AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.2 VARIATION AND EVOLUTION (PACK 3)

SCORE	PERCENTAGE
/234	%

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Q1.

Scientists have produced many different types of GM (genetically modified) food crops.

(a) Use words from the box to complete the sentence about genetic engineering.

clones	chromosomes	embryos	genes

GM crops are produced by cutting _____ out of the _____ of one plant and inserting them into the cells of a crop plant.

(2)

(b) Read the information about GM food crops.

- Herbicide-resistant GM crops produce higher yields.
- Scientists are uncertain about how eating GM food affects our health.
- Insect-resistant GM crops reduce the total use of pesticides.
- GM crops might breed naturally with wild plants.
- Seeds for GM crops can be bought from only one manufacturer.
- The numbers of bees will fall in areas where GM crops are grown.

Use this information to answer these questions.

(i) Give **two** reasons why some farmers are in favour of growing GM crops.

1. _____

_____

2. _____

_____

(2)

(ii) Give **two** reasons why many people are against the growing of GM crops.

1. _____

_____

2. _____

_____

(2)

(Total 6 marks)

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Q2.

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



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.

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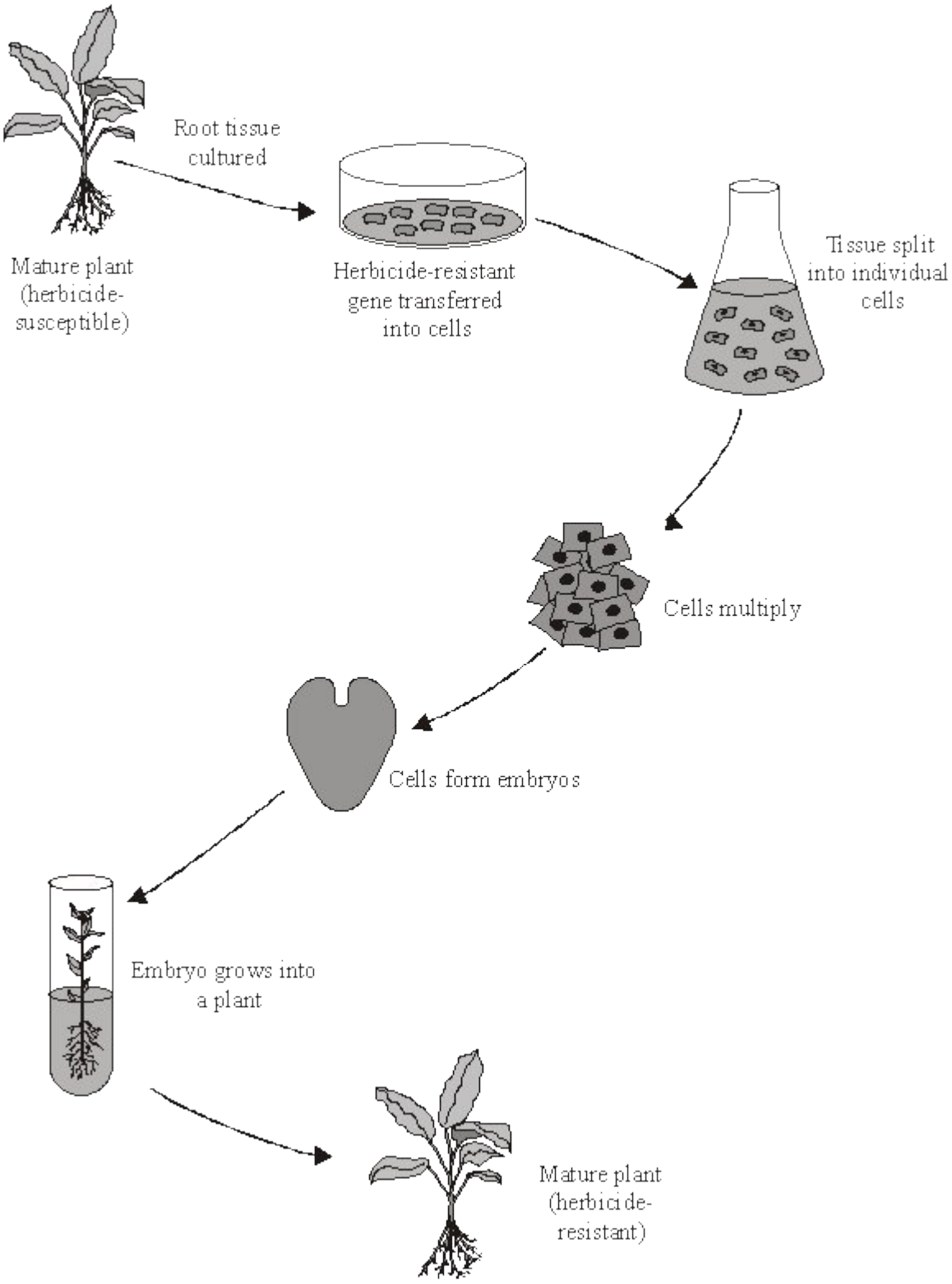
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(1)

(Total 5 marks)

Q3.

The diagram shows one method of producing herbicide-resistant crop plants.



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(a) (i) The herbicide-resistance gene is obtained from a herbicide-resistant plant.

Which structure in a cell carries the genes?

_____

(1)

(ii) How is the herbicide-resistance gene cut out of this structure?

_____

_____

(1)

(b) Apart from having the herbicide-resistance gene, the herbicide-resistant plants are identical to the herbicide-susceptible plants.

Explain why.

_____

_____

_____

_____

(2)

(c) Suggest **one** advantage to a farmer of growing herbicide-resistant crops.

_____

_____

(1)

(d) Many people are opposed to the growing of herbicide-resistant crops produced in this way.

Suggest **one** reason why.

_____

_____

(1)

(Total 6 marks)

Q4.

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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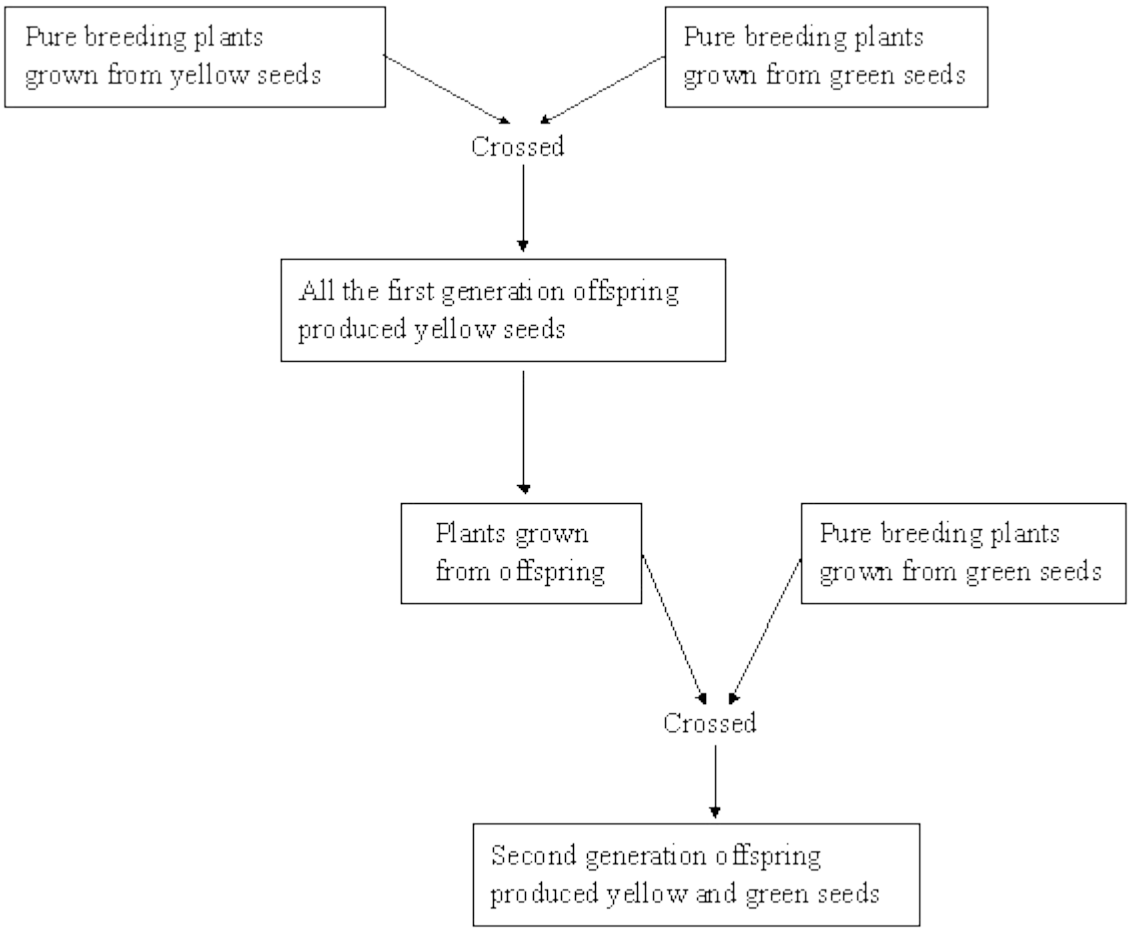
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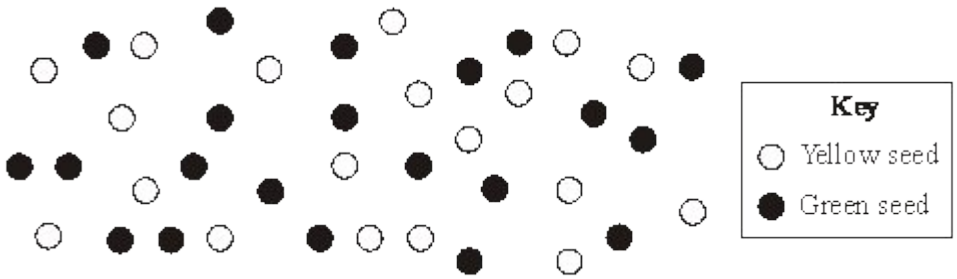
(2)

