AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



EXAM QUESTION PACK

4.6.2 VARIATION AND EVOLUTION (PACK 4)

SCORE	PERCENTAGE
/149	%

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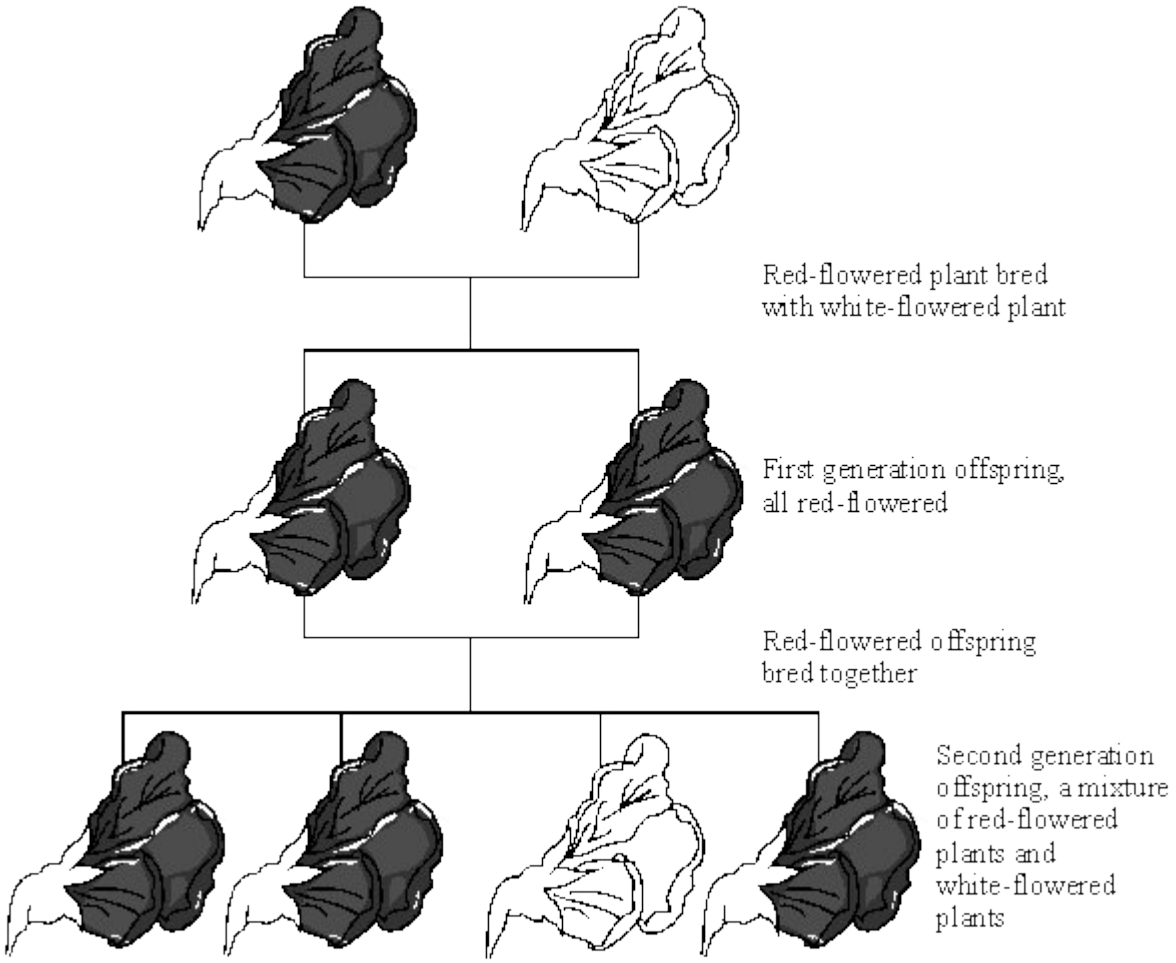
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Q1.

The diagrams show one of the experiments performed by a scientist called Mendel.

He bred sweet pea plants.



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

Mendel proposed that flower colour was controlled by inherited factors.

The first generation plants show that the red factor is

dominant
environmental
recessive

The second generation plants show that the white factor is

dominant
environmental
recessive

We now call inherited factors

chromosomes
gametes
genes

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These factors are passed from generation to generation in [gametes / glands / organs]

