1 The photograph shows a sperm cell and an egg cell just before fertilisation.



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(a) Which row describes the sperm cell and the egg cell before fertilisation?

Place a cross (☒) in the box next to your answer.

(1)

	sperm cell	egg cell
☐ **A**	diploid	diploid
☐ **B**	diploid	haploid
☐ **C**	haploid	diploid
☐ **D**	haploid	haploid

(b) The sperm cell contains DNA.

Describe the structure of DNA.

(3)

(c) Information in a DNA strand can be transcribed to make a strand of mRNA.

Describe how this mRNA strand is then used to make proteins.

(4)

(Total for Question 1 = 8 marks)

2 A DNA molecule consists of two strands coiled to form a double helix.

(a) Describe how the two strands of a DNA molecule are linked together.

(2)

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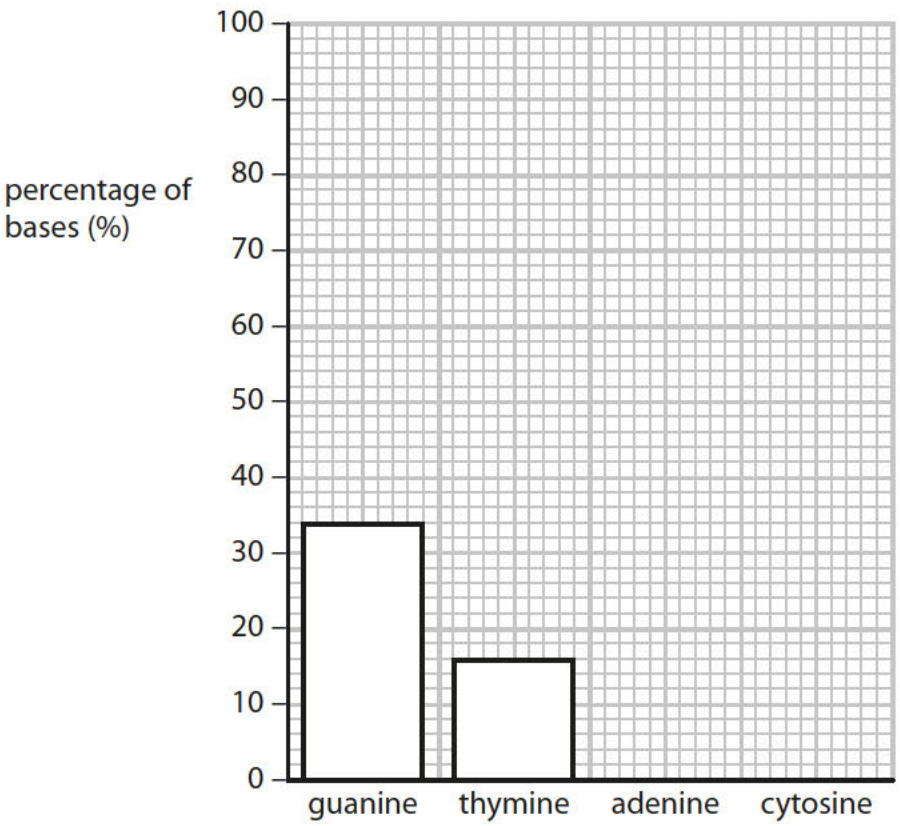
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(b) The bar chart shows the percentage of guanine and thymine in a sample of DNA.

Complete the bar chart to show the percentage of adenine and cytosine in the sample.

(2)



(c) The diagram shows part of one DNA strand.

(i) Complete the empty boxes to show the mRNA strand coded for by this DNA strand.

(2)

DNA strand	G	G	C	T	A	G	T	T	G
mRNA strand									

(ii) State the maximum number of amino acids that are coded for by this DNA strand.

(1)

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(d) Name the structure where translation occurs.

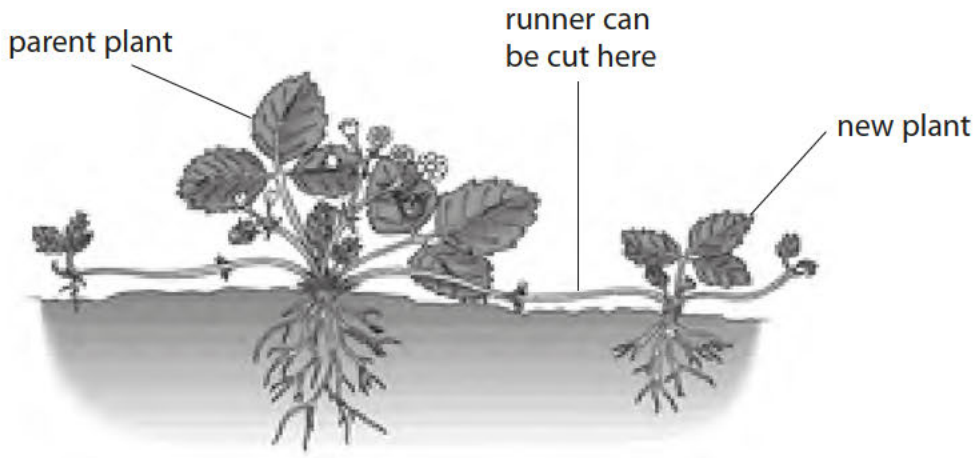
(1)

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(Total for Question 2 = 8 marks)

3 Strawberry plants grow runners and new strawberry plants develop along the runners. The new plants are genetically identical to the parent plant.

