

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel Level 3 GCE

Monday 11 May 2026

Morning (Time: 1 hour 30 minutes) Paper reference **8BI0/01**

Biology B
Advanced Subsidiary
PAPER 1: Core Cellular Biology and Microbiology

You must have:
 Scientific calculator, HB pencil, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
 – *there may be more space than you need.*

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
 – *use this as a guide as to how much time to spend on each question.*
- In question(s) marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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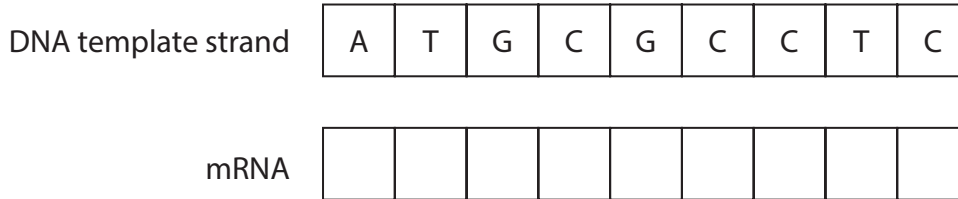
Answer ALL questions.

Some questions must be answered with a cross $\boxtimes$. If you change your mind about an answer, put a line through the box $\boxtimes$ and then mark your new answer with a cross $\boxtimes$.

- 1** Diabetes is a condition that causes a person's blood sugar level to become too high.

Diabetes may be caused by mutations in the gene coding for insulin.

- (a) The diagram shows the sequence of bases in part of the DNA template (antisense) strand coding for insulin and the mRNA molecule formed during protein synthesis.



- (i) Complete the diagram to show the sequence of bases in this mRNA.

(1)

- (ii) Name this stage of protein synthesis.

(1)

- (b) In 2019, 9.3% of the world's population had diabetes. This was a total of 463 million people.

- (i) Calculate the total number of people in the world in 2019.

Give your answer in standard form.

(1)

Answer



(ii) It is estimated that by 2030, 783 million people could have diabetes.

Calculate how many more people will have diabetes in 2030 than in 2019.

Give your answer in standard form to three significant figures.

(1)

Answer

(c) The diagram shows the base sequence in another part of the insulin gene and in the same part with a mutation.

Base sequence

C	T	G	C	C	C	C	T	G	C	T	G	G	C	G
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Mutated sequence

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

(i) State which type of mutation has taken place in this base sequence.

(1)

(ii) Give a reason for your answer.

Use the information in the diagram to support your answer.

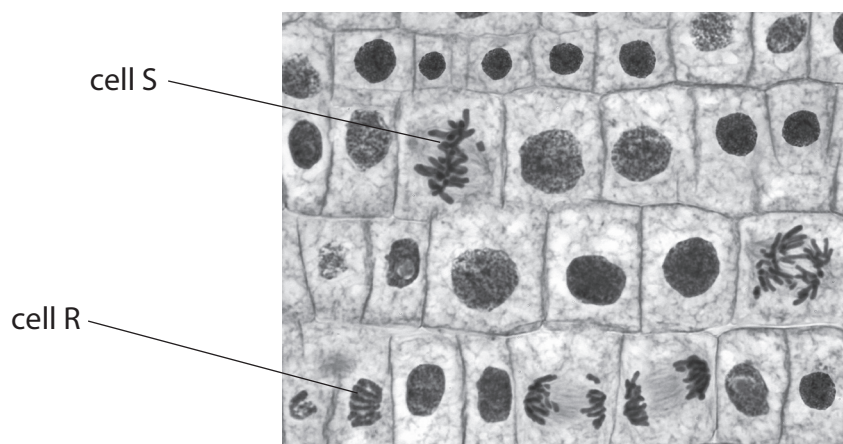
(1)

(Total for Question 1 = 6 marks)



2 The cell cycle is divided into three main stages: interphase, mitosis and cytokinesis.

(a) The photograph shows cells in a root tip.



(Source: © Scenics & Science/Alamy Stock Photo)

(i) Which row of the table shows the stage of mitosis in cell R and cell S?

(1)

	Cell R	Cell S
☐ A	anaphase	metaphase
☐ B	anaphase	telophase
☐ C	prophase	metaphase
☐ D	prophase	telophase

(ii) The mitotic index is calculated by dividing the number of cells in mitosis by the total number of cells.

Calculate the mitotic index for this part of the root tip.