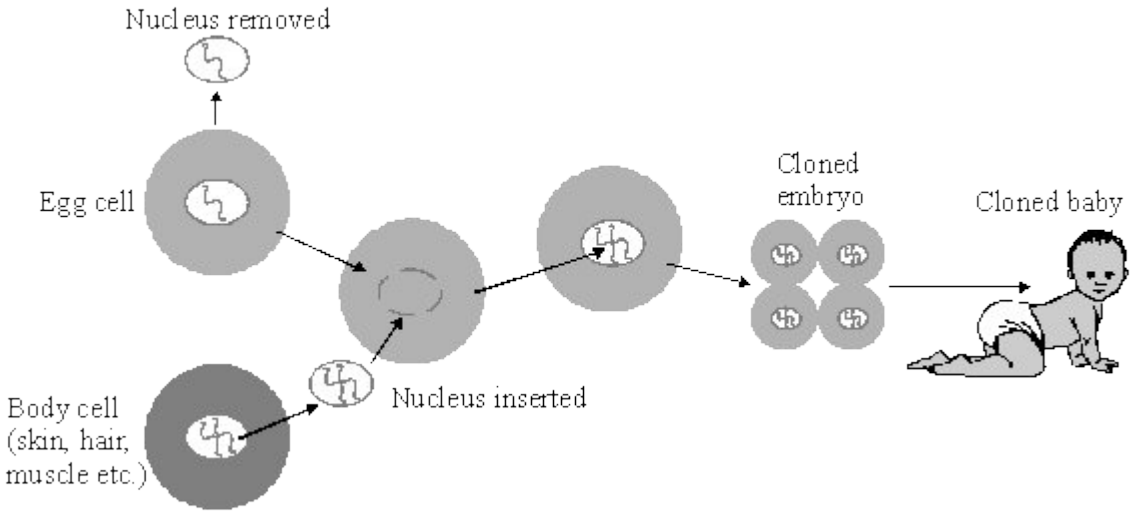
The red-flowered sweet pea plants did not all grow to the same height.

This was due to [dominant / environmental / recessive] factors.

(Total 5 marks)

Q2.

It is now possible to clone humans. The diagram shows one way in which this can be done.



(a) What type of reproduction is this?

_____

(1)

(b) Will the baby have the characteristics of the egg cell or the body cell?

_____

Explain the reason for your answer.

_____

_____

_____

_____

(2)

(c) The procedure in the diagram could be used to produce several cloned embryos.

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Suggest how this might be done.

_____

_____

(1)

(Total 4 marks)

Q3.

Genetic engineering is being used to help sufferers of cystic fibrosis.

In the sentence below, cross out the **two** lines which are wrong in each box.

In genetic engineering, genes are cut out of	cell membranes chromosomes cytoplasm	using	drugs enzymes hormones	

(Total 2 marks)

Q4.

In some methods of reproduction, clones are made.

(a) Explain what is meant by a clone.

_____

_____

_____

_____

(2)

(b) *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.*

Describe, in as much detail as you can, **one** way in which an embryo can be cloned.

_____

_____

_____

_____

_____

_____

(3)

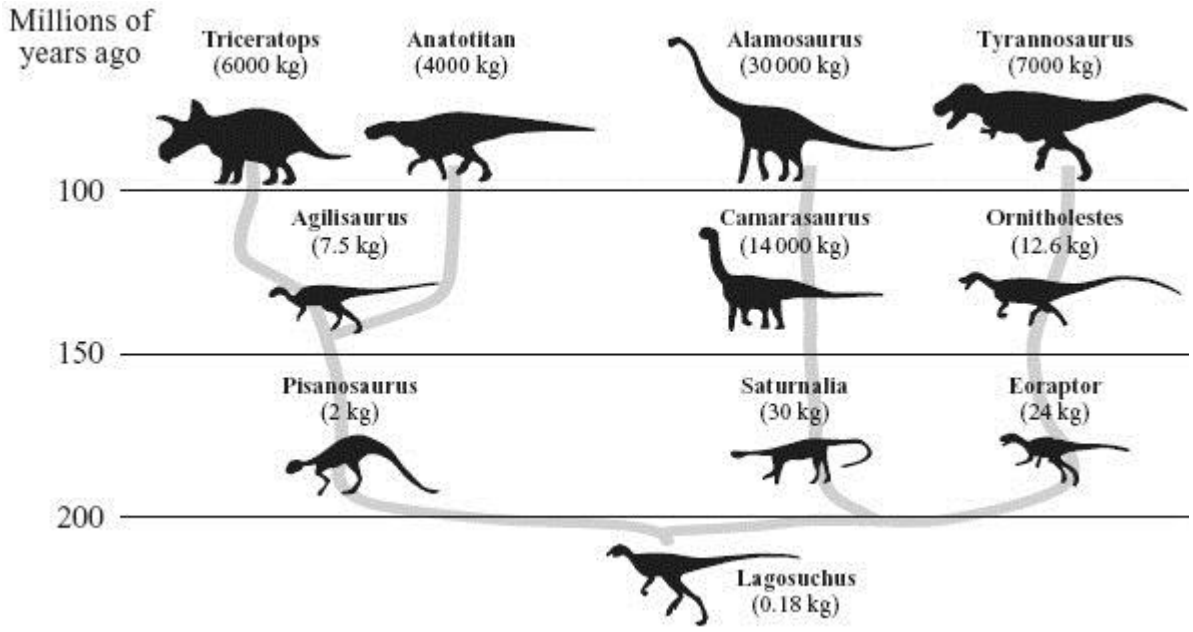
(Total 5 marks)

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Q5.

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?

_____

(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.

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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)

Q6.

Carnation plants have attractive flowers.



(a) Carnation plants are grown from cuttings.

Complete the sentences by using the correct words from the box.

asexual	**clones**	**genes**	**mutation**	**sexual**

Carnations grown from cuttings have the same _____ as their parents.

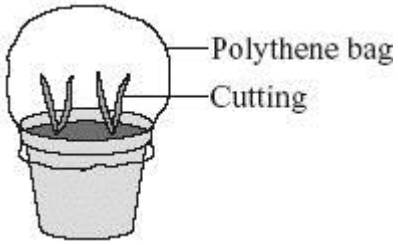
This type of reproduction is _____ .

