

Variation and Evolution

Question Paper 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.6 Inheritance Variation and Evolution
Sub-Topic	Variation and Evolution
Difficulty Level	Gold Level
Booklet	Question Paper 1

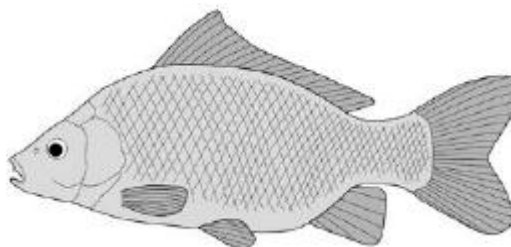
Time Allowed: 59 minutes

Score: / 57

Percentage: /100

Grade Boundaries:

Q1. The figure below shows a carp.



- (a) A mutation causes a blue colour in some carp.

What is a mutation?

.....
.....

(1)

- (b) Suggest how a mutation could cause a different colour in carp.

.....
.....

(1)

- (c) Two alleles control the body colour of carp:

- brown (**B**)
- blue (**b**).

The brown allele is dominant to the blue allele.

Two carp that are heterozygous for colour are crossed and produce 2.6×10^5 offspring.

Approximately how many of the offspring are expected to be blue?

Draw a genetic diagram to explain your answer.

Give your answer in standard form.

Number of offspring expected to be blue =

(5)

- (d) A scientist wanted to find out whether a brown carp has the genotype **BB** or **Bb**.

Describe what genetic cross a scientist could do to determine this.

.....

.....

.....

.....

.....

.....

(2)
(Total 9 marks)

Q2. Humans can use different methods to produce animals and plants with desired characteristics.

The figure below shows some different breeds of horse.



- (a) All breeds of horse are of the same species.

Suggest what you could do to show this.

.....

.....

.....

.....

(2)

- (b) Horse racing is an ancient sport.

Selective breeding has been used for centuries to produce racehorses.

Describe the steps involved in selective breeding to produce a racehorse.

.....

.....

.....

.....

.....

.....

(3)

- (c) Another way of producing organisms with desired characteristics is genetic engineering.

Bt cotton is a variety of cotton that has been genetically engineered to produce a poison.

The poison kills several different species of insect that feed on cotton plants.

The poison is naturally produced by a soil bacterium called *Bacillus thuringiensis*.

Describe how cotton plants can be genetically engineered to produce the Bt poison.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

- (d) Describe the advantages and disadvantages of growing Bt cotton.

.....

.....

.....

.....

.....

.....

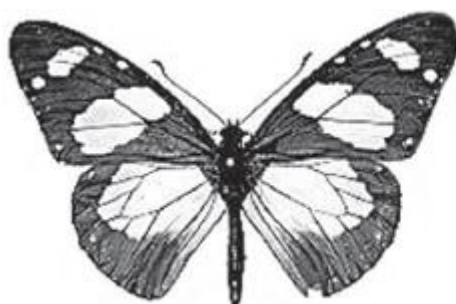
.....

.....

(4)

(Total 12 marks)

Q3. The drawings show two different species of butterfly.



Amauris



Hypolimnast

- Both species can be eaten by most birds.
- *Amauris* has an unpleasant taste which birds do **not** like, so birds have learned **not**

to prey on it.

- *Hypolimnas* does **not** have an unpleasant 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*.

.....

.....

.....

.....