(1)

Answer



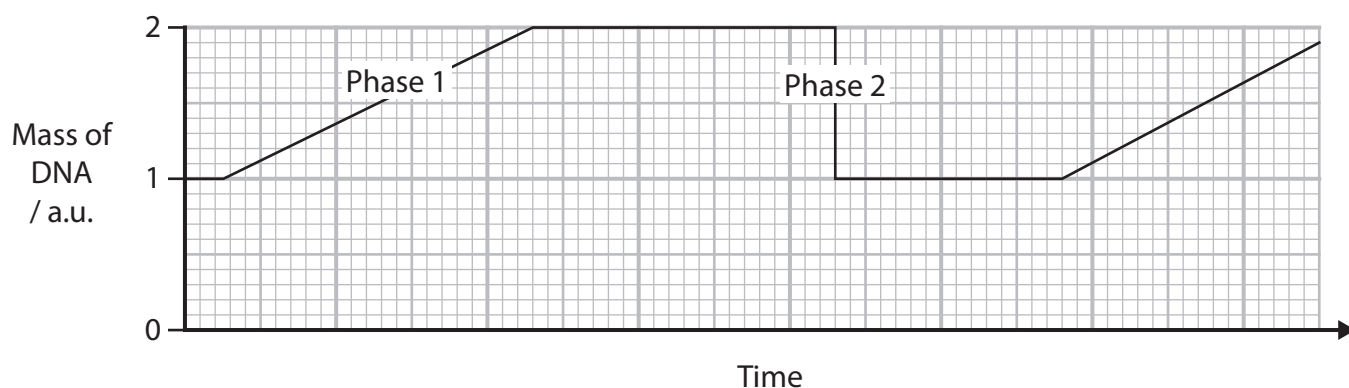
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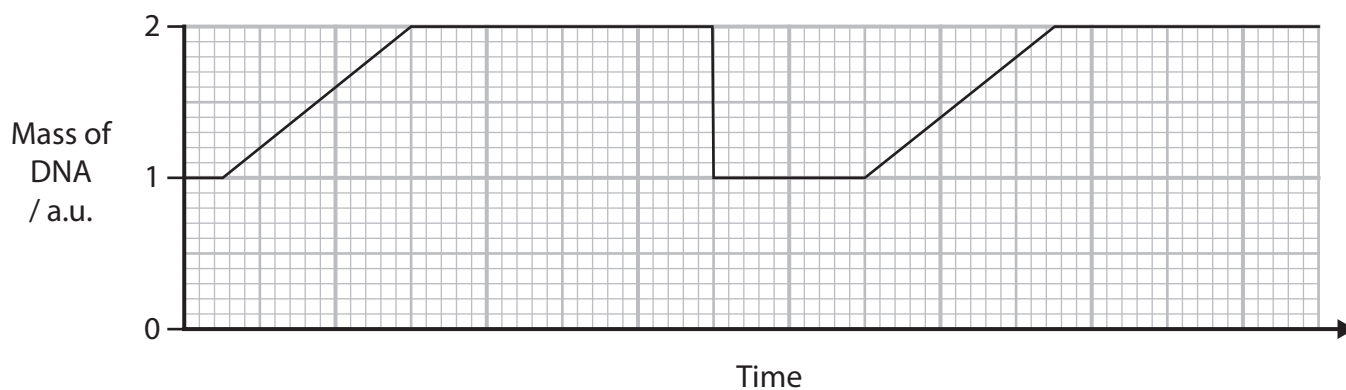
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- (b) The graphs show the changes in the mass of DNA in two different cells, V and W, during phases of the cell cycle over the same time period.

Cell V



Cell W



- (i) Explain the changes in the mass of DNA in cell V during phase 1 and phase 2.

(3)

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(ii) Compare and contrast the duration of the stages of the cell cycle for cells V and W.

(3)

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(Total for Question 2 = 8 marks)

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- 3 Insects that live on land conserve water by minimising water loss by evaporation through their cuticle.

The cuticle is the external layer around an insect and is waterproofed by lipids.

- (a) (i) Explain how the structure of a lipid relates to its role in waterproofing.

(2)

- (ii) Explain why a saturated lipid has better waterproofing properties than an unsaturated lipid with the same number of carbon atoms.