The new plants are known as _____ .

(3)

(b) Gardeners usually cover the cuttings with a polythene bag as shown in the diagram below.

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Why do the cuttings grow better if gardeners do this?

_____

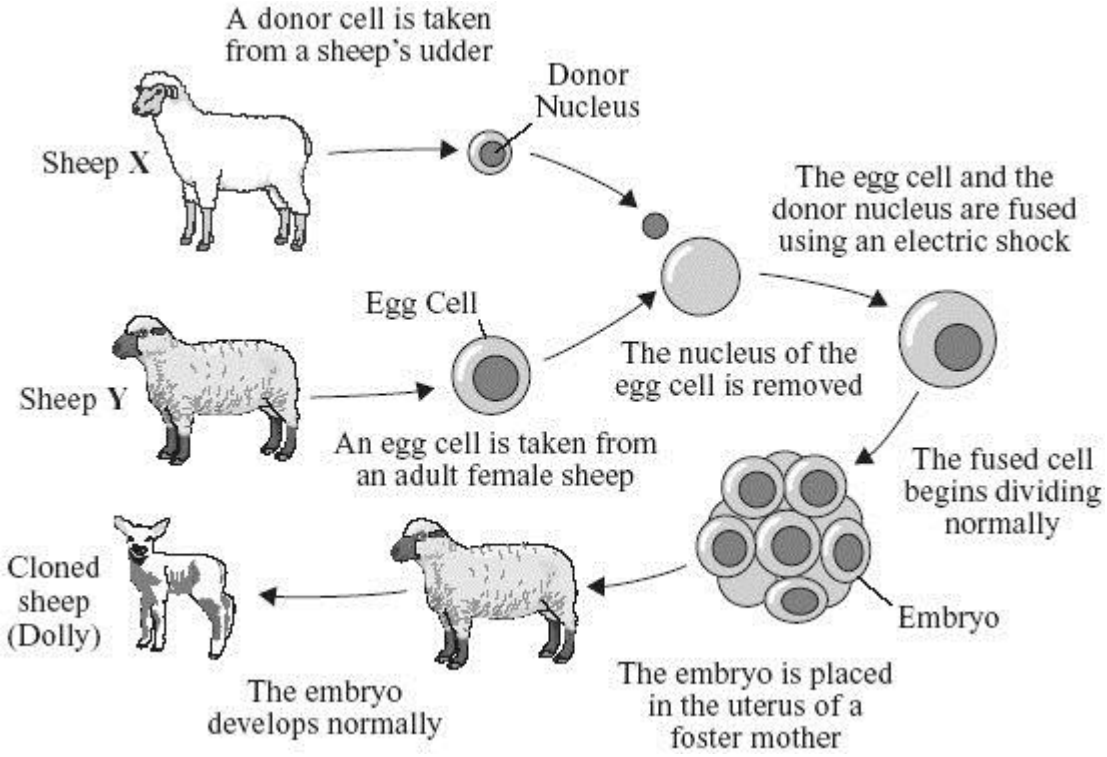
_____

(1)

(Total 4 marks)

Q7.

The diagram shows how Dolly the sheep was cloned.



(a) Name the type of cell division that occurs:

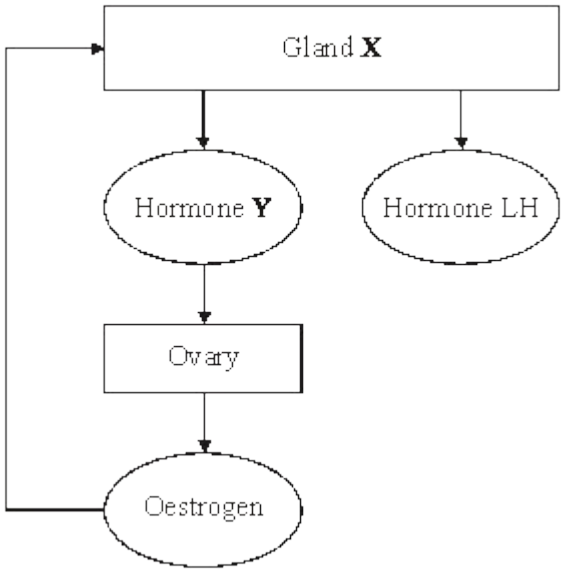
(i) as the egg cell is produced; _____

(ii) as the fused cell begins to divide normally. _____

(2)

(c) The diagram below shows the relationships between the glands and hormones that control the menstrual cycle of a woman.

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(i) Name:

gland **X**; _____

hormone **Y**. _____

(2)

(ii) Give **two** effects of the hormone oestrogen on gland **X**.

