

AQA – Genetic information, variation and relationships between organisms – A2 Biology

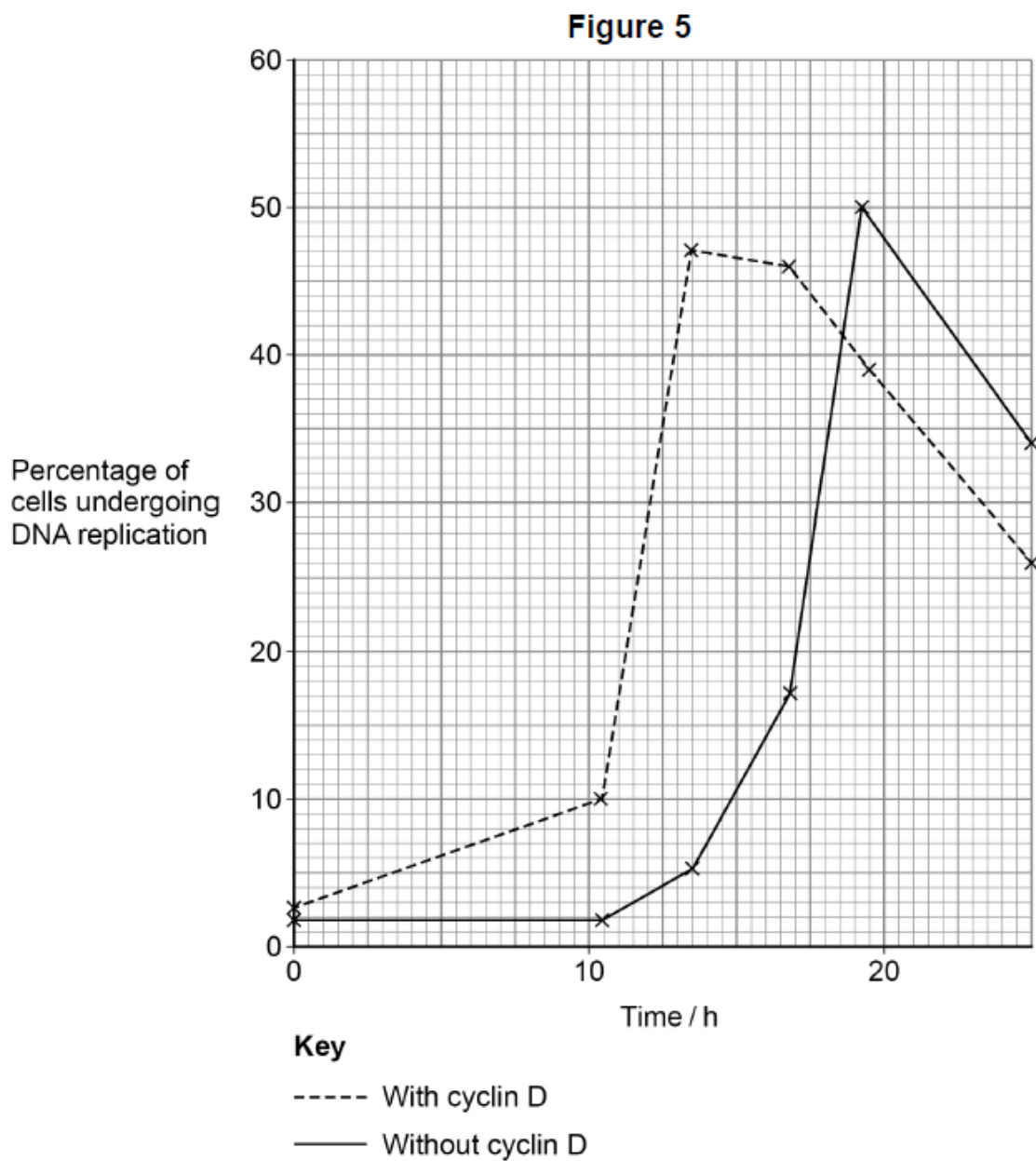
1. June/2020/Paper_1/No.5

0 5 . 1

Describe the role of DNA polymerase in the semi-conservative replication of DNA.