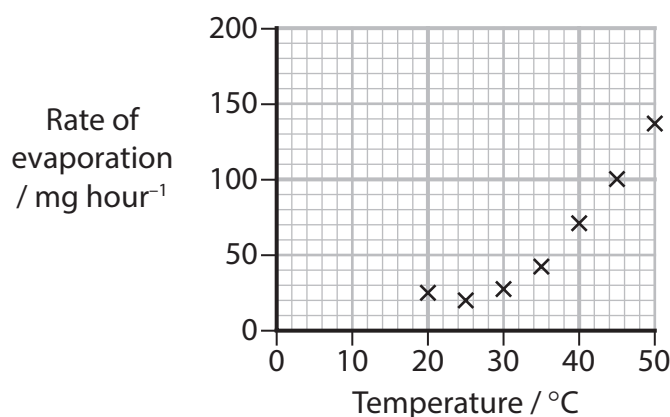
(2)



- (b) In an investigation, the effect of temperature on the rate of evaporation of water from cockroaches was determined.

One cockroach was left at each temperature for five minutes before the measurements were taken.

The graph shows the results of this investigation.



- (i) Analyse the data to describe what measurements and calculations needed to be made in this investigation.

(2)

- (ii) The results show that the critical temperature (T_c) for cockroaches was 30°C.

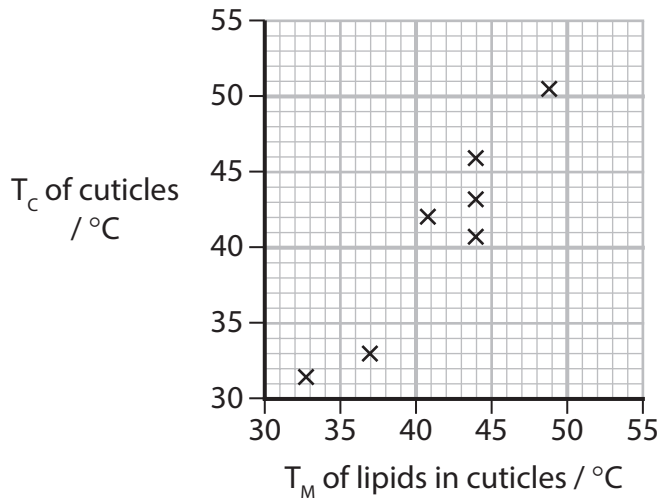
Analyse the data in the graph to state what is meant by critical temperature.

(1)

(c) The temperature at which 50% of a particular lipid melts is the T_M .

The relationship between the T_C for different insects and the T_M of lipids in the cuticle of these was modelled.

The graph shows this relationship.



Explain how the composition of lipids in the cuticle of an insect affects the water loss from this insect.

Use the information in the graph to support your answer.

(2)

(Total for Question 3 = 9 marks)



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4 Pollen tube growth can be investigated in a laboratory.

A student sprinkled pollen onto a sucrose solution and measured the length of the pollen tube using a microscope.

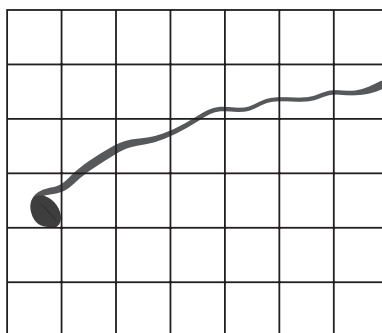
- (a) Which part of a flower secretes a sucrose solution to stimulate pollen tube growth?

(1)

- ☐ A embryo sac
☐ B ovule
☐ C stigma
☐ D style

- (b) The diagram shows a pollen tube viewed using a microscope and a grid.

The width of one square on this grid is $5\text{ }\mu\text{m}$.



- (i) Give an estimate of the length of this pollen tube.

(1)

Answer μm

- (ii) Which of the following is the magnification of this diagram?