1. _____

_____

2. _____

_____

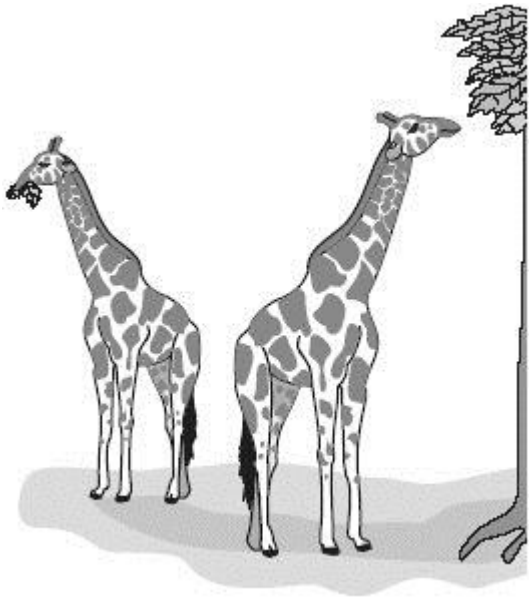
(2)

(Total 6 marks)

Q8.

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.

_____

_____

_____

_____

_____

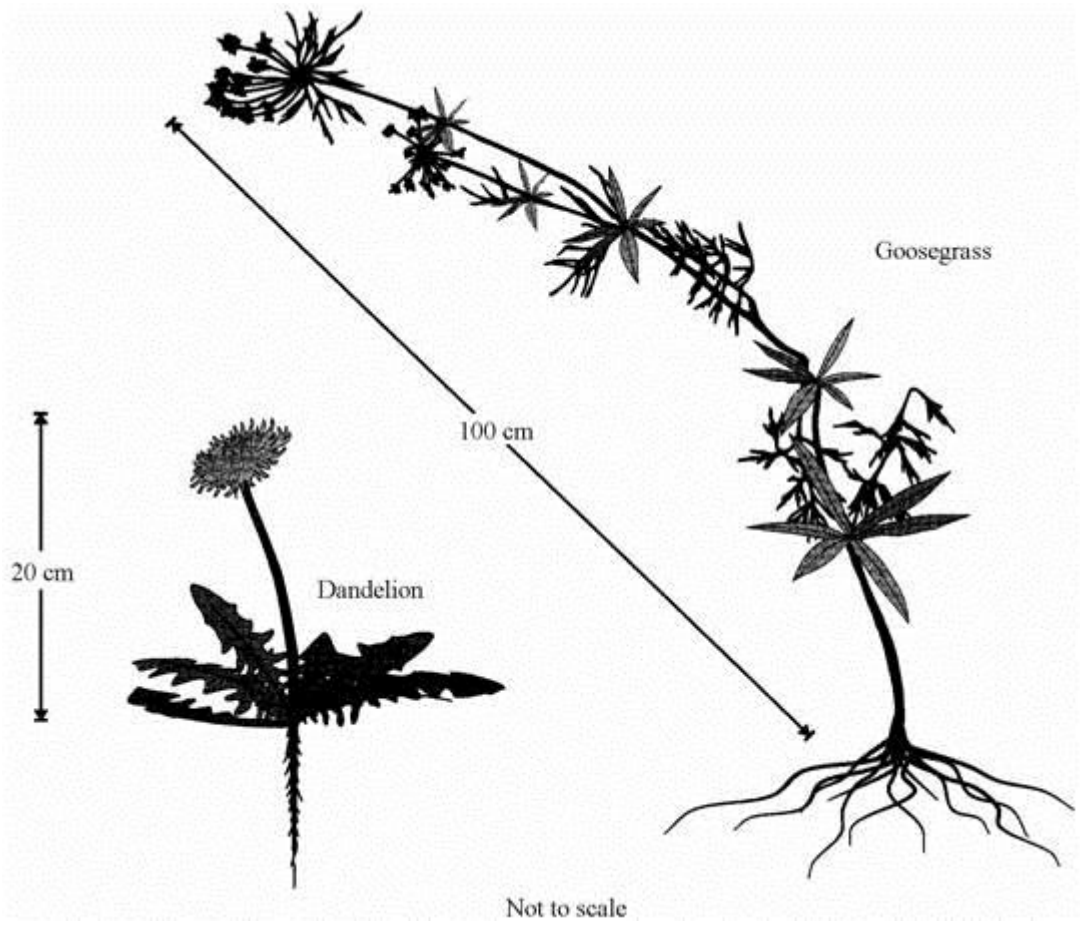
_____

(2)

(Total 4 marks)

Q9.

Dandelions have become adapted to live in lawns and grass areas where animals graze. Goosegrass, however, has become adapted to live alongside hedgerows and cannot survive being mown.



(a) Use the information in the drawings to suggest **one** advantage of each of the following adaptations.

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(i) Dandelion leaves lie flat on the ground.

_____

_____

(1)

(ii) A dandelion has a thick tapered root.

_____

_____

(1)

(iii) Goosegrass stems are long.

_____

_____

(1)

(iv) Goosegrass roots are thin and very long.

_____

_____

(1)

(b) Dandelions and goosegrass are different species of plants.

(i) What name is given to the unit of inheritance which controls one particular characteristic of a plant or animal?

_____

(1)

(ii) Why would you be unlikely to succeed if you tried to breed a new species of plant by crossing a dandelion with goosegrass?

_____

_____

(1)

(c) Animals as well as plants have become adapted to live in different environments.

State **one** way a polar bear has become adapted to living in the Arctic, and the reason for the adaptation.

_____

_____

_____

_____

(2)

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(Total 8 marks)

Q10.

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)

Q11.

Insulin is now made by a biotechnological process. A description of the process is given below. Complete the gaps in the sentences.