The diagram shows the parent plant with new plants attached to runners.



(a) (i) Name the type of cell division that results in the production of these new plants.

(1)

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(ii) Farmers cut the runners and sell the new plants.

Suggest advantages of producing new strawberry plants in this way.

(2)

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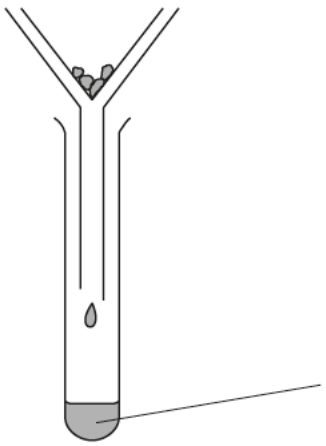
(b) Some students extracted DNA from strawberries.
The diagram shows the method used.

stage 1



grind strawberry in soapy water

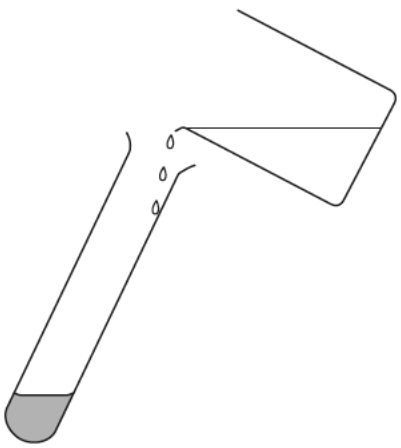
stage 2



filter mixture into a boiling tube

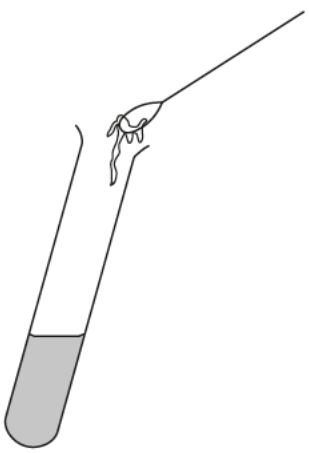
strawberry filtrate

stage 3



slowly pour ice cold ethanol into the strawberry filtrate

stage 4



remove DNA with a wire loop

Suggest the purpose of stages 1 and 3 in the DNA extraction.

(2)

stage 1 .....

.....

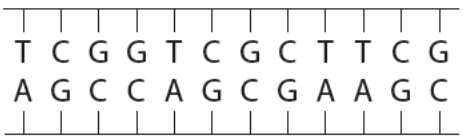
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stage 3 .....

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(c) A short section of DNA from a strawberry is shown in the diagram.



(i) How many codons are shown in this section of DNA?

Put a cross (☒) in the box next to your answer.

(1)

☒ **A** 2

☒ **B** 3

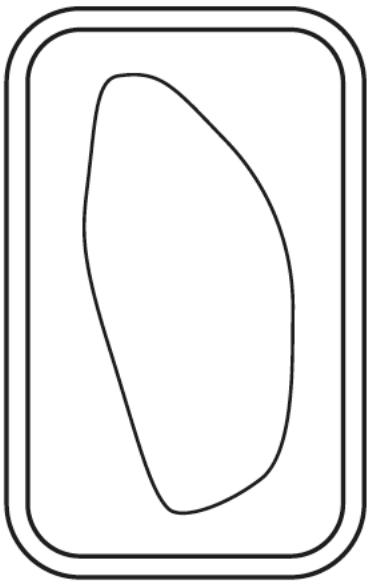
☒ **C** 4

☒ **D** 12

(ii) This DNA is found in a structure within a cell of a strawberry plant.

On the diagram of a plant cell, draw and name the structure containing DNA.

(2)



(Total for Question 3 = 8 marks)

4 (a) Describe how a section of DNA determines the structure of a protein.

(4)

*(b) Describe the structure of DNA, including the roles of the scientists involved in its discovery.

(6)

Human DNA was sequenced during the Human Genome Project.

(c) Explain how the Human Genome Project has contributed to advances in medicine.

(2)

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(Total for Question 4 = 12 marks)