(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)

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

_____

(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)

Q5.

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.

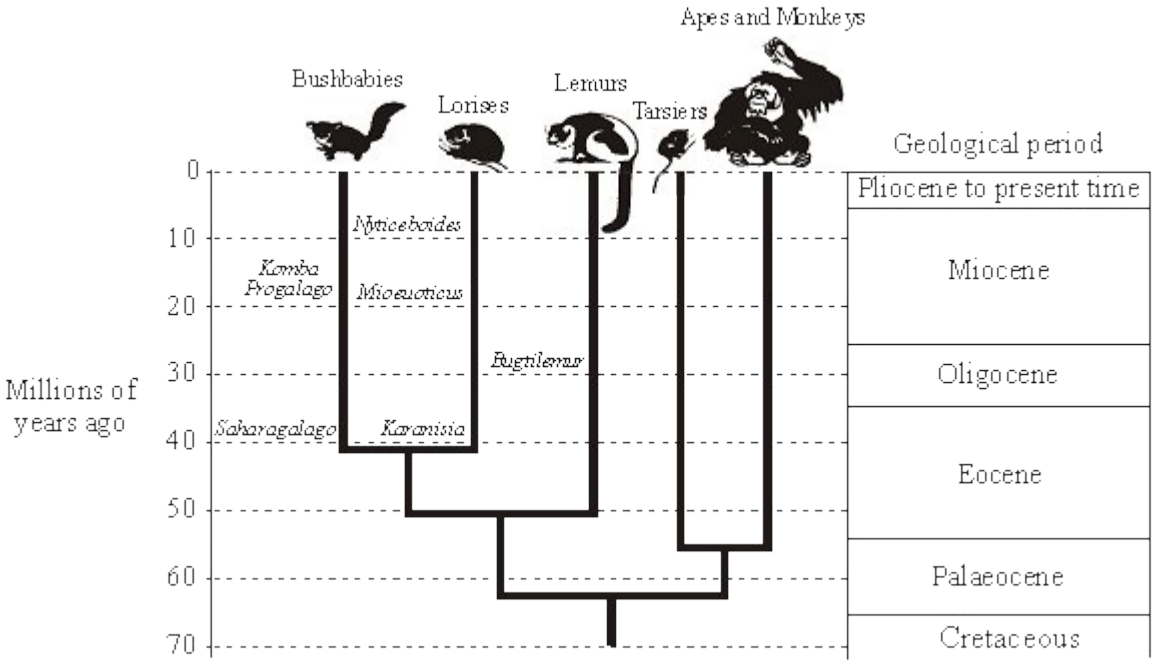


Illustration by Lucrezia Beerli-Bieler

(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)

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

_____

(1)

(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)

Q6.

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.

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

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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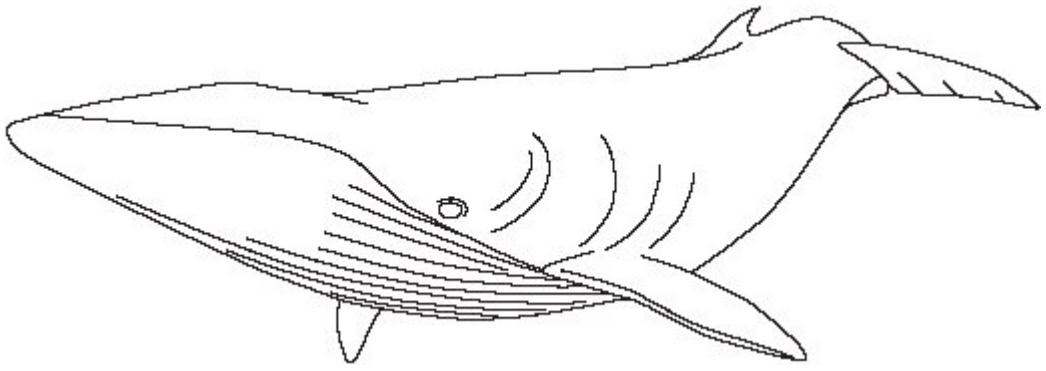
_____

(Total 4 marks)

Q7.

(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. _____

_____

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(2)

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

Figure 2

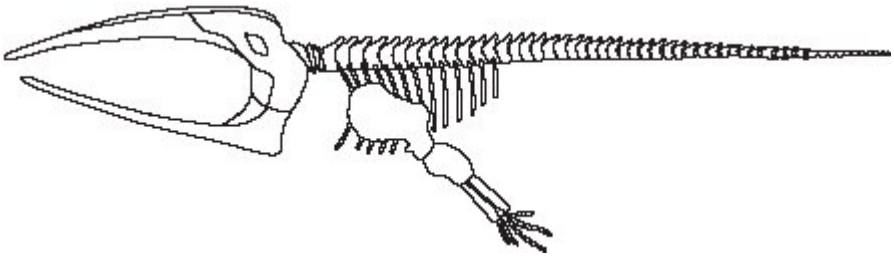
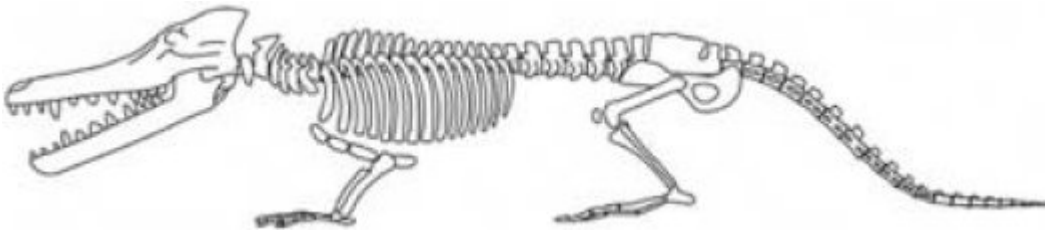


Figure 3 shows the fossil skeleton of an extinct whale.

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.

(2)

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(Total 6 marks)

Q8.

(a) Use words from the box to complete the sentences about curing disease.

antibiotics	antibodies	antitoxins	painkillers	statins

The substances made by white blood cells to kill pathogens are

called _____

The substances made by white blood cells to counteract poisons produced by

pathogens are called _____

Medicines which kill bacteria are called _____

(3)

(b) The MMR vaccine protects people against three diseases.

Write down the names of **two** of these diseases.

1. _____

2. _____

(2)

(c) All vaccinations involve some risk.

The table shows the risk of developing harmful effects:

- from the disease if a child is **not** given the MMR vaccine;
- if a child **is** given the MMR vaccine.

Harmful effect	Risk of getting the harmful effect from the disease (if not vaccinated)	Risk of getting the harmful effect from MMR vaccine
Convulsions	1 in 200	1 in 1000
Meningitis	1 in 3000	Less than 1 in 1 000 000
Brain damage	1 in 8000	0

A mother is considering if she should have her child vaccinated with the MMR vaccine.

