

Reproduction

Question Paper 1

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

Time Allowed: 46 minutes

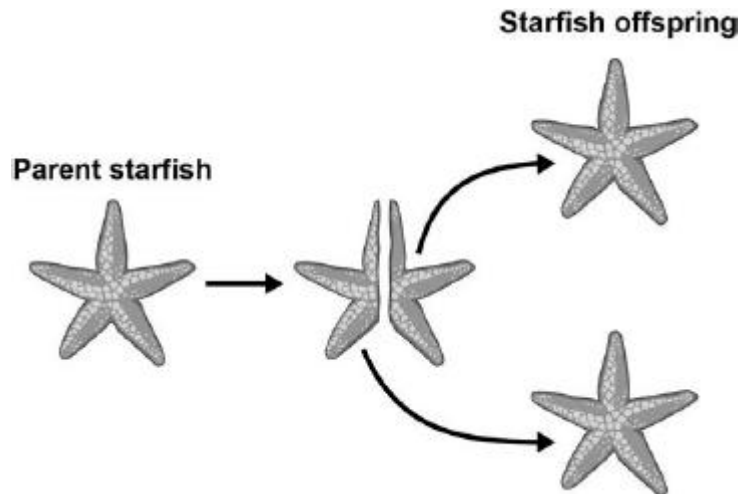
Score: / 45

Percentage: /100

Grade Boundaries:

Q1. Starfish can split in half. Each half can then grow new arms to form offspring.

This process is shown in the figure below.



(a) What process produces the starfish offspring?

Tick **one** box.

Asexual reproduction

☐

Fertilisation

☐

Selective breeding

☐

Sexual reproduction

☐

(1)

(b) More cells are produced as the starfish grows more arms.

What process will produce more cells in the starfish as they grow?

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(1)

(c) All the offspring produced are genetically identical.

What name is given to genetically identical organisms?

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(1)

(d) Each body cell of the parent starfish contains 44 chromosomes.

How many chromosomes are in each body cell of the offspring?

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(1)

(Total 4 marks)

Q2. Moose are animals that eat grass.

Figure 1 shows a moose.

Figure 1



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Figure 2 shows a food chain.

Figure 2

Grass → Moose → Wolves

(a) Name the secondary consumer shown in **Figure 2**.

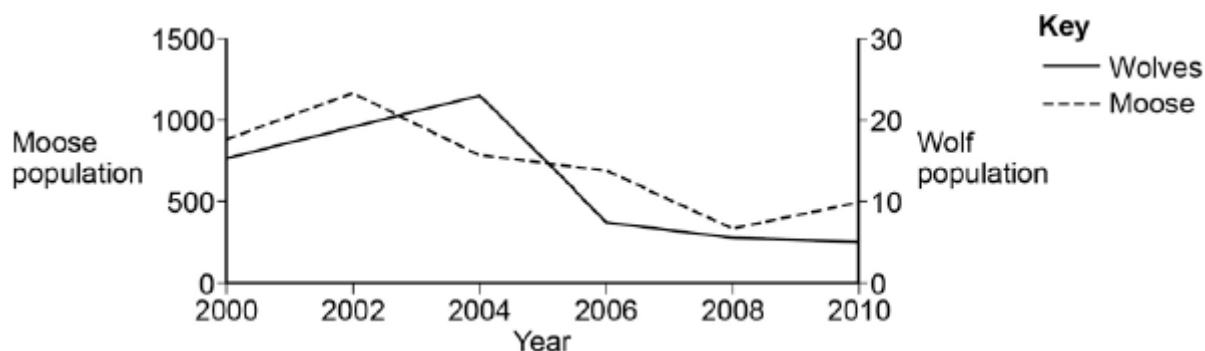
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(1)

- (b) **Figure 3** shows how the moose population and wolf population have changed in one area.

This is a predator-prey cycle.

Figure 3



In 2004 the line on **Figure 3** for wolves is above the line for moose.