(1)

- ☐ A 1.6×10^{-3}
☐ B 1.6×10^{-2}
☐ C 1.6×10^2
☐ D 1.6×10^3



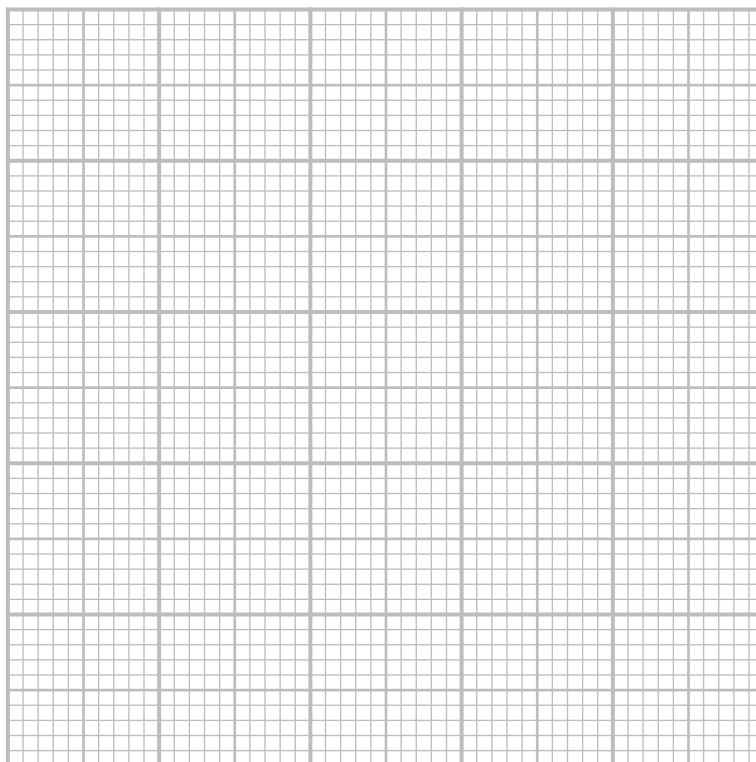
(c) The student measured the growth of a pollen tube over a period of time.

The table shows the measurements taken by this student.

Time of day	Length of pollen tube / μm
10:30	0
11:30	5
12:00	6
13:00	11
13:30	12
14:30	16

(i) Draw a graph of the data to show the length of the pollen tube with time after germination.

(3)



(ii) Draw a line of best fit on your graph.

(1)

(iii) Predict the length of this pollen tube after 8 hours.

Assume that the mean rate of growth remains constant.

Use the equation:

$$y = mx + c$$

(2)

Answer μm

(Total for Question 4 = 9 marks)

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5 Animals and plants need mineral ions for healthy growth and fully functioning cells.

(a) Haemoglobin is present in animals.

(i) Name one mineral ion needed for haemoglobin.

(1)

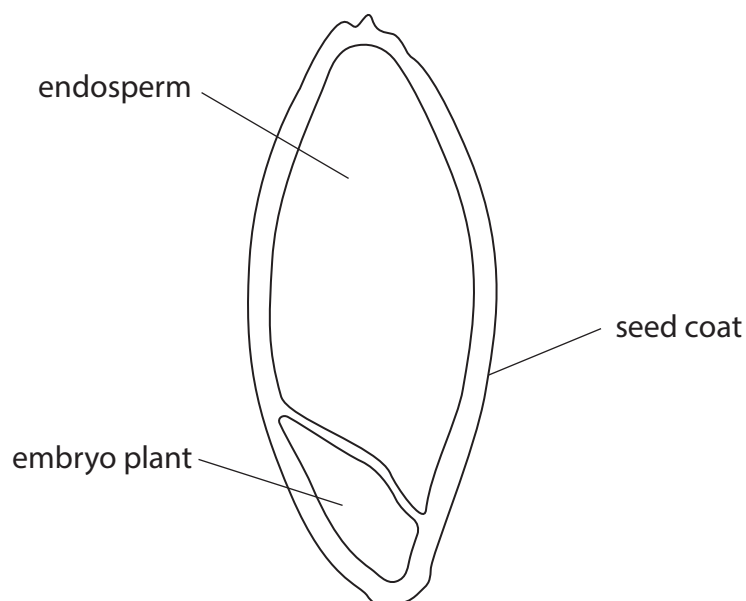
(ii) Explain how the structure of haemoglobin is related to its oxygen-carrying function.

(3)



(b) A student investigated the effect of mineral ion deficiencies on the growth and appearance of barley grain seedlings.

(i) The diagram shows the structure of a barley grain, as seen in section.



Describe the process of double fertilisation in the embryo sac in the formation of a seed.

(2)

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- *(ii) Barley grains were soaked overnight in water and then transferred onto cotton wool in a test tube of culture liquid.