Use information from the table to persuade the mother that she should have her child vaccinated.

_____

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_____

_____

_____

(2)

(d) The vaccine used to protect us from the Hepatitis B virus is produced by genetic engineering.

Yeast cells are used to produce the vaccine.

Use words from the box to complete the sentence.

chromosomes	**drugs**	**enzymes**	**genes**	**hormones**

To produce the vaccine _____ are used to cut out _____

from the Hepatitis B virus which are then inserted into the yeast cells.

(2)

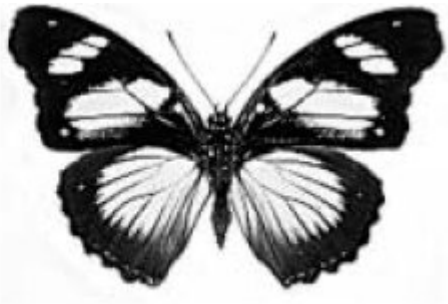
(Total 9 marks)

Q9.

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)

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

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q10.

Read the passage about IVF (in-vitro fertilisation) and embryo-splitting.

> "IVF is not as successful as we would like it," says scientist Michael Tucker. "On average, only one in five or one in six of all the embryos that we generate in the IVF lab will develop as far as full-term delivery as a baby."
>
> "There is a way to perhaps double those odds. A new, identical embryo is split off from the original embryo made in the IVF lab."
>
> "What we are really doing is creating an identical twin," says scientist Dr Hilton Kort.
>
> "And that's what happens in nature every day. Cloning is creating a replica of a person or an animal."

(a) Explain why the two embryos will develop into identical twins.

_____

_____

_____

_____

(2)

(b) Explain why the embryos are **not** clones of their parents.

_____

_____

_____

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_____

(2)

(c) The scientists want to develop this technique, but are afraid to do so because public opinion might be against the technique.

Suggest an explanation for this.

_____

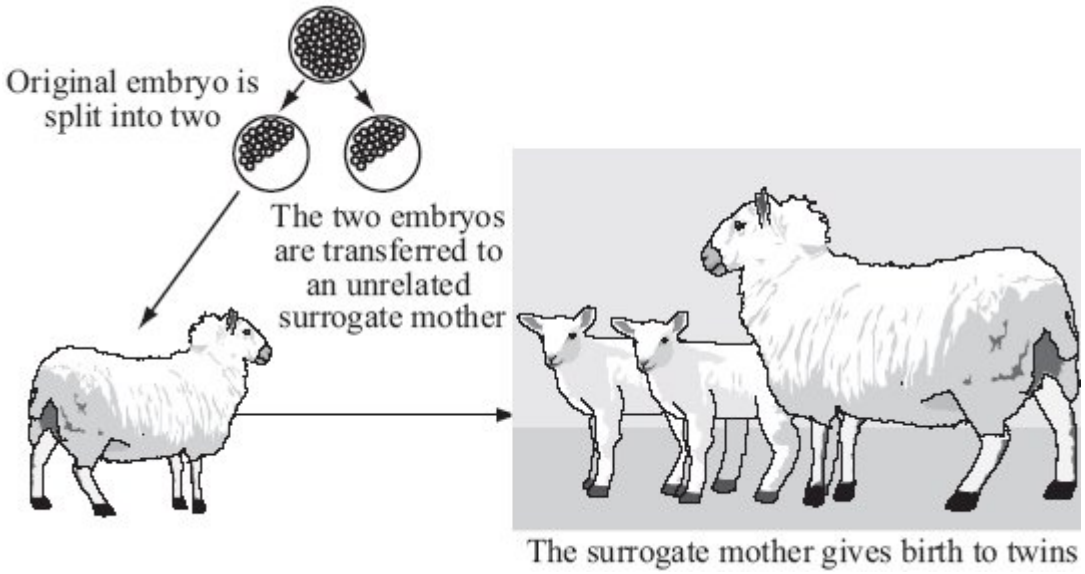
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(1)

(Total 5 marks)

Q11.

The diagram shows one way of cloning sheep.



Use words from the box to complete the sentences.

asexual	**clones**	**different**	**gametes**
identical	**joining**	**sexual**	**splitting**

The original embryo in the diagram developed following the _____ of an egg and a sperm. This is called _____ reproduction. The twins in the diagram have _____ genetic information. This is because the two embryos were produced by _____ reproduction. Because of this they are known as _____

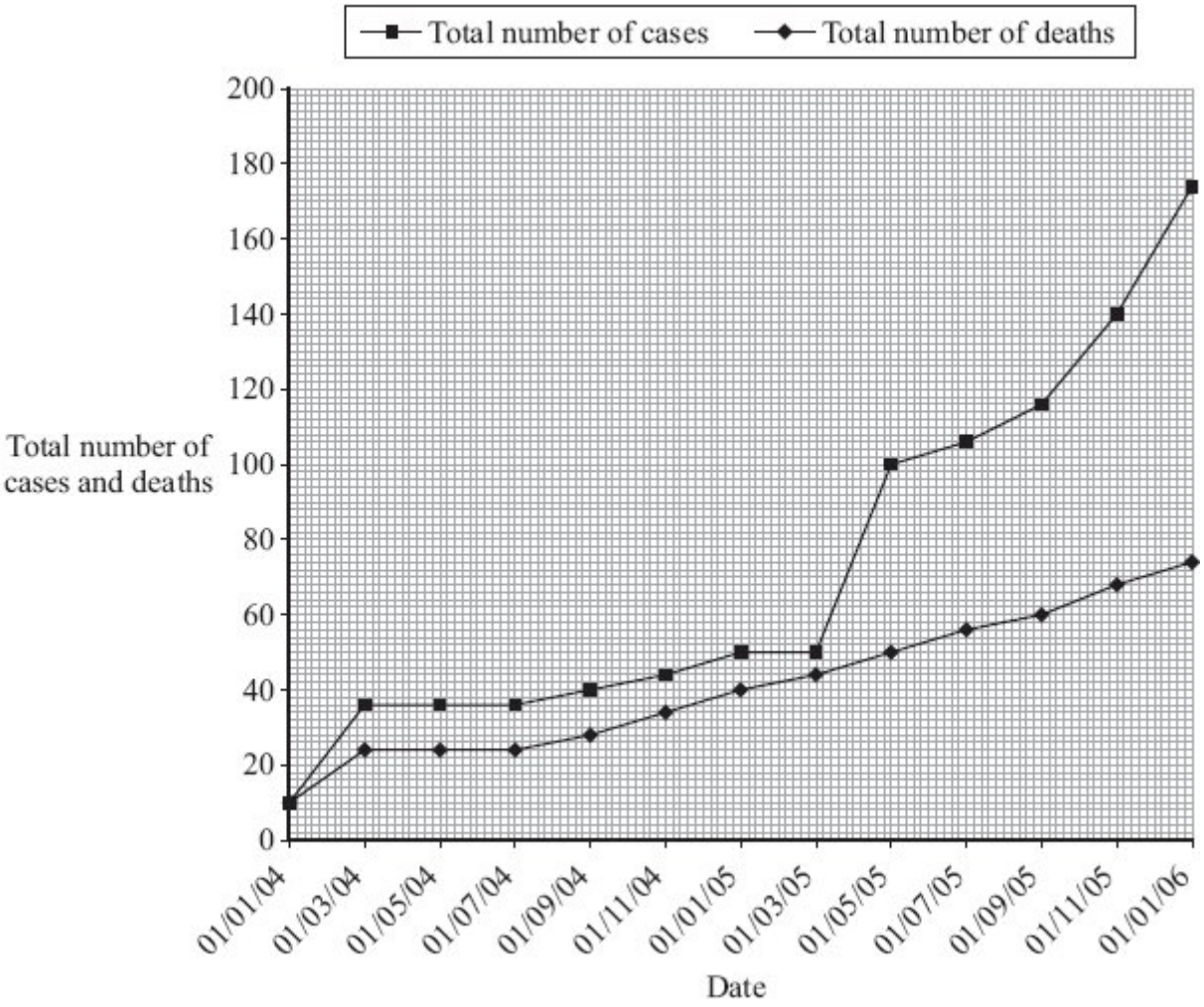
(Total 5 marks)

Q12.

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Scientists began to keep records of cases of H5N1 bird flu in humans in January 2004.

The graph shows the total number of cases of bird flu in humans and the total number of deaths up to January 2006.



