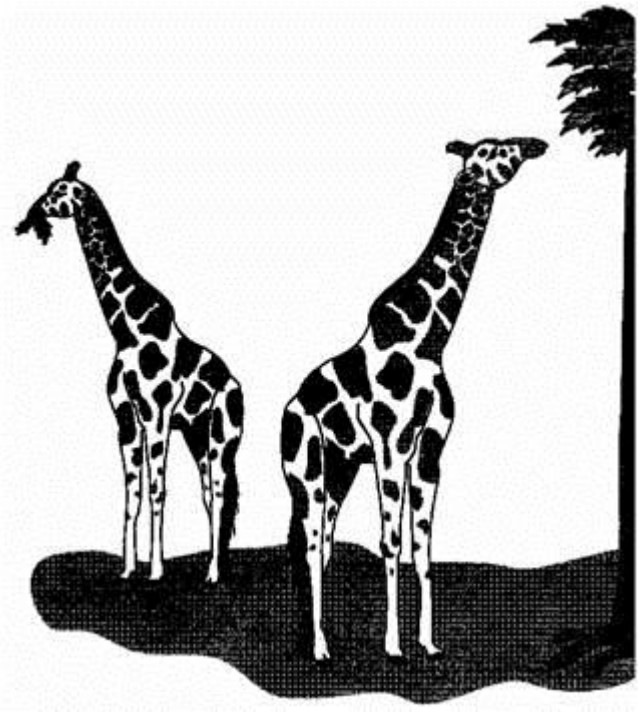
(4)

(Total 7 marks)

Q33.

Giraffes feed on the leaves of trees and other plants in areas of Africa. They are adapted, through evolution, to survive in their environment.

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(a) Use the information in the picture to give **one** way in which the giraffe is adapted to its environment.

_____

(1)

(b) Explain how Jean-Baptiste Lamarck (1744–1829) accounted for the evolution of the long neck in giraffes.

_____

_____

_____

_____

_____

(3)

(c) Another scientist, August Weismann (1834 -1914) wanted to check Lamarck's explanation. To do this he cut off the tails of a number of generations of mice and looked at the offspring.

His results did not support Lamarck's theory. Explain why.

_____

_____

_____

_____

_____

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(2)

(d) Explain how Charles Darwin (1809–1882) accounted for the evolution of the long neck in giraffes.

_____

_____

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(4)

(Total 10 marks)

Q34.

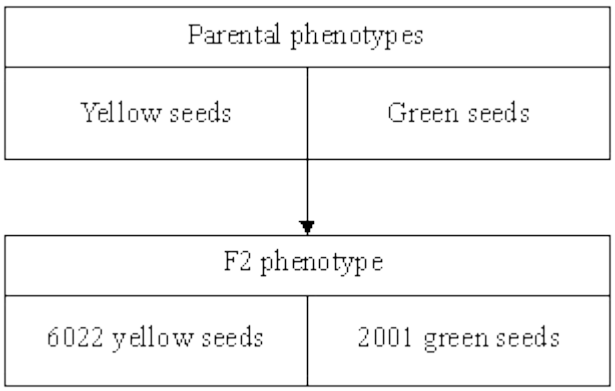
In the 1850s an Austrian monk, called Gregor Mendel, carried out a series of investigations on heredity.

(i) What plants did he use for his investigations?

_____

(1)

(ii) In his work he assumed that one gene controlled one characteristic. He started his investigations with pure breeding parents. Use a genetic diagram to show how he explained the following result.



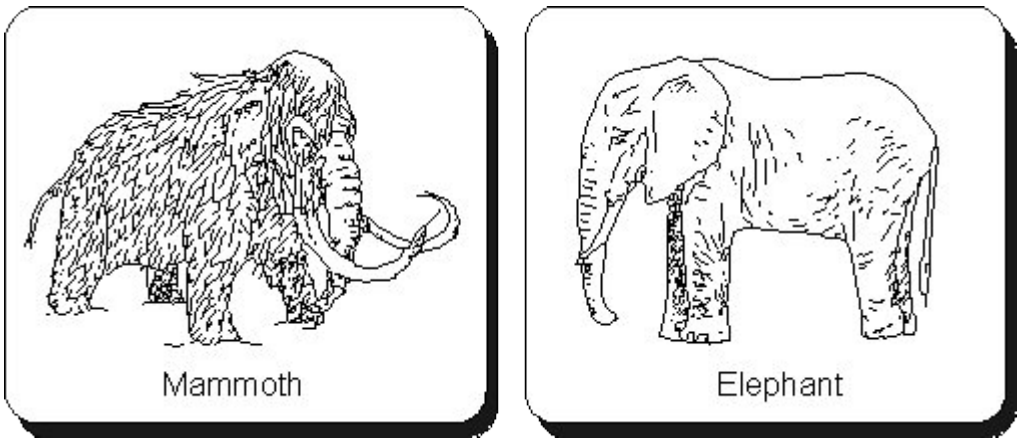
(4)

(Total 5 marks)

Q35.

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The drawings below show a mammoth, an extinct relation of the elephant which lived in arctic regions, and a modern elephant which lives in tropical areas.



The mammoth, which was very hairy, and the elephant, are both thought to have evolved from a scantily haired ancestor. Explain, as fully as you can, how the **mammoth** evolved from the common ancestor.

_____

_____

_____

_____

_____

(Total 5 marks)

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