[2 marks]

Figure 5 shows the percentage of rat cells undergoing DNA replication. Some cells contained a protein called cyclin D and some cells did not contain cyclin D. All cells were in early interphase at time 0



0 5 . 2

It took less time for 25% of cells with cyclin D to be undergoing DNA replication than for 25% of cells without cyclin D.

Use **Figure 5** to calculate this time difference as a percentage decrease.

Show your working.

[2 marks]

Answer _____ %

0 5 . 3

Cyclin D stimulates the phosphorylation of DNA polymerase, which activates the DNA polymerase.

Describe how an enzyme can be phosphorylated.

[2 marks]

0 5 . 4

Some tumour cells contain higher than normal concentrations of cyclin D.

Use **Figure 5** to suggest why higher than normal concentrations of cyclin D could result in a tumour.

[2 marks]

2. June/2020/Paper_1/No.8

0 8 . 1

Complete **Table 2** to show **three** differences between DNA in the nucleus of a plant cell and DNA in a prokaryotic cell.

[3 marks]

Table 2

DNA in the nucleus of a plant cell	DNA in a prokaryotic cell
1	
2	
3	

0 8 . 2

Scientists investigated the genetic diversity between several species of sweet potato. They studied non-coding multiple repeats of base sequences.

Define 'non-coding base sequences' and describe where the non-coding multiple repeats are positioned in the genome.

[2 marks]

The percentage similarities in the non-coding multiple repeats of base sequences of four species of sweet potato are shown in **Table 3**.

Table 3

Species of sweet potato	Percentage similarity between non-coding multiple repeat base sequences			
	C	L	R	T
C		53.5	25.7	59.7
L	53.5		33.4	53.7
R	25.7	33.4		36.6
T	59.7	53.7	36.6	

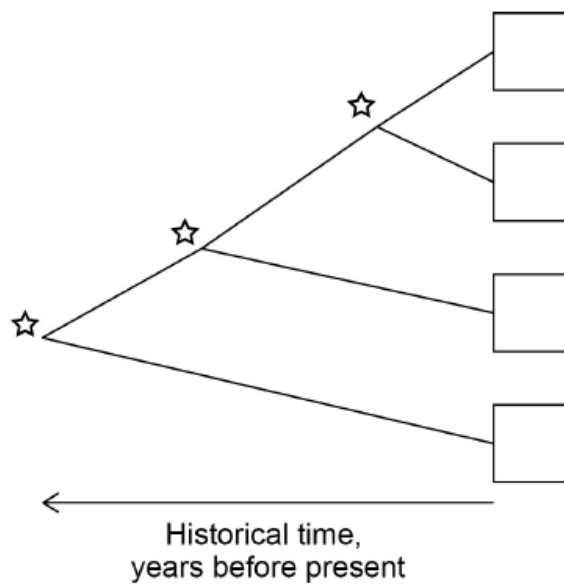
0 8 . 3

Use the information in **Table 3** to complete the phylogenetic tree shown in **Figure 8**.

Write the letter that represents the correct species into each box.

[1 mark]

Figure 8



Key

☆ Common ancestor of the species to the right

0 8 . 4

The scientists studied five individuals from each species. Within the five individuals of **species T** they found a percentage similarity of 66%.

Use **Table 3** to evaluate how this information affects the validity of the phylogenetic tree.

[2 marks]