(a) (i) How many people had died from bird flu up to 01/07/05?

_____

(1)

(ii) Describe, as fully as you can, how the number of cases of bird flu in humans changed between 01/07/04 and 01/01/06.

_____

_____

_____

_____

(2)

(b) At present, humans can only catch bird flu from contact with infected birds. The bird flu virus may mutate into a form that can be passed from one human to another.

Explain why millions of people may die if the bird flu virus mutates in this way.

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_____

_____

_____

_____

(2)

(Total 5 marks)

Q13.

Tetra is the first monkey to be cloned.



The method is described below.

- A sperm and an egg were combined and the resulting embryo was allowed to split into two cells, then four, then eight cells.
- At the eight-cell stage, the embryo itself was split by scientists to produce four two-cell embryos.
- The four embryos were then implanted into surrogate mothers. Three of the embryos did not survive. The fourth, Tetra, was born 157 days later. Her name means ‘one of four’.

(a) Explain why this method could produce several identical monkeys.

_____

_____

_____

_____

(2)

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(b) Suggest **two** reasons why these monkeys would be valuable in trials of new treatments for human diseases.

1. _____

_____

2. _____

_____

(2)

(Total 4 marks)

Q14.

(a) What does the theory of evolution state?

_____

_____

_____

_____

(2)

(b) *Daphnia* are microscopic water fleas. Midge larvae prey on *Daphnia*. The midge larvae release a hormone into the water. *Daphnia* respond to these hormones by growing larger protective 'helmet'-like structures

Scientists were surprised to observe that the offspring of *Daphnia* females who had been exposed to these hormones always had larger helmets than offspring whose mothers had never been exposed to the hormones. The offspring with the large helmets went on to produce offspring with large helmets.

Explain why the scientists' observations seem to contradict the theory of natural selection.

_____

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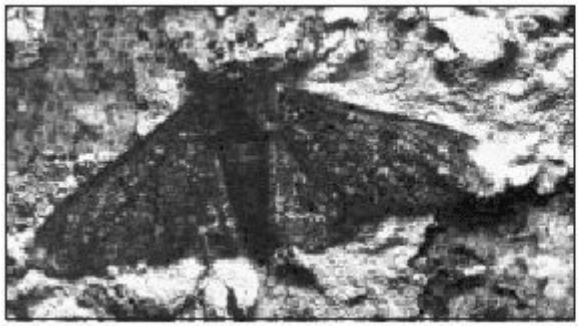
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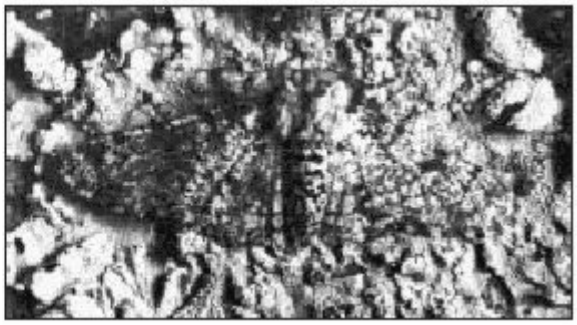
Q15.

The photographs show two varieties of moths, **X**and **Y**. The moths belong to the same species.
The moths are resting on a tree trunk in open countryside.

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Moth **X**



Moth **Y**

(a) Which variety of moth, **X** or **Y**, is more likely to be killed by insect-eating birds? Give a reason for your answer.

Variety of moth: _____

Reason _____

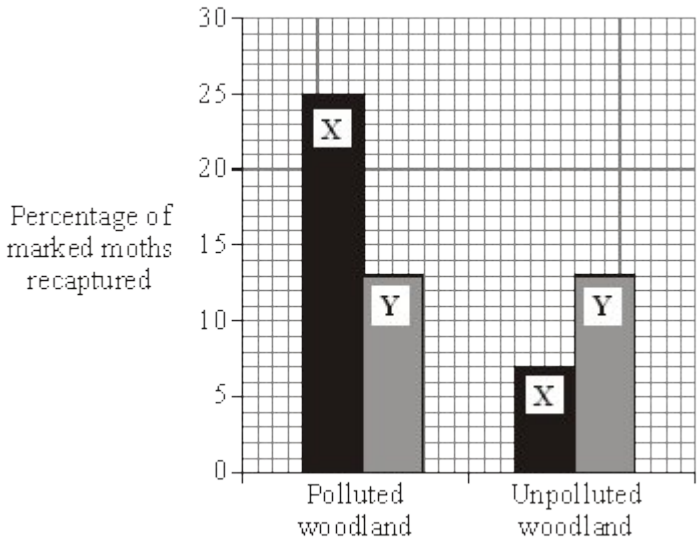
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(1)

(b) In an experiment, large numbers of each variety of moth were caught in a trap.

- They were marked with a spot of paint on the underside of one wing and then released.
- A few days later, moths were again trapped and the number of marked moths was counted.
- The experiment was carried out in a woodland polluted by smoke and soot, and also in an unpolluted woodland.

The results are shown in the bar graph.



(i) When the moths were being marked, suggest why the paint was put on the underside of the wing and not on the top.

_____

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(1)

(ii) What percentage of moths of type **X** was recaptured in:

the polluted woodland; _____

the unpolluted woodland? _____

(2)

(iii) In each woodland, only a small number of marked moths of both varieties were recaptured. Suggest **one** reason for this.

_____

_____

(1)

(c) (i) The colour of the moths is controlled by a gene. The dark form was first produced by a mutation in the gene.

What chemical, found in a gene, is changed by a mutation? Draw a ring around your answer.

carbohydrate **DNA** **fat** **protein**

(1)

(ii) Some of the offspring from the original dark moth were also dark. What caused this?

_____

_____

(1)

(Total 7 marks)

Q16.

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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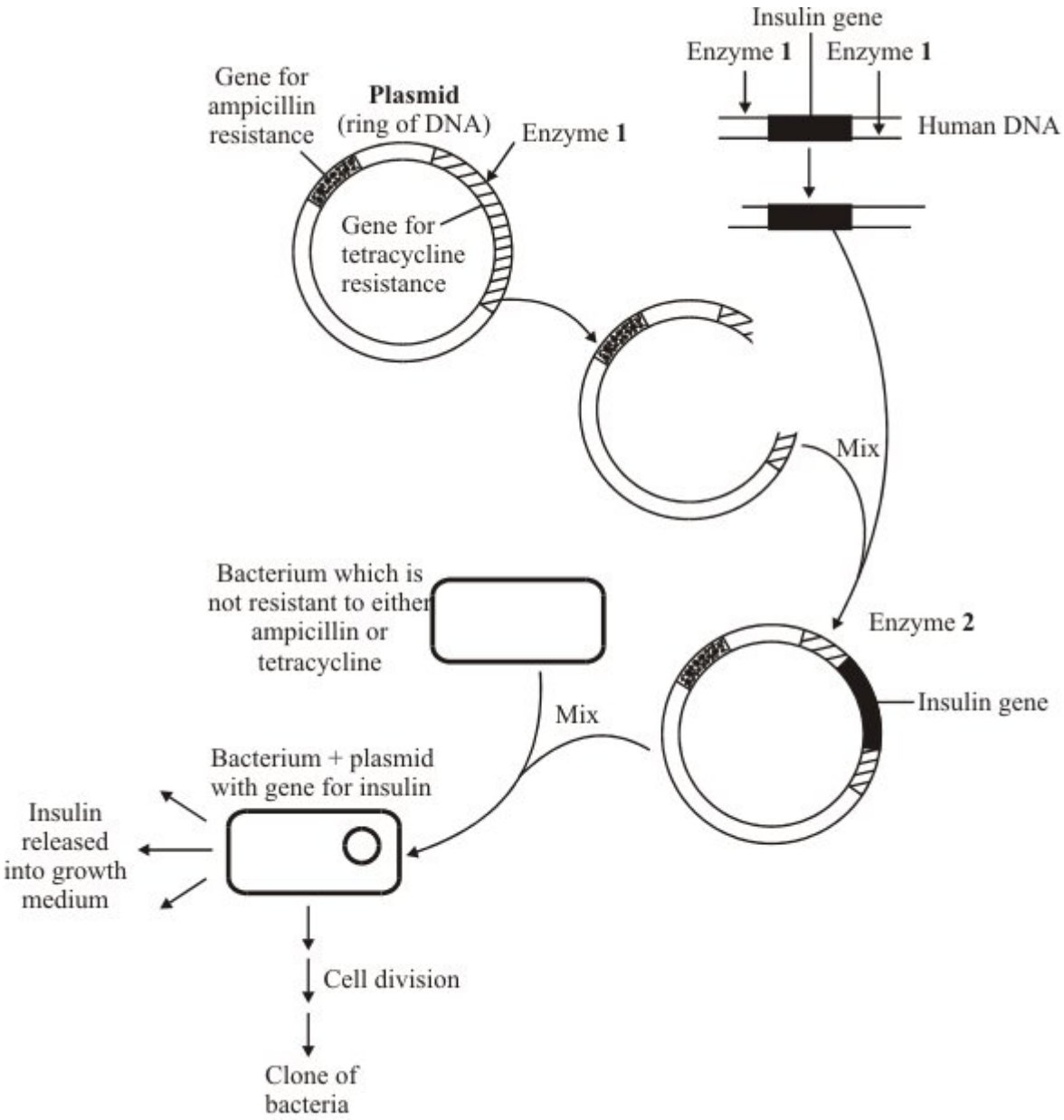
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(Total 5 marks)

Q17.