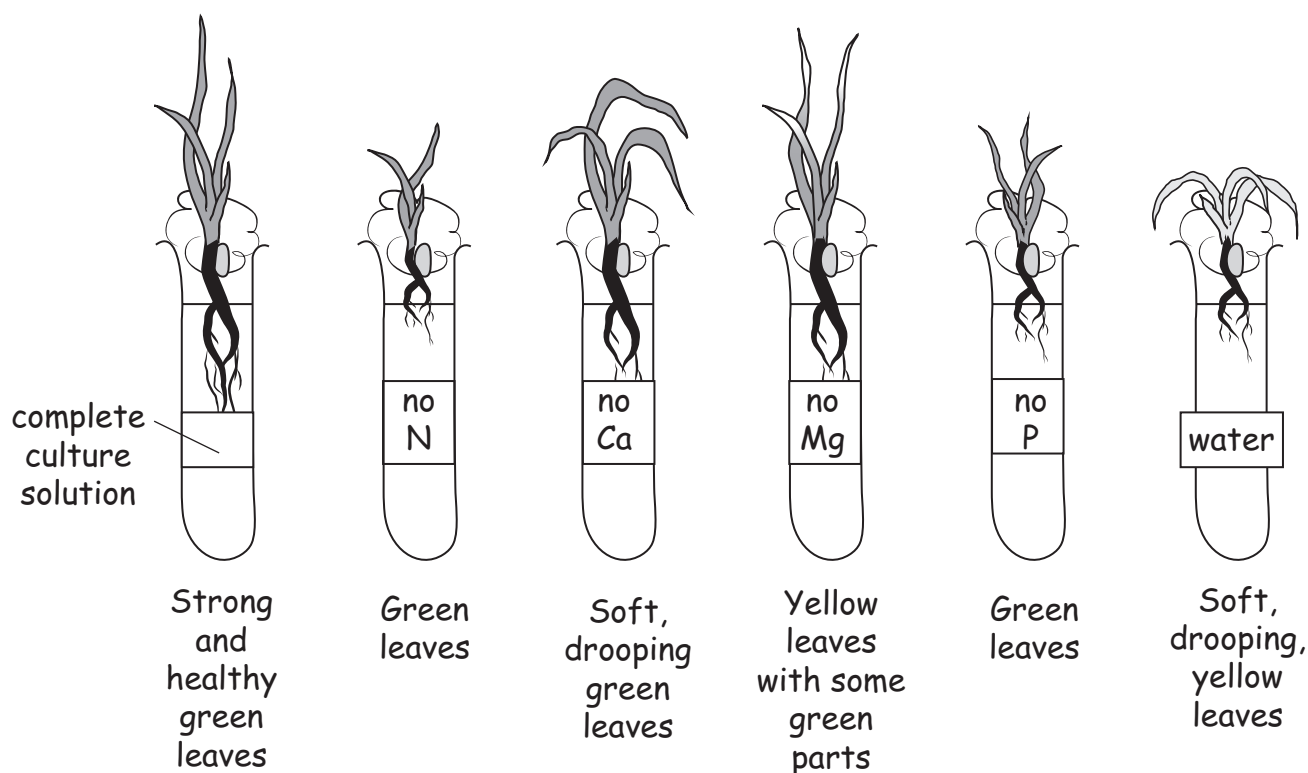
The culture liquids used were:

- a solution containing all mineral ions required by the barley grain seedlings (complete culture solution)
- complete culture solution minus nitrates (no N)
- complete culture solution minus calcium ions (no Ca)
- complete culture solution minus magnesium ions (no Mg)
- complete culture solution minus phosphate ions (no P)
- water.

The barley grains were left for six weeks to germinate and for the shoots and roots to develop.

The test tubes were regularly topped up with the appropriate culture liquid.

The diagram shows the sketch and notes made by the student at the end of the six-week period.



Explain the growth and appearance of the seedlings in each of these test tubes.

Use the student's sketches and notes to support your answer.

(6)

(Total for Question 5 = 12 marks)

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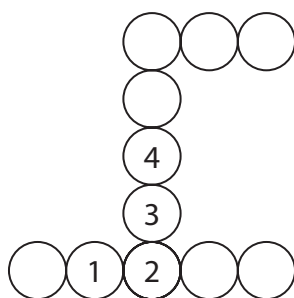
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6 Glycogen and cellulose are both polysaccharides.

(a) The diagram shows part of a glycogen molecule.

Each circle represents a monosaccharide.



(i) Which of the following statements are true for this part of the molecule?