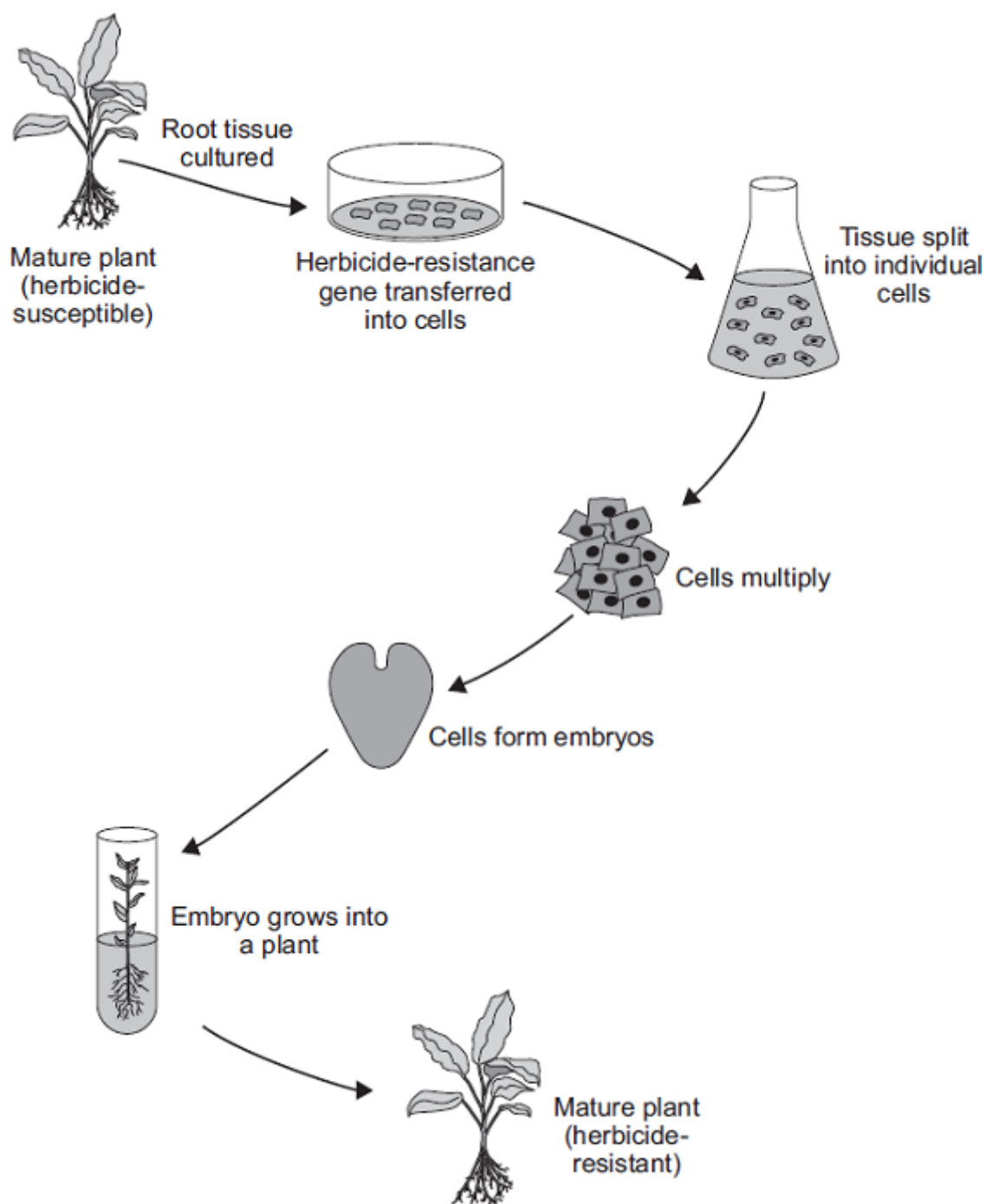
.....

.....

(3)

(Total 5 marks)

Q4. The diagram shows one method of producing herbicide-resistant crop plants.



- (a) The herbicide-resistance gene is cut out of a chromosome of a herbicide-resistant plant.

How is the herbicide-resistance gene cut out of the chromosome?

.....

.....

(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 5 marks)

Q5. The photographs show the flowers of two closely-related species of plant.

Species A Species B



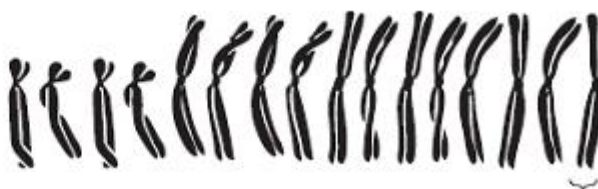
Images: © iStock/Thinkstock

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

Species A Species B



**One
chromosome**



**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.

.....
.....
.....
.....

(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?

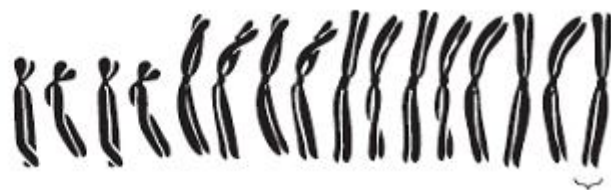
.....
.....
.....
.....

(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.

Suggest an explanation for this.

.....

.....

.....

.....

.....

.....

(2)
(Total 10 marks)

Q6.The Blue-moon butterfly lives on a small island called Samoa, in the Pacific Ocean.



By Eموke 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?

.....

(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)

- Q7.** (a) Animal breeders use sexual reproduction to produce new strains of animals.

How does sexual reproduction produce variation?

.....
.....

.....

.....

(2)

- (b) A salmon is a type of fish.

Scientists have created a GM (genetically modified) 'super' salmon.

The scientists transferred a gene from a fish called a pout into a salmon. The gene increases the secretion of growth hormone in the salmon. The GM salmon grows much faster than an ordinary salmon, reaching market size up to one year earlier. Many more GM salmon will be grown in fish farms.

- (i) Describe how a gene can be transferred from a pout into a salmon.

.....

.....

.....

.....

.....

.....

(3)

- (ii) The government might not allow the production of GM salmon.

Suggest **one** reason why.

.....

.....

(1)

(Total 6 marks)

- Q8.** The picture shows a zebra fish.



Illustration © Emily S. Damstra

Zebra fish are small freshwater fish that usually have black and silver stripes. Zebra fish can tolerate a wide range of environmental conditions.

- (a) Scientists have genetically modified zebra fish to act as pollution indicators. The genetically modified zebra fish have a gene transferred from a jellyfish. The gene allows the stripes of the zebra fish to change colour.

Describe how the scientists produced the genetically modified zebra fish.

.....

.....

.....

.....

.....

.....

.....

(3)

- (b) Some scientists are worried about the production of genetically modified zebra fish. Suggest reasons why.

.....

.....

.....

.....

(2)

(Total 5 marks)