The diagram shows how genetic engineering can be used to produce human insulin from bacteria. Ampicillin and tetracycline are two types of antibiotic. Study the diagram carefully and answer the questions.



In experiments like these, some bacteria take up the plasmid (ring of DNA) containing the insulin gene. Other bacteria fail to take up a plasmid, or they take up an unmodified plasmid (a ring of DNA which has not been cut open and which does not contain the insulin gene).

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(a) Complete the table by putting a tick (✓) in the correct boxes to show which bacteria would be able to multiply in the presence of ampicillin and which bacteria would be able to multiply in the presence of tetracycline.

	Bacterium can multiply in the presence of	
	Ampicillin	**Tetracycline**
Bacterium + plasmid with the insulin gene		
Bacterium without a plasmid		
Bacterium with an unmodified plasmid		

(3)

(b) The bacterium with the plasmid containing the insulin gene multiplies by cell division to form a clone of bacteria.

Will **all** the bacteria in this clone be able to produce insulin? Explain your answer.

_____

_____

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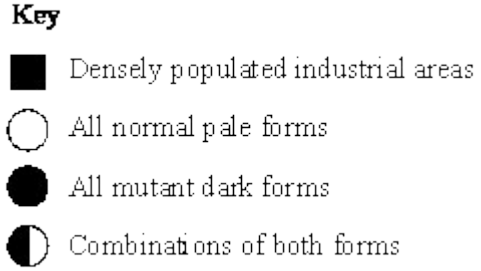
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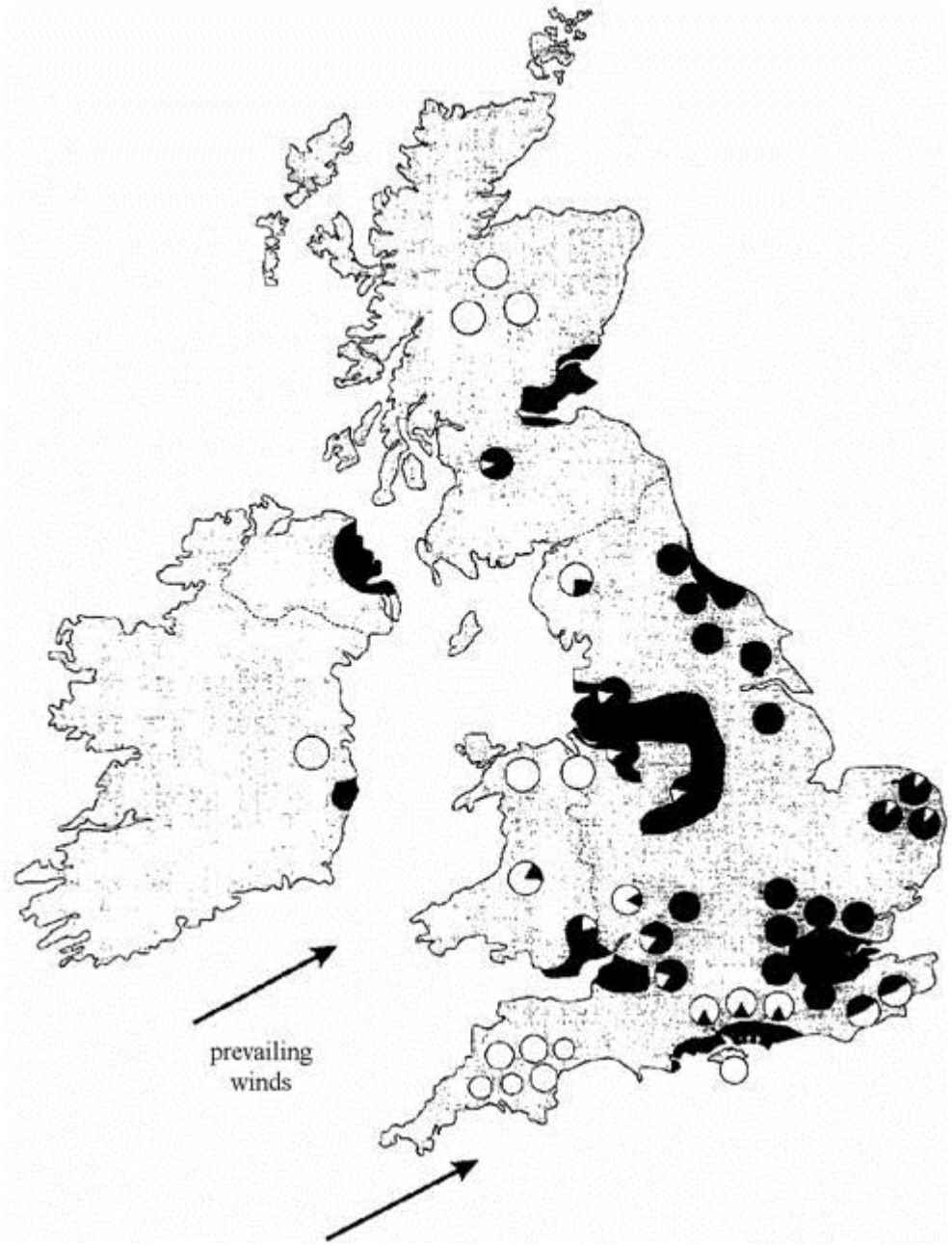
Q18.

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)

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(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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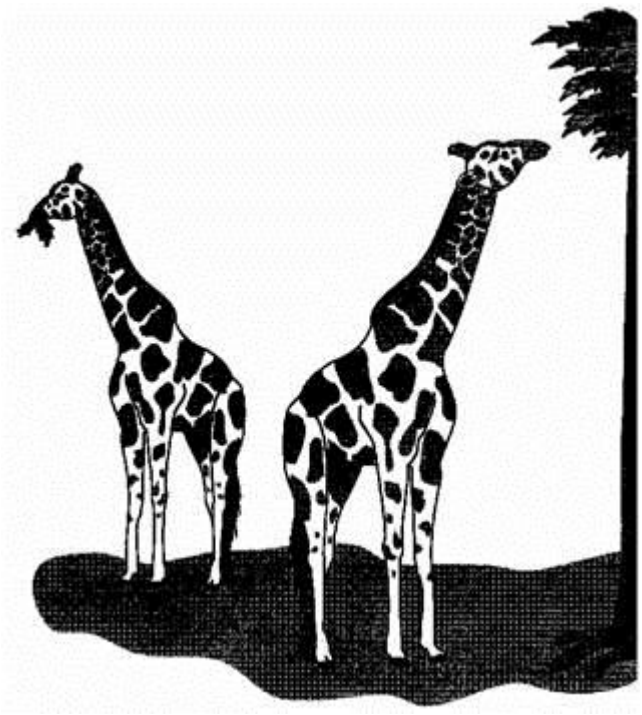
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(4)

(Total 7 marks)

Q19.

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



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

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_____

(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.

_____

_____

_____

_____

_____

(2)

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

_____

_____

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(4)

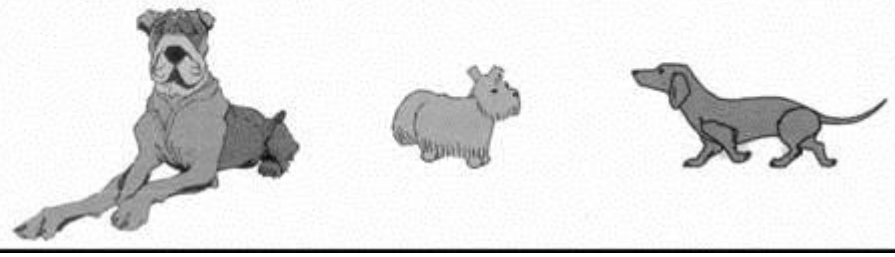
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Q20.