(1)

- 1 monosaccharides 1 and 4 are α glucose
- 2 monosaccharides 2 and 3 are β glucose
- 3 there are 66 oxygen atoms

- ☐ **A** 1 only
- ☐ **B** 2 only
- ☐ **C** 1 and 3 only
- ☐ **D** 2 and 3 only

(ii) Put one cross ☐ in the appropriate box, in each row, to show the type of glycosidic bonds that are formed by monosaccharides 2 and 3.

(2)

Monosaccharide	Glycosidic bond			
	1 – 4 only	1 – 6 only	Both 1 – 4 and 1 – 6	Neither 1 – 4 nor 1 – 6
2	☐	☐	☐	☐
3	☐	☐	☐	☐



(iii) Explain how the structure of glycogen relates to its function.

(3)

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*(b) Cellulose is broken down into glucose by the enzyme cellulase.

The presence of glucose in a solution can be detected by adding Benedict's solution and heating the mixture.

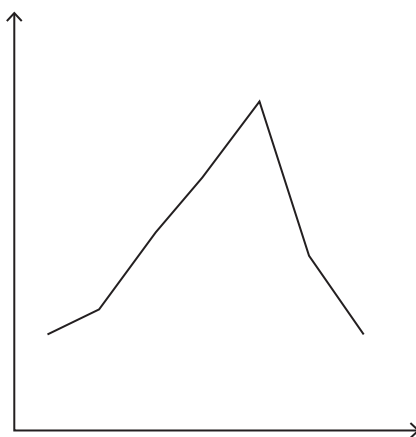
The colour that the mixture goes indicates the concentration of glucose present.

The table shows the colour of the mixture and the concentration of glucose.

Colour of mixture	blue	green	yellow	orange	brick red
Concentration of glucose / mg dm^{-3}	0	<1000	1001 to 1500	1501 to 2000	>2001

A student investigated the effect of temperature on cellulase activity.

The diagram shows a sketch made by the student of the expected results.



Explain how the student could investigate the effect of temperature on the activity of cellulase to produce an accurate graph.

(6)

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(Total for Question 6 = 12 marks)



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- 7 Activated sludge (AS) systems use bacteria to treat waste water.

Large numbers of viruses are also found in these systems.

The type of virus can affect the strains of bacteria present and therefore the effectiveness of the AS systems.

- (a) One type of virus that infects bacteria is λ (lambda) phage.

Draw a labelled diagram of λ (lambda) phage to show its structure and the type of nucleic acid present.

(3)

- (b) Explain why the types of virus present would alter the effectiveness of AS systems.

(3)

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- (c) The types of virus present can be identified using metagenomics.

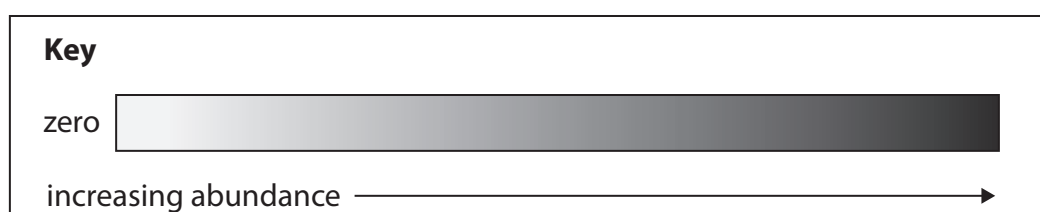
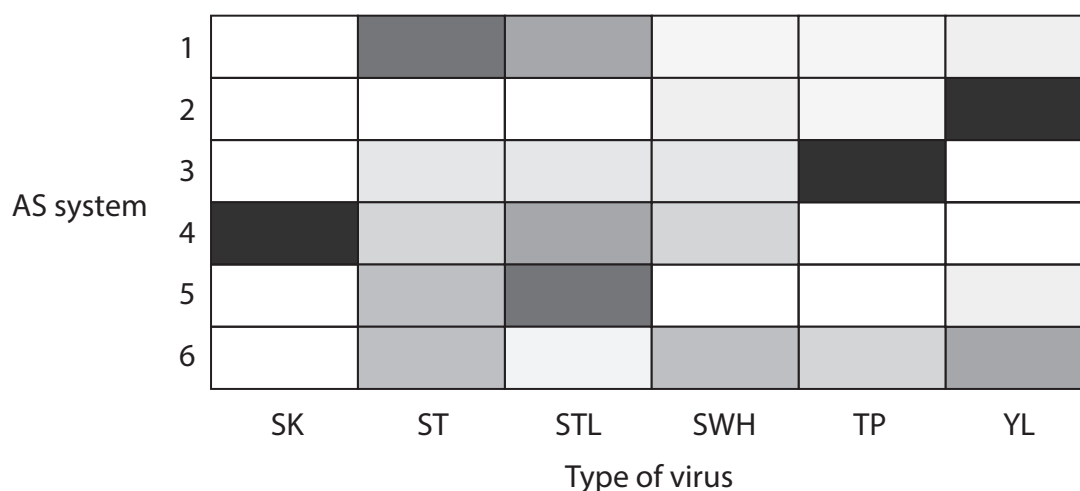
Metagenomics analyses nucleotide sequences found in environmental samples.