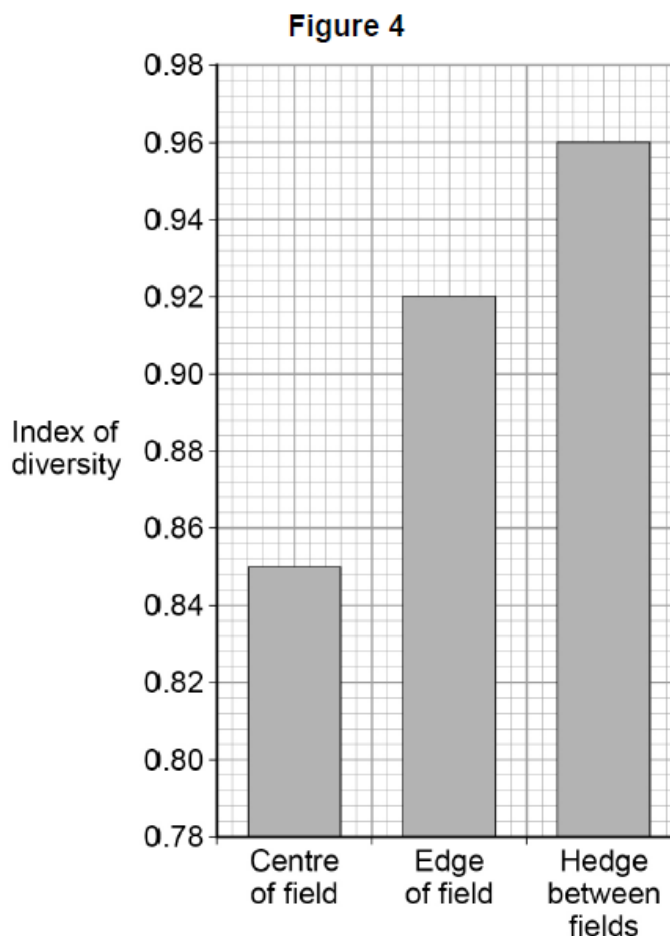
4. June/2019/Paper_1/No.3

0 3

A group of students investigated biodiversity of different areas of farmland. They collected data in each of these habitats:

- the centre of a field
- the edge of a field
- a hedge between fields.

Their results are shown in **Figure 4**.



0 3 . 1

What data would the students need to collect to calculate their index of diversity in each habitat?

Do **not** include apparatus used for species sampling in your answer.

[1 mark]

0 3 . 2

Give **two** ways the students would have ensured their index of diversity was representative of each habitat.

[2 marks]

1 _____

2 _____

0 3 . 3

Modern farming techniques have led to larger fields and the removal of hedges between fields.

Use **Figure 4** to suggest why biodiversity decreases when farmers use larger fields.

[1 mark]

0 3 . 4 Farmers are now being encouraged to replant hedges on their land.

Suggest and explain **one** advantage and **one** disadvantage to a farmer of replanting hedges on her farmland.

[2 marks]