(a) The first step in the biotechnological process is that a special enzyme is used to cut the insulin _____ out from a human _____ .

In a separate operation, a ring of bacterial _____ is cut open using a special enzyme.

These two pieces of genetic material are combined together to form a new plasmid ring which is inserted into a bacterium.

(3)

(b) Explain why large quantities of insulin are produced when this bacterium is put into a culture medium.

_____

_____

_____

(2)

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(c) Before insulin was made in this way, it could only be obtained from sheep and pigs. Suggest **two** reasons, other than preventing the exploitation of animals, why it is better to obtain insulin by genetic engineering than from animals.

1. _____

_____

2. _____

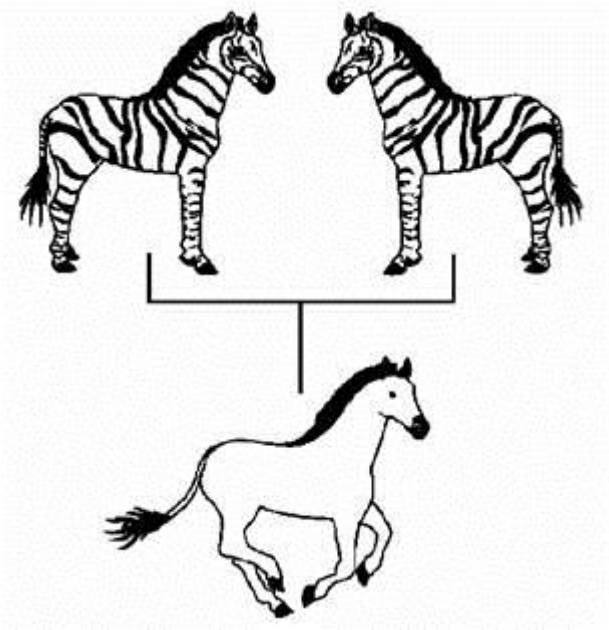
_____

(2)

(Total 7 marks)

Q12.

Sometimes an adult offspring will show a distinct variation from its parents, like a zebra appearing to have no stripes.



(a) (i) Changes of this sort are called _____

(1)

(ii) Which part of the cell has chemically changed to cause this variation? Circle the correct answer.

Cytoplasm gene membrane nucleus

(1)

(b) Give a cause of this type of chemical change in a cell.

_____

(1)

(c) Use zebras as an example to explain the term *species.*

_____

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_____

_____

(2)

(Total 5 marks)

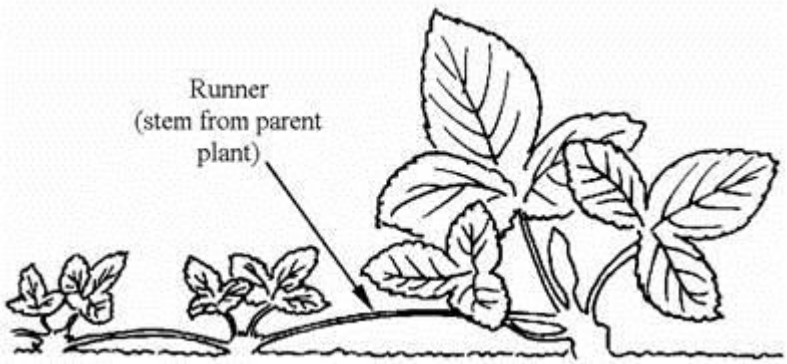
Q13.



A grower found some small strawberries with a nice taste, growing on a strawberry plant.

The grower then developed plants with strawberries which were larger but had the same nice taste.

Once the grower had developed his new plants, he could use runners to produce more plants which had the new large and tasty strawberries.



(i) What type of reproduction is this called?

_____

(1)

(ii) Why would he use this type of reproduction to produce more new plants?

_____

(1)

(Total 2 marks)

Q14.

A particular species of snail has a shell which may be pink, yellow or brown. It may also be plain or have bands running round it.

The snails are eaten by song thrushes.

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Explain why snails with plain brown shells are the most common in hedgerows.

_____

_____

_____

_____

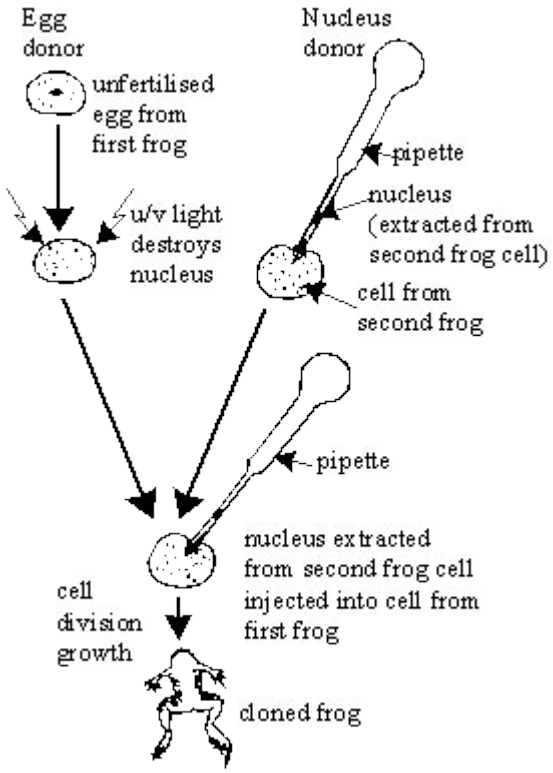
_____

_____

(Total 4 marks)

Q15.