Explain why nucleotide sequences from viruses would be found in water samples taken from AS systems.

(2)

- (d) One investigation determined the relative abundance of six types of virus in samples of water from six different AS systems.

The chart shows the results of this investigation.



Analyse the data to describe the conclusions that can be made about the viruses found in these AS systems.

(4)

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(Total for Question 7 = 12 marks)



- 8 All living organisms consist of cells, which are classed as either prokaryotic cells or eukaryotic cells depending on their ultrastructure.

(a) Put one cross [x] in the appropriate box, in each row, to show the presence of structures in prokaryotic cells and eukaryotic cells.

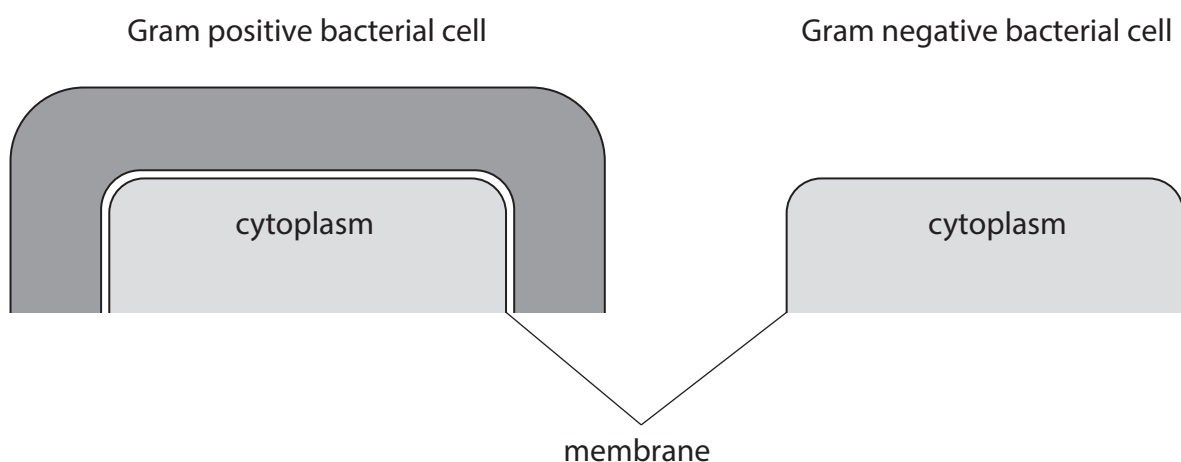
(2)

Structures	Presence of structure			
	In prokaryotic cells only	In eukaryotic cells only	In both prokaryotic cells and eukaryotic cells	In neither prokaryotic cells nor eukaryotic cells
mitochondria	☐	☐	☐	☐
nucleoid	☐	☐	☐	☐

(b) Bacteria are prokaryotic cells.

They may be either Gram positive or Gram negative.

The diagram shows part of a Gram positive bacterial cell and part of a Gram negative bacterial cell.



Complete the diagram to show the structure of the Gram negative bacterial cell wall.

Label your diagram.

(2)



- (c) Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

Explain **two** reasons why these bacteria react differently to antibiotics.

(2)

1

2

- (d) Nourseothricin is a natural product mixture with antibiotic activity.

Nourseothricin targets 70S ribosomes.

Nourseothricin consists of 7 types of streptothricins, including S-F and S-D.

- (i) The percentage of S-F in nourseothricin is 65.5% and the percentage of S-D is 29.6%.

Calculate the ratio of S-F:S-D:other streptothricins.

Give your answer as **whