VARIATION AND EVOLUTION PART III

Q1.

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?

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(6)

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

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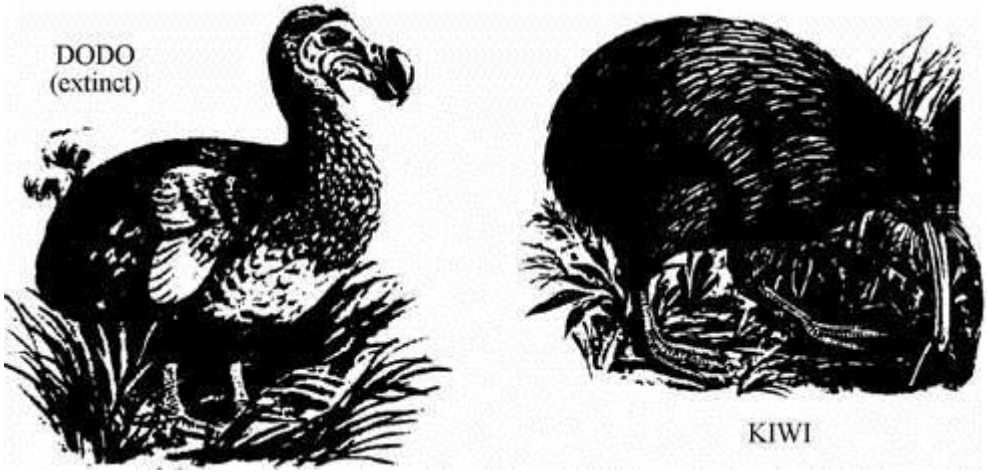
(3)

(Total 9 marks)

Q2.

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



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

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

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(6)

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

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

1. _____

_____

2. _____

_____

(2)

(Total 8 marks)

Q3.

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?

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_____

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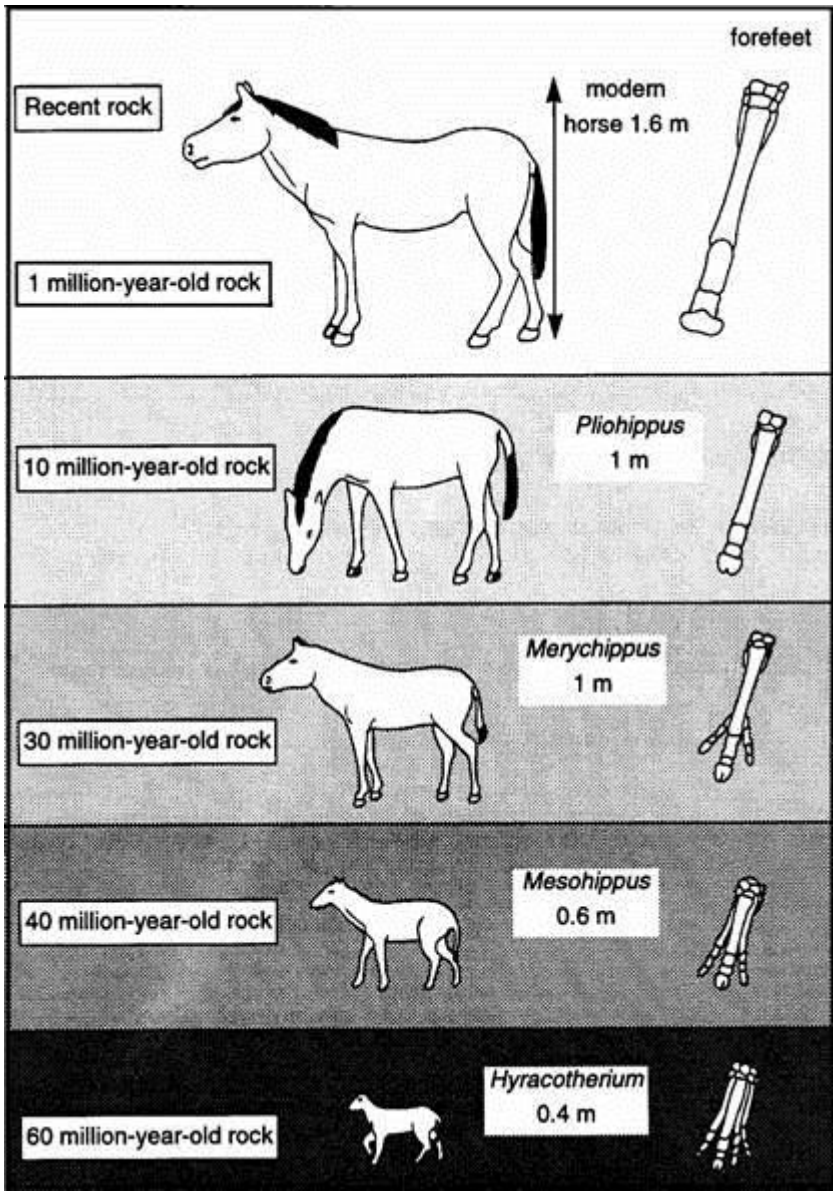
(Total 3 marks)

Q4.

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



(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?

_____

_____

(1)

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

_____

_____

_____

(3)

(Total 7 marks)

Q5.

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)

Q6.