How does **Figure 3** show that there are more moose than wolves in 2004?

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(1)

- (c) Suggest why the moose population decreased between 2002 and 2004.

Use information from **Figure 3**.

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(1)

- (d) The number of wolves is one biotic factor that could affect the size of the moose population.

Give **two** other biotic factors that could affect the size of the moose population.

1

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(2)

- (e) Moose have distinct characteristics such as antlers.

Describe how moose may have evolved to have large antlers.

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(5)
(Total 10 marks)

Q3. DNA is the genetic material of human cells.

Figure 1 shows the structure of part of a DNA molecule.



- (a) (i) Describe where DNA is found in a human cell.

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(2)

- (ii) When a cell divides by mitosis the new cells are genetically identical.

What causes the cells to be genetically identical?

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(1)

- (b) Many genes have different forms called alleles.

- (i) A person has polydactyly (extra fingers or toes). Polydactyly is caused by a dominant allele.

What is the smallest number of copies of the dominant allele for polydactyly that could be found in a body cell of this person?

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(1)

- (ii) Another person has cystic fibrosis. Cystic fibrosis (CF) is caused by a recessive allele.

How many copies of the recessive CF allele are there in a body cell of this person?

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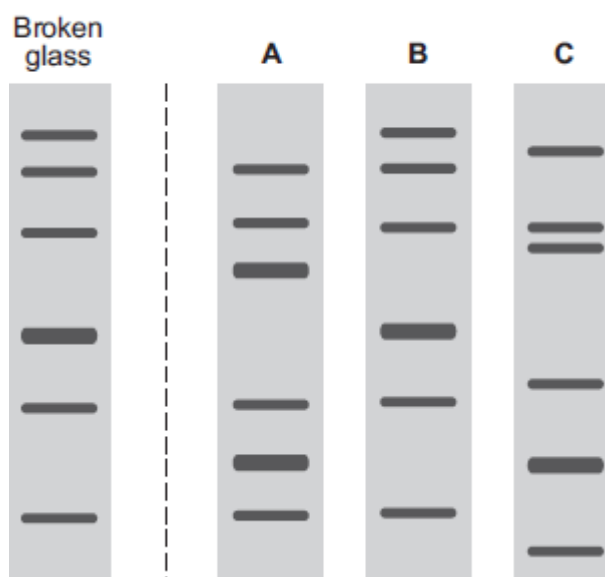
(1)

- (c) A burglar broke into a house. The burglar cut his hand on some broken glass. Scientists extracted DNA from the blood on the broken glass.

The scientists analysed the DNA from the glass and DNA from three suspects, **A**, **B** and **C**. The scientists used a method called DNA fingerprinting.

Figure 2 shows the scientists' results.

Figure 2



Which suspect, **A**, **B** or **C**, is most likely to have been the burglar?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

(1)
(Total 6 marks)

Q4. Some genetic disorders are caused by alleles inherited from the parents.

(a) What are **alleles**?

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(1)

- (b) Describe how embryos can be screened for the alleles that cause genetic disorders.

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(4)

- (c) Polydactyly is a genetic disorder that leads to extra fingers or toes.

Polydactyly is caused by a dominant allele, **D**.

The photograph shows the hand of a person with polydactyly.



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A man has polydactyly. His wife does not have polydactyly.

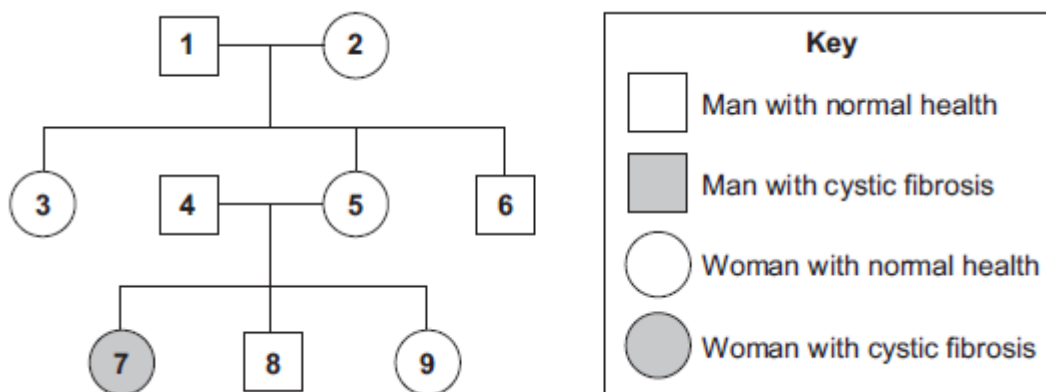
This couple's children have a 50% chance of having polydactyly.

Draw a genetic diagram to explain why.

(3)

- (d) Cystic fibrosis is another genetic disorder. It is caused by a recessive allele.

The diagram shows the inheritance of cystic fibrosis in one family.



Woman **5** is pregnant with her fourth child.

What is the probability that this child will have cystic fibrosis?

Draw a genetic diagram to explain your answer.

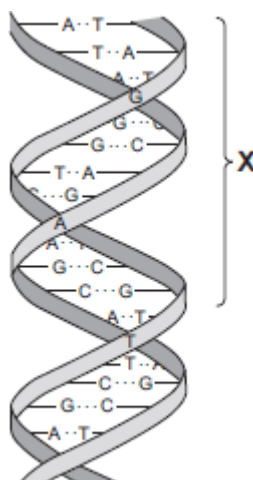
Use the following symbols.

N = allele for normal health

n = allele for cystic fibrosis

(4)
(Total 12 marks)

Q5. The diagram shows part of a DNA molecule.



- (a) (i) In which part of an animal cell is DNA found?

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(1)

- (ii) Complete the following sentence.

The letters **A**, **C**, **G** and **T** in the diagram represent four different compounds called

(1)

- (iii) One strand of the DNA, in the section labelled **X**, contains the following sequence of these compounds:

T A T G G G T C T T C G

How many amino acids would this section of the DNA code for?

(1)

- (iv) The section of DNA described in part **(a) (iii)** is a small part of a gene.

The sequence of compounds **A**, **C**, **G** and **T** in the gene is important.

Explain why.

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(2)

- (b) *Read the following information about genetic engineering.*

The caterpillar of the European Corn Borer moth feeds on the fruits of maize (sweet corn). There is a chemical called Bt-toxin which is poisonous to the corn borer caterpillar but not to humans.

Scientists carried out the following steps.

1. The Scientists made a bacterial plasmid to which they added two genes:
 - **Bt** gene, which coded for production of the Bt-toxin
 - **kan^r** gene, which coded for resistance to an antibiotic called kanamycin.
2. They used this plasmid to produce genetically modified bacteria which could invade plant cells.
3. They mixed these genetically modified bacteria with pieces cut from maize leaves.

4. They placed the pieces of maize leaf on agar jelly in a Petri dish. The agar jelly contained the antibiotic, kanamycin. The kanamycin killed most of the pieces of maize leaf, but a few survived.
5. They took some cells from the surviving pieces of maize leaf and grew them in tissue culture.

The result was maize plants that now contained the **Bt** gene, as well as the **kan^r** gene, in all of their cells.

- (i) What is a **plasmid** (Step 1)?

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(2)

- (ii) Why did the scientists add **kanamycin** to the agar jelly (Step 4)?

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(2)

- (iii) The scientists grew each Bt-maize plant from a single cell which contained the **Bt** gene.

Explain why **all** the cells in the Bt-maize plant contained the **Bt** gene.

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(2)

- (iv) Kanamycin is an antibiotic.

Some scientists are concerned that the gene for kanamycin resistance has been put into maize.

Suggest why.

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(2)
(Total 13 marks)