These are all dogs. They are *in the same species.*

Type:	Great Dane	Yorkshire Terrier	Standard Dachshund
Weight:	54 kg	3.5 kg	9 kg
Height to shoulder:	57 cm	25 cm	20 cm



(a) What does it mean to be *in the same species?*

_____

_____

(2)

(b) Complete the following sentences.

- When dogs reproduce the _____ produces sperm in the _____ and the female produces eggs in the _____
- Sperm and eggs are also called _____
- During mating, the sperm and eggs fuse together. This is known as _____
- Once this has happened the _____ starts to develop in the uterus of the mother.

(6)

(c) Explain why puppies have some of the characteristics of both parents.

_____

_____

_____

(2)

(Total 10 marks)

Q21.

Penicillin is an antibiotic which stops bacteria from reproducing. It was used a lot in the past to treat bacterial infections in humans and other animals. In many hospitals there are now strains of penicillin resistant bacteria.

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Explain how natural selection could have produced these strains of penicillin resistant bacteria.

_____

_____

_____

_____

_____

_____

_____

_____

(Total 5 marks)

Q22.

The following passage is adapted from an article by Martin Kelly in The Independent newspaper.

Thanks to the test tube banana

Specially bred resistant varieties may

save African crops from disease

A banana is a fruit, but it has no seeds. And if there are no seeds how do the plants reproduce? At one level the answer is easy; centuries of selective breeding have resulted in varieties with plenty of tasty flesh but few bitter inedible seeds, and propagation is carried out by means of root corms.

Most bananas we eat are thus actually 'clones' of a few successful plants, as is also the case with the potato. Banana clones are genetically identical to their parents, so growers can be completely sure their fruits will be big and tasty.

Genetic variability of these cloned plants is extremely low. Resistance to new diseases, therefore, is almost nil; witness the spread of potato blight through Ireland in the 1840s.

The issue goes well beyond our high streets and supermarkets. The banana has a larger relative called a plantain, which is starchy rather than sweet and is a staple food of more than 60 million Africans. Bananas and plantains are being ravaged by a new fungal disease called Black Sigatoka. The commercial planters that produce the bananas we buy in supermarkets have little problem here; they can afford to buy chemicals to spray their crops. African subsistence farmers, forced to rely on 'organic' methods can only sit by and watch their plants die.

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Several governments have turned to the International Institute for Tropical Agriculture (IATA) for help. IATA is in Africa, but is not of Africa. It is internationally funded with levels of staffing and equipment that enable advanced bio-technological techniques to be used. However, even with genetic engineering, to breed resistant varieties is a long-term project and Black Sigatoka is not going to wait. IATA scientists have had to divide their energies between two approaches: an interim solution and the development of resistant varieties.

The interim solution was easily found in a group of 'cooking bananas' which were resistant to Black Sigatoka disease and which could, to some extent, be substituted for plantain in the diet. These, however, were only found in localised areas and the first problem facing IATA was to obtain enough plants from the few available plants of resistant varieties to supply the needs of the affected farmers.

(a) Explain how selective breeding may have been used to produce bananas with tasty flesh.

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(2)

(b) Explain, as fully as you can, why “Genetic variability of these cloned plants is extremely low” compared with natural populations.

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(4)

(c) Explain, as fully as you can, how IATA scientists might be able to “obtain enough plants from the few available plants of resistant varieties to supply the needs of affected farmers”.

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(3)

(d) Explain, as fully as you can, how IATA scientists may use genetic engineering to produce varieties of banana resistant to Black Sigatoka disease.

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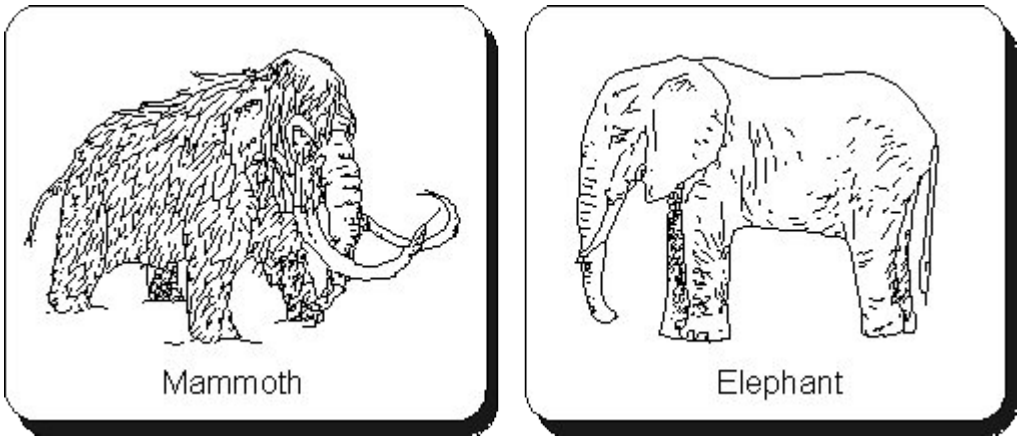
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(4)

(Total 13 marks)

Q23.

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.

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(Total 5 marks)

Q24.

The article below appeared in the Daily Mail on February 24 1993.

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March of the mutant tomatoes as Frankenfood hits the menu

Just when you thought it was safe to go back to the dinner table, 'Frankenfoods' are heading for the menu.

Rainbow trout with human genes and tomatoes grown with traits of flounder fish are the latest products of food scientists.

It is good news for producers – the trout grow bigger and more quickly, while the tomatoes have a lower freezing point, preventing them becoming damaged.

But consumer groups fear a whole breed of these 'genetically modified organisms' (GMOs) may be introduced without proper trials.

David King, director of the pressure group Genetic Forum, said: 'The march of scientists who want to genetically alter food has very serious implications both for animal welfare and the environment.'

'You run the risk of introducing triffid-like creatures – plants which have the capacity to overtake landscapes and force out other plant life.'

Genetic forum is to join groups including the RSPCA and World Wide Fund for Nature to debate a number of GMOs awaiting licenses in the United States.

They have called for proper labelling so shoppers can decide for themselves whether they want to buy modified foods.

Two genetic compounds – certain brands of cheddar cheese and bakers' yeast are already approved for use in British food manufacture, said Mr. King.

British multi-national ICI also has a company, Zeneca seeds, working on genetically altering food and is planning to sell tomatoes in which the ripening gene has been 'blocked' to increase shelf life.

An ICI spokesperson said 'Extensive trials are carried out on all these modified foods and we are required by the Ministry of Agriculture to provide full information on all our trials.'

Growers were able to pick the new tomato when it was ripe and red instead of green and it was wrong to label such an advance 'Frankenfood', she said.

'It has very negative connotations which are not at all correct. The entire drive behind this work is to produce positive benefits to the consumer.'

ICI had helped to produce crops able to resist pests and diseases, bringing food to people who otherwise would go hungry, she added.

(a) The foods described in the article have been produced by genetic engineering. Explain, as fully as you can, how this technique is used to produce 'genetically modified organisms'.

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(4)

(b) Having produced the desired type of tomato by genetic engineering, how might scientists quickly produce large numbers of the new plants to supply to horticulturists?

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(2)

(c) Using information from the article and your own knowledge, assess the advantages and disadvantages of producing new types of food by genetic engineering.

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(6)

(Total 12 marks)

Q25.

Cotton crops may become infested with weeds. Scientists are developing genetically-engineered strains of cotton which resist the action of herbicides. This means that when the crop is sprayed with herbicide, only the weeds are killed. However, there are potential dangers with this procedure. Cotton plants can interbreed with some other species of plants.

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Evaluate the possible advantages and disadvantages of developing genetically-engineered herbicide-resistant crops.

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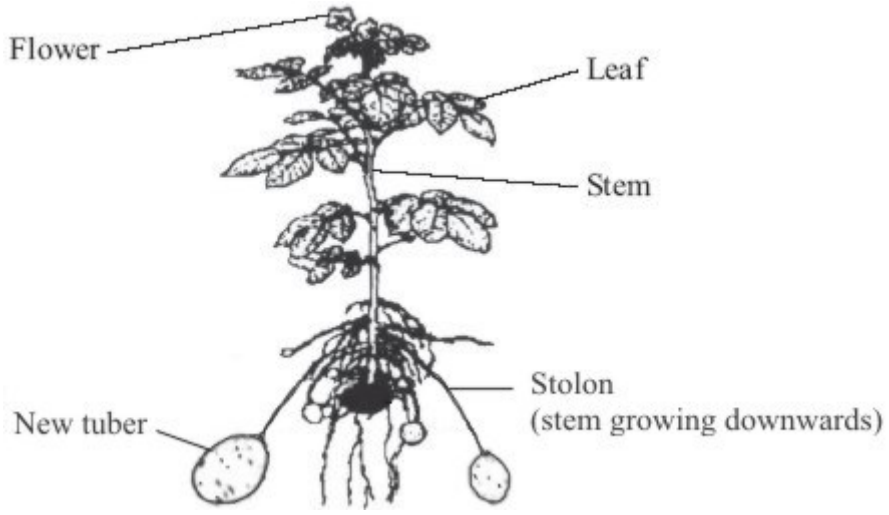
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(Total 5 marks)

Q26.

The drawing shows a potato plant producing new tubers (potatoes). Buds on the stem of the parent plant produce stolons. The new tubers are formed at the ends of the stolons (stems that grow downwards).



(a) Explain why the new tubers are genetically identical to each other.

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(2)

(b) Some of the tubers are used to produce potato plants. These new potato plants will not all grow to the same height.

Give **one** reason why.

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(1)

(Total 3 marks)

Q27.

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.

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(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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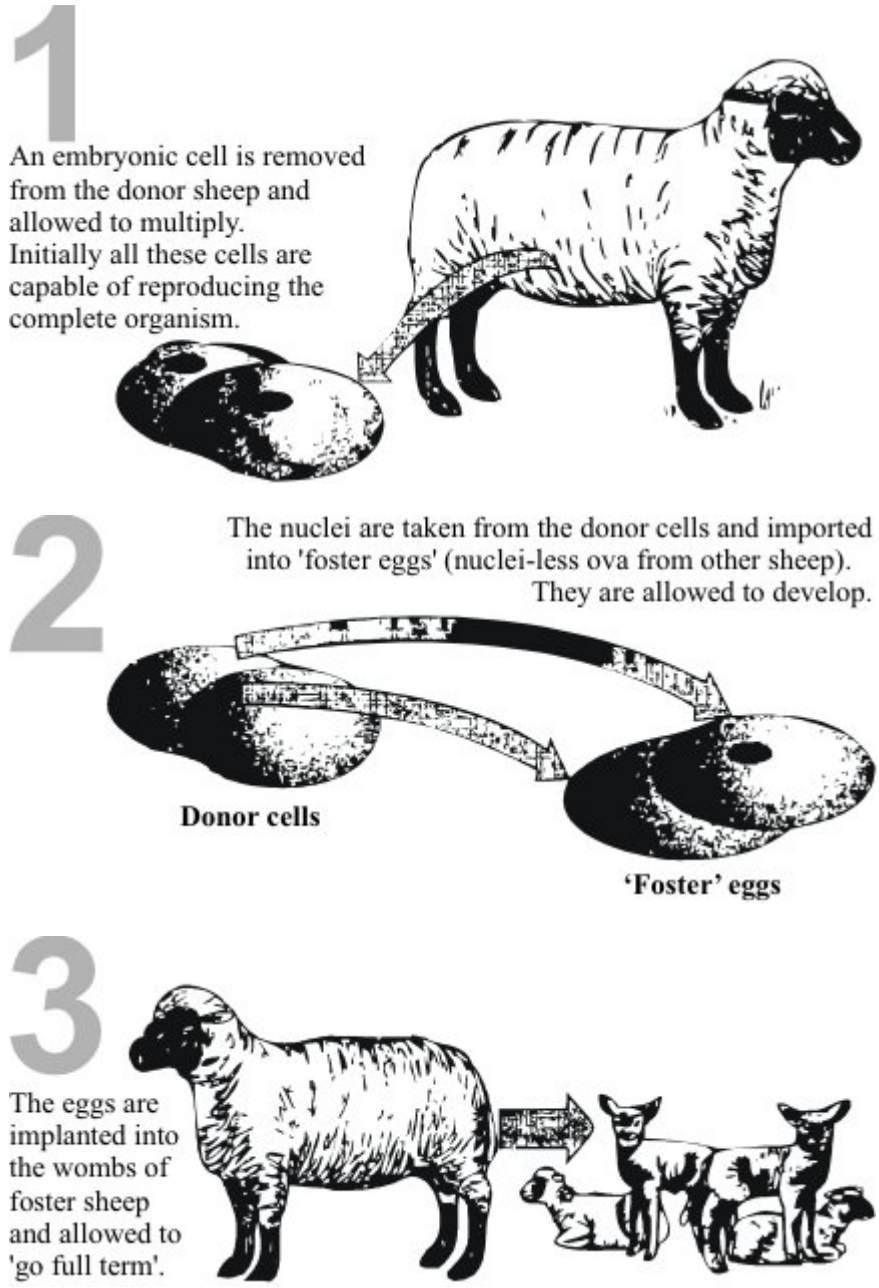
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(3)

(Total 7 marks)

Q28.

The diagram shows one method of cloning sheep.



(a) Explain why the lambs produced by this technique are identical to each other.

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(2)

(b) Explain why the lambs are **not** genetically identical to the sheep which produced the 'foster' eggs.

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(2)

(c) Explain the drawback of widespread use of just a few clones of sheep.

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(3)

(Total 7 marks)

Q29.

A market gardener produces large numbers of attractive, large flowered geranium plants.

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(a) Give two advantages to the gardener of producing geraniums from cuttings rather than from seeds.

1. _____

_____

2. _____

_____

(2)

(b) Gardeners often cover trays of cuttings with large polythene bags.

Suggest **one** advantage of this.

_____

_____

(1)

(Total 3 marks)

Q30.

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.

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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?

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(3)

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

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(3)

(Total 6 marks)

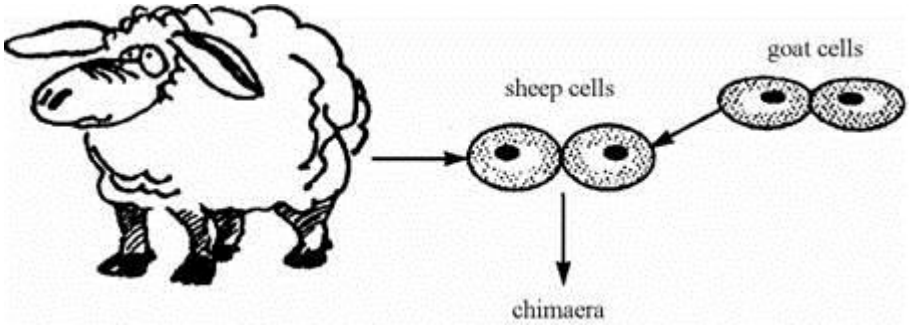
Q31.

Read the passage.

One reason for cloning animals is to prevent rare breeds from becoming extinct. Early embryos can be divided into four to produce identical quads. Dividing a young embryo into more than four parts is a problem because each part may not have enough cells to create both an embryo and a placenta.

The problem can be overcome by adding cells from another embryo, to make a mixture of cells called a chimaera. The two sets of cells may be from two different breeds of animals, or even two different species, such as sheep and goats.

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The aim is not to create freaks but chimaeras in which the added cells form the placenta only. The sheep embryos are given cells to make goat placentas and are carried to full term in the uteri of goats. They are born as pure sheep.

(a) Explain why the sheep embryos with added goat placental cells develop into sheep, not goats.

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(2)

(b) Use information from the passage and your own knowledge and understanding to evaluate the use of cloning techniques in agriculture.

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(6)

(Total 8 marks)

Q32.

Busy lizzie plants produce flowers with many different colours.

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A gardener wants to produce busy lizzie plants to fill a flower bed in her garden.
She decides to grow them from cuttings rather than seeds.

(a) Give **one** condition that she should supply to the new cuttings so that they grow well.

_____

(1)

Busy Lizzie plants can produce flowers which are white, pink or red.
A gardener wants to grow a display containing all three colours of flowers.

(b) Give **one** advantage and **one** disadvantage to the gardener of growing Busy Lizzie plants from cuttings rather than seeds.

Advantage _____

Disadvantage _____

(2)

(Total 3 marks)

Q33.

(a) Use words from the list to complete the sentences.

alleles **chromosomes** **gametes** **genes** **mutations**

The nucleus of a cell contains thread-like structures called _____ .

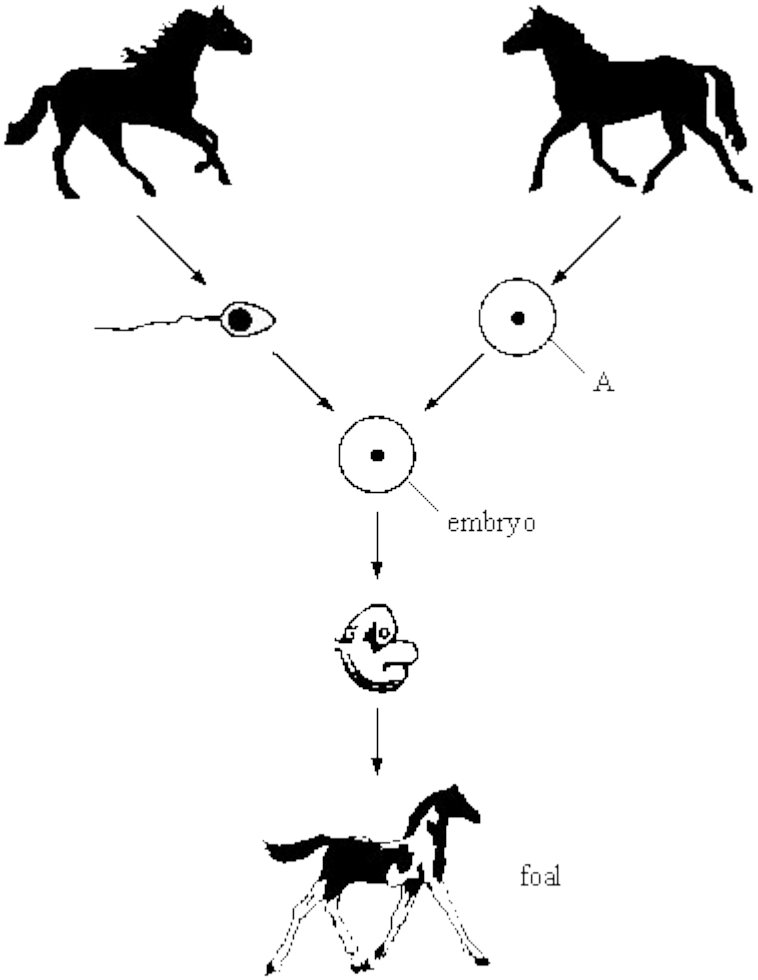
The characteristics of a person are controlled by _____

which may exist in different forms called _____ .

(3)

(b) The drawing shows some of the stages of reproduction in horses.

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(i) Name this type of reproduction _____

(1)

(ii) Name the type of cell labelled **A** _____

(1)

(c) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.

(i) Explain why it will look similar to its parents.

_____

_____

(1)

(ii) Explain why it will **not** be identical to either of its parents.

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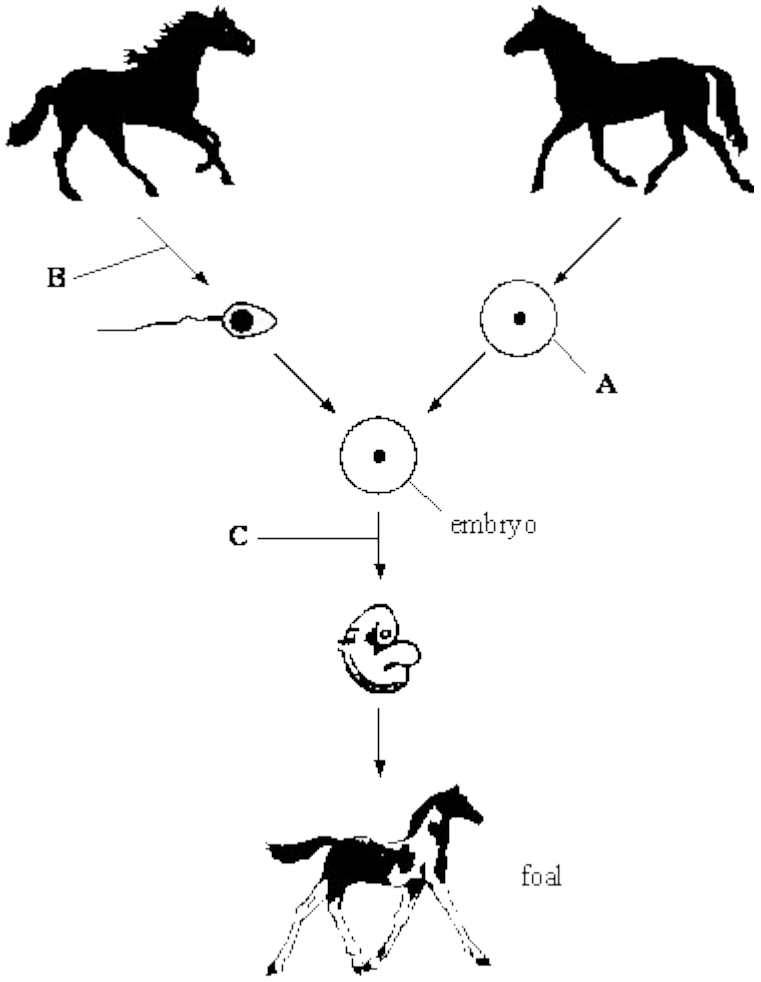
(2)

(Total 8 marks)

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Q34.

The drawing shows some of the stages of reproduction in horses.



(a) (i) Name this type of reproduction _____

(1)

(ii) Name the type of cell labelled **A** _____

(1)

(b) Name the type of cell division taking place at the stage labelled:

(i) **B** _____

(ii) **C** _____

(2)

(c) How does the number of chromosomes in each cell of the embryo compare with the number of chromosomes in cell **A**?

_____

(1)

(d) When the foal grows up it will look similar to its parents but it will **not** be identical to either parent.

(i) Explain why it will look similar to its parents.

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(1)

(ii) Explain why it will **not** be identical to either of its parents.

_____

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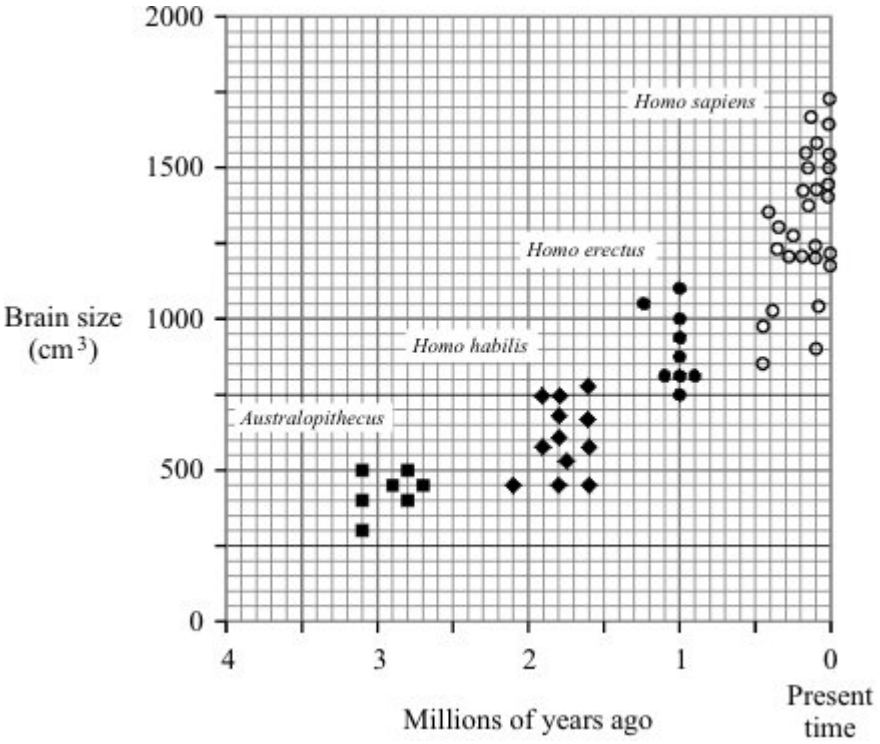
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(2)

(Total 8 marks)

Q35.

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*.

_____

_____

_____

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_____

(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)

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