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. _____

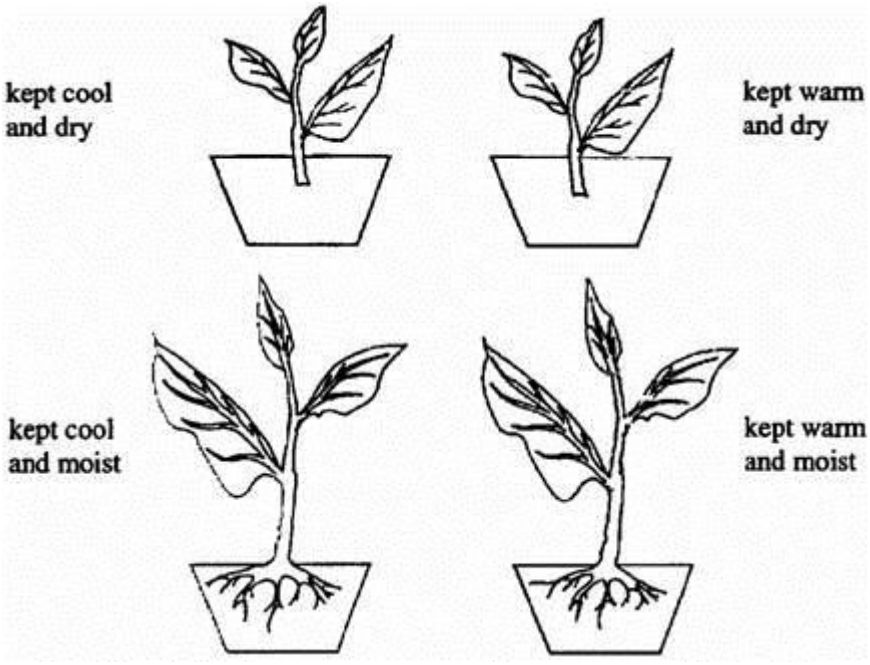
2. _____

(4)

(Total 8 marks)

Q7.

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.

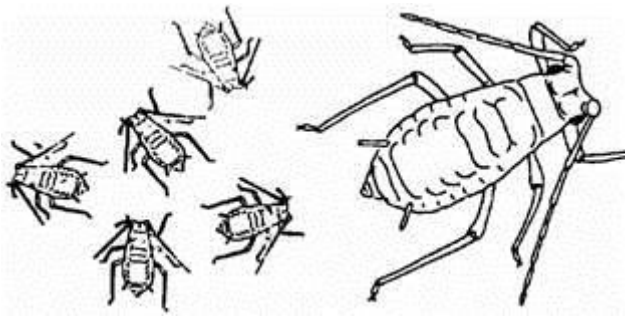
_____

(1)

(Total 4 marks)

Q8.

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.



(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

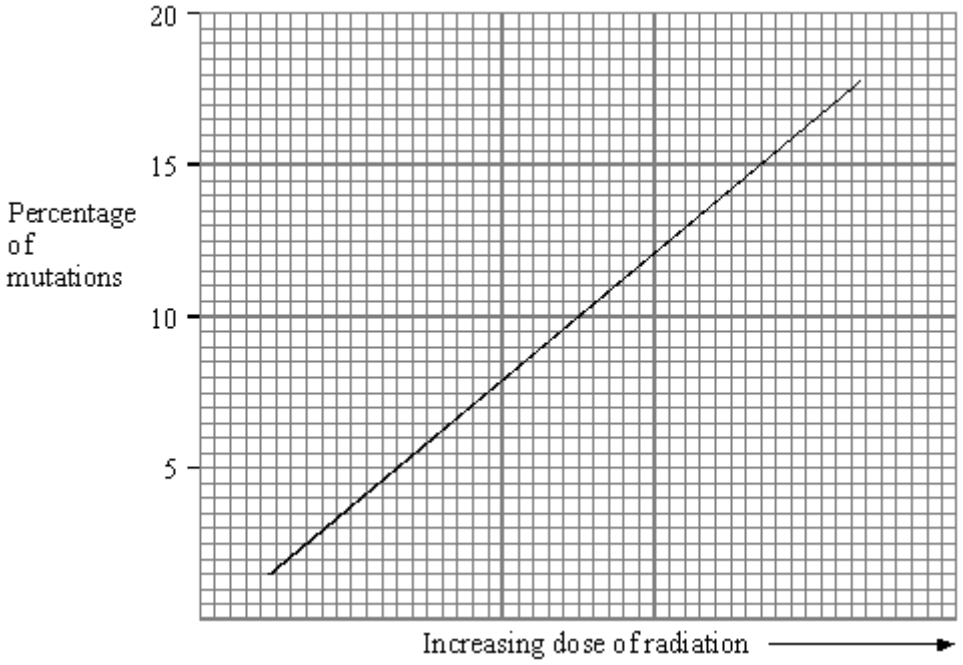
_____

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.



(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.

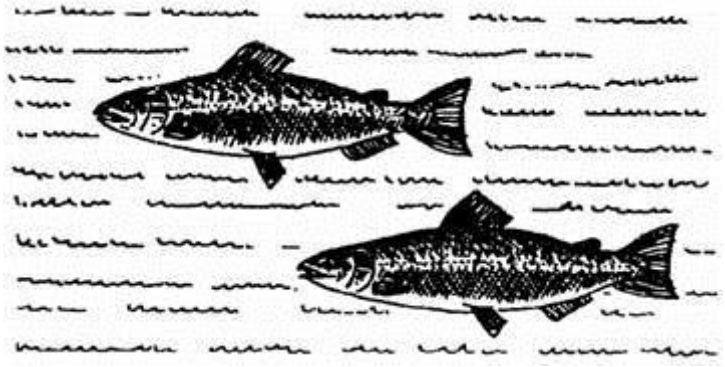
_____

(1)

(Total 7 marks)

Q9.

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)