The diagram shows how a frog can be cloned.



(a) In the example shown, will the cells of the cloned frog be the same as those of frog 1 or frog 2?

Explain your answer as fully as possible.

_____

_____

_____

_____

_____

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_____

(4)

(b) Discuss the advantages and disadvantages of cloning compared to sexual reproduction.

_____

_____

_____

_____

_____

_____

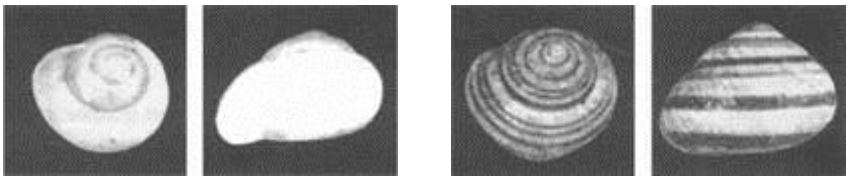
_____

(5)

(Total 9 marks)

Q16.

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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_____

_____

_____

_____

_____

(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.

_____

_____

_____

_____

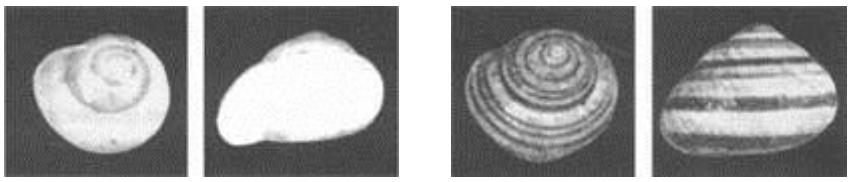
_____

(4)

(Total 11 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

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.

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

_____

_____

_____

_____

_____

_____

_____

(Total 4 marks)

Q18.

Many insecticides contain “active” ingredients called pyrethrins. These are extracted from pyrethrum daisies. These plants are grown in Kenya, a developing country in Africa. They provide income for farmers and valuable exports.

An American biotechnology company has now transferred the gene for making a specific pyrethrin to brewers’ yeast. This can be grown easily, so this pyrethrin can be produced cheaply. However, insect populations can build up resistance to specific pyrethrins.

(a) What are the advantages and disadvantages of using brewers’ yeast to produce pyrethrins?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(b) Describe, as fully as you can, how a gene for making pyrethrins is transferred from daisy to yeast.

_____

_____

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_____

_____

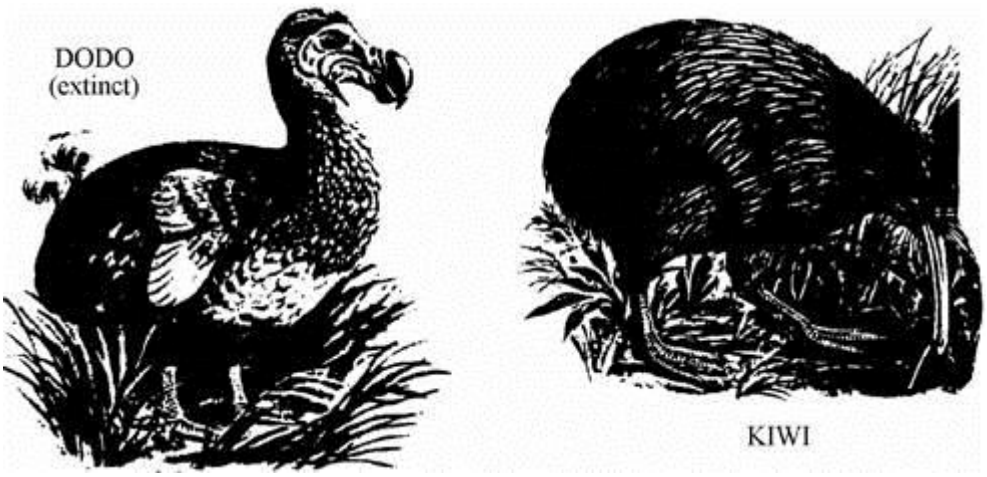
_____

(3)

(Total 9 marks)

Q19.

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.

_____

_____

_____

_____

_____

_____

_____

(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.

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1. _____

_____

2. _____

_____

(2)

(Total 8 marks)

Q20.

Spiders produce a protein thread which is extremely strong compared to man-made fibres of the same diameter.



Scientists can now use bacteria to produce the **same** protein.
How can they do this?

_____

_____

_____

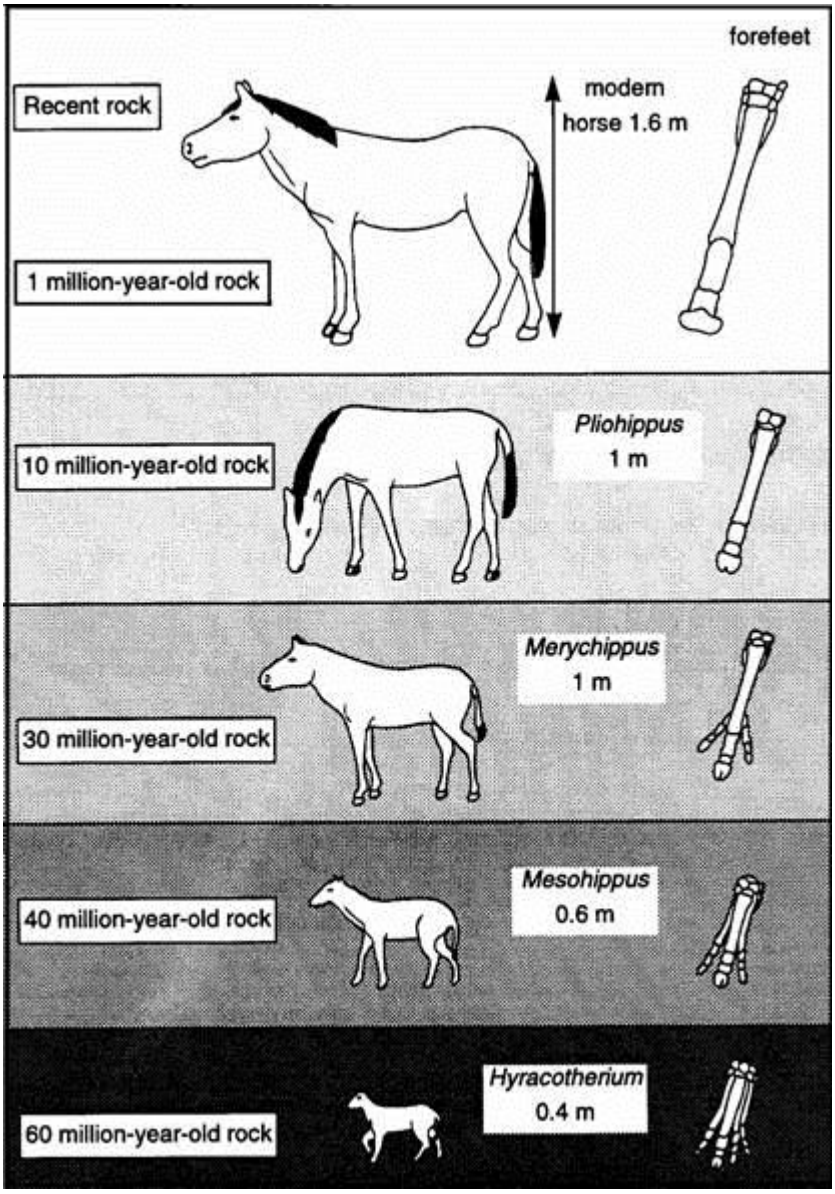
_____

(Total 3 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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_____

_____

_____

_____

_____

(3)

(Total 7 marks)

Q23.

Insect pests can be controlled without using chemical insecticides.

For example, the bacterium *Bacillus thuringiensis* produces a toxin extremely poisonous to certain species of insects. The gene which produces this toxin has been introduced into tomato plants.
It gives them built-in resistance to a range of insect pests, but is not poisonous to humans.

(a) Explain, step-by-step, how the tomato plant is made resistant to some insect pests.

_____

_____

_____

_____

_____

_____

(4)

(b) Give **two** arguments for and **two separate** arguments against controlling insect pests in this way.

For:

1. _____

2. _____

Against:

1. _____

2. _____

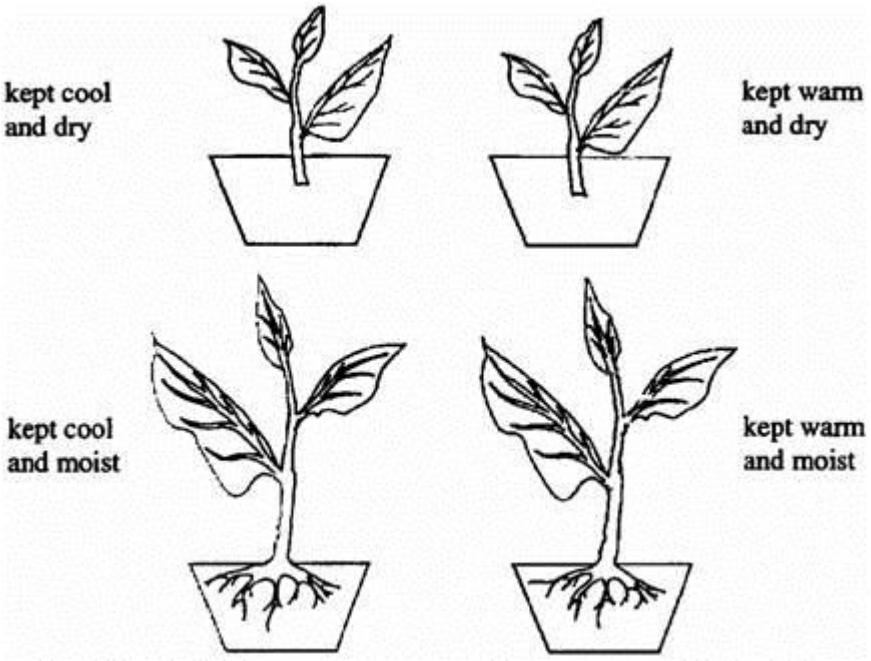
(4)

(Total 8 marks)

Q24.