Advantage _____

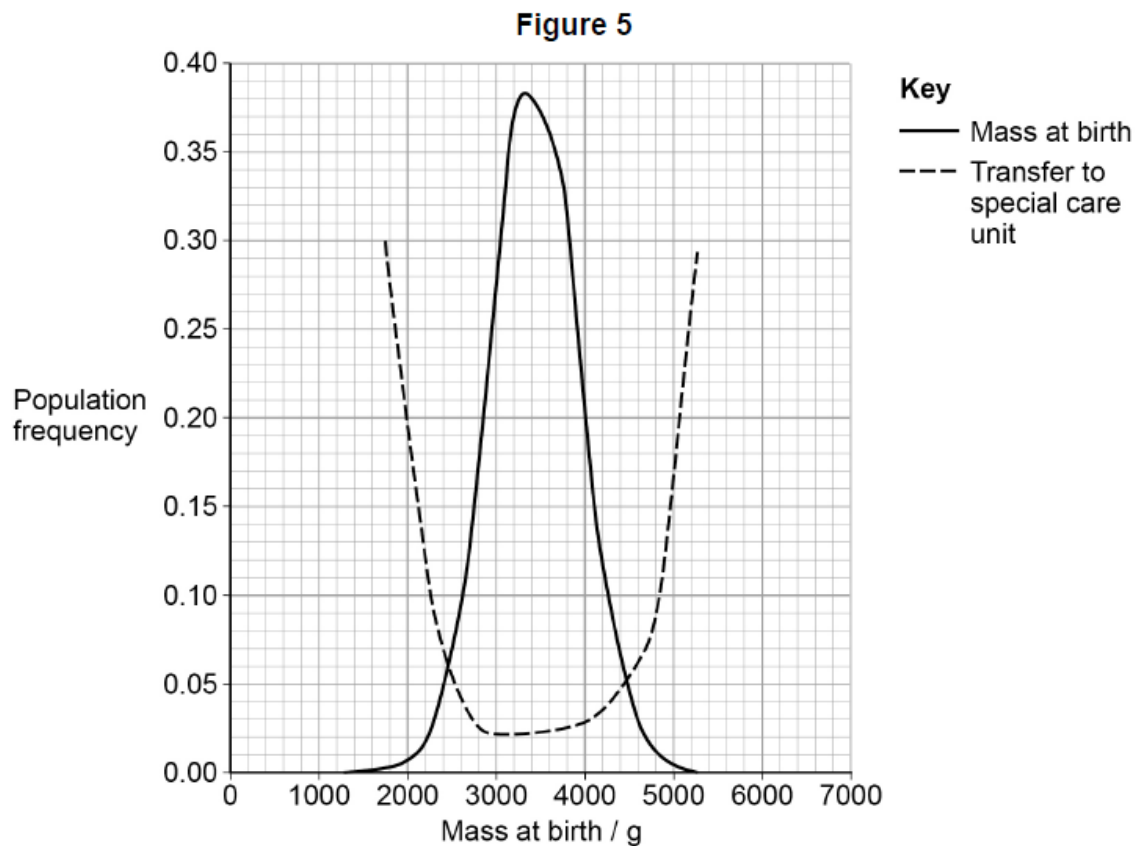
Disadvantage _____

5. June/2019/Paper_1/No.4

0 4

Scientists collected data on 800 000 human births. The data showed the mass of each baby at birth and whether the baby needed to be transferred to a special care unit for very ill babies.

Their results are shown in **Figure 5**.



0 4 . 2

The scientists studied the effect of one form, *KIR2DS1*, of the human *KIR* gene on mass at birth.

In the following passage the numbered spaces can be filled with biological terms.

KIR2DS1 is an _____ (1) _____ of the *KIR* gene, found at a _____ (2) _____ on chromosome 19. *KIR2DS1* is 14 021 bases long and is _____ (3) _____ into mRNA that is 1101 bases long. This mRNA is then _____ (4) _____ into a polypeptide 304 amino acids long. The polypeptide is then modified in the organelle, _____ (5) _____, before forming its functional _____ (6) _____ protein structure.

Write the correct biological term beside each number below, that matches the space in the passage.

[3 marks]

- (1) _____
- (2) _____
- (3) _____
- (4) _____
- (5) _____
- (6) _____

- 0 4 . 3 The scientists studied 1500 more births. They recorded the mass at birth of each baby and the nature of the *KIR* gene in the mother's genome.

Some of their results are shown in **Table 2**.

Table 2

Presence or absence of <i>KIR2DS1</i> in mother's genome	Number of babies with mass at birth:	
	between 2500 g and 4500 g	above 4500 g
Present	389	148
Absent	606	173

The scientists used a statistical test to test the following null hypothesis:

'The presence of *KIR2DS1* in the mother's genome does **not** affect the frequency of births above 4500 g'

Tick (✓) **one** box that gives the name of the statistical test that the scientists should use with the data in **Table 2** to test this null hypothesis.

[1 mark]

- Chi-squared
- Correlation coefficient
- Student's t-test

6. June/2019/Paper_1/No.6

0 6

Scientists investigated the cell cycle in heart cells taken from mice 6 days before their birth and then at 4, 14 and 21 days after their birth.

Their results are shown in **Table 4**. Age 0 days = day of birth.

Table 4

Age / days	Percentage of heart cells undergoing mitosis	Percentage of heart cells undergoing DNA replication
-6	13.9	8.5
4	8.5	2.6
14	1.6	0.2
21	0.6	0.0

0 6 . 1

Describe and explain the data in **Table 4**.

[2 marks]

[Extra space] _____

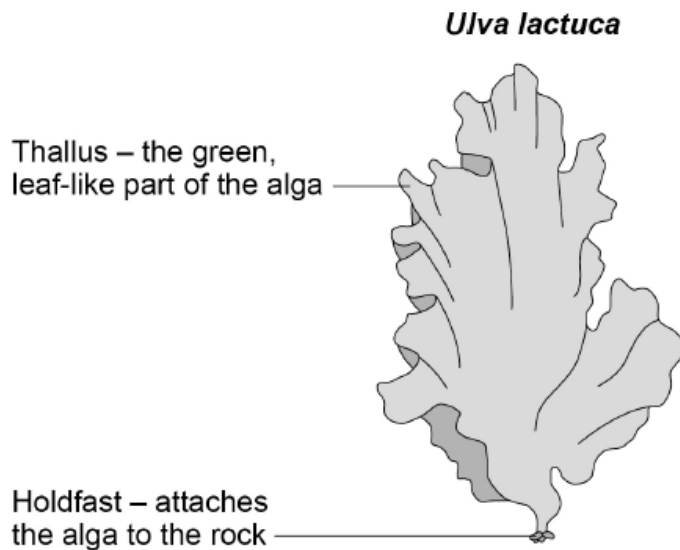
7. June/2019/Paper_1/No.7

0 7

Ulva lactuca is an alga that lives on rocks on the seashore. It is regularly covered by seawater.

Figure 6 shows a diagram of one *Ulva lactuca* alga.

Figure 6



0 7 . 1

Unlike plants, *Ulva lactuca* does not have xylem tissue.

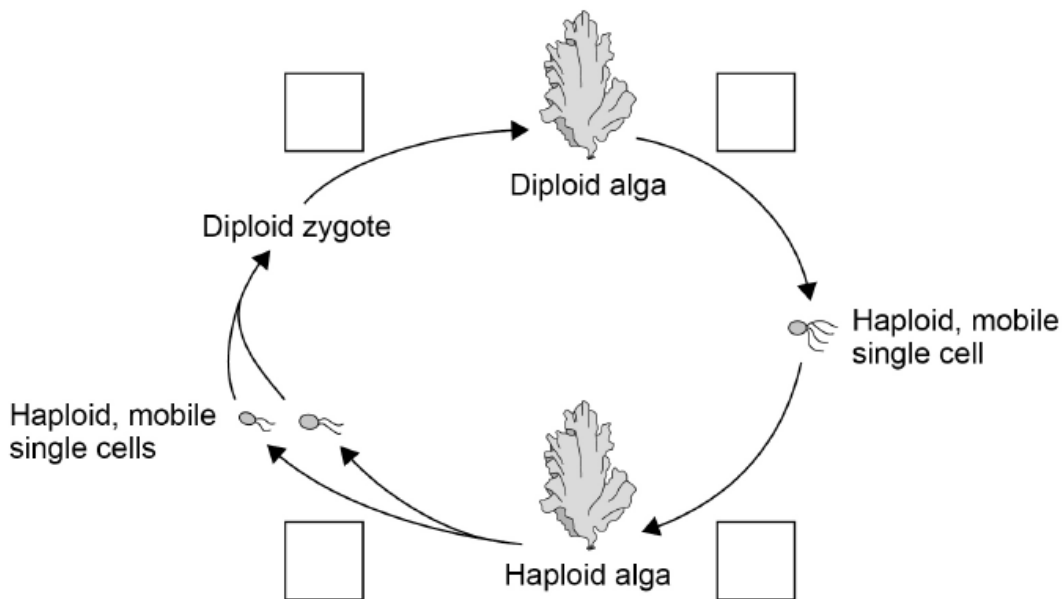
Suggest how *Ulva lactuca* is able to survive without xylem tissue.

[1 mark]

Ulva lactuca has a haploid and a diploid form.

Figure 7 shows the life cycle of *Ulva lactuca*.

Figure 7



0 7 . 2

On Figure 7 complete each box with an appropriate letter to show the type of cell division happening between each stage in the life cycle. Use 'T' to represent mitosis and 'E' to represent meiosis.

[2 marks]

0 7 . 3

Ulva prolifera also produces haploid, mobile single cells that can fuse to form a zygote.

Suggest and explain one reason why successful reproduction between *Ulva prolifera* and *Ulva lactuca* does not happen.

[2 marks]