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A gardener took four cuttings from the same plant and put them in compost.
He kept them in different conditions.
The diagrams show each cutting some time later.



(a) Use information from the diagrams to answer this part.

(i) The most important condition needed for cuttings to develop is that

they should be kept _____

(1)

(ii) Explain why you chose this condition.

_____

(2)

(b) Gardeners often grow new plants from cuttings instead of from seeds.
Give a reason for this.

_____

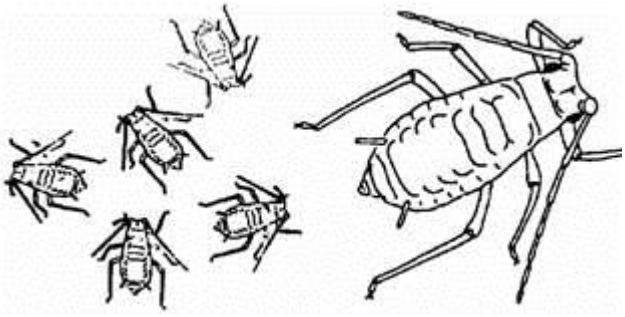
(1)

(Total 4 marks)

Q25.

The bean aphid is a type of black-fly which lives on broad bean plants in summer.
In the autumn, males and females mate and produce eggs.

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(a) Name the type of reproduction which produces the eggs.

_____

(1)

(b) In spring these eggs hatch. The young aphids are all female.
Explain why they are all similar but not identical to each other.

_____

(1)

(c) These females are then able to produce offspring without needing any males.

(i) Name the type of reproduction where females do **not** need males to produce offspring.

_____

(1)

(ii) How will the offspring from one of these females:

A compare with each other

_____

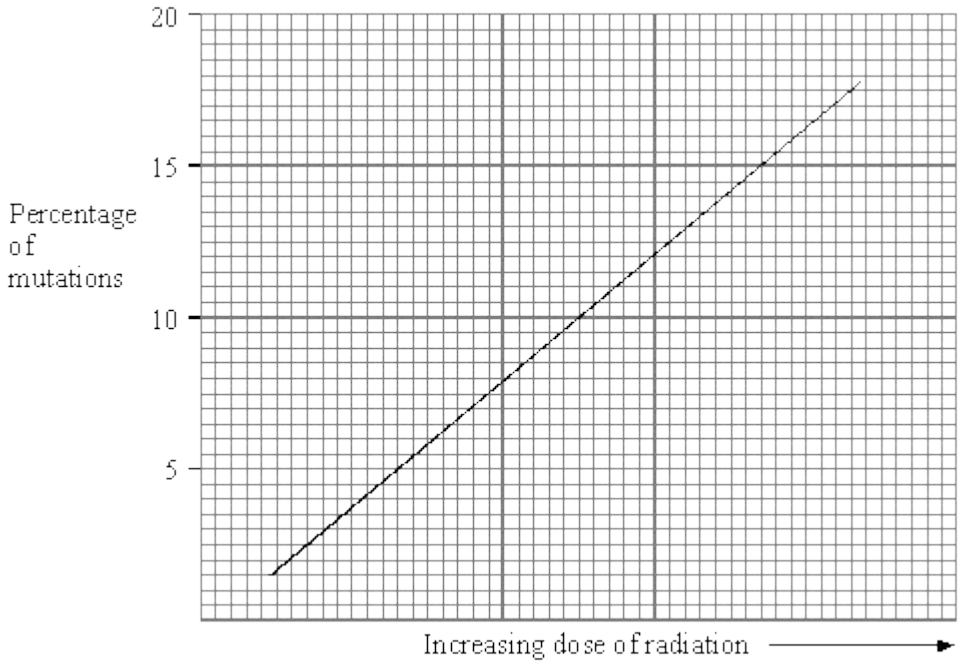
B compare with the offspring from other females?

_____

(2)

(d) Some scientists investigated mutations in these aphids. They exposed the aphids to X-rays.
They plotted their results.

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(i) What was the connection between the dose of X-rays and the percentage of mutations?

_____

(1)

(ii) Name **one** other possible cause of mutations.

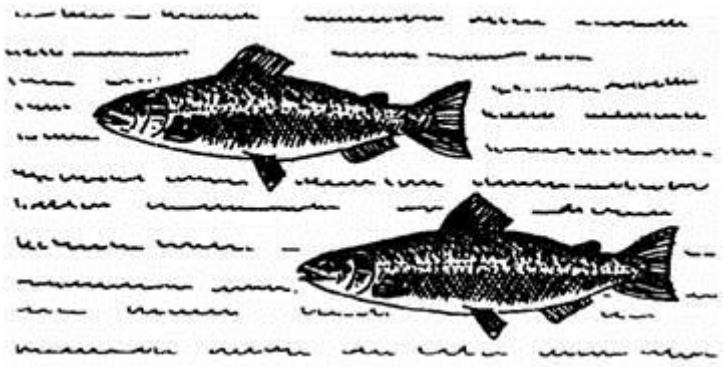
_____

(1)

(Total 7 marks)

Q26.

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.

_____

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_____

_____

_____

_____

(Total 4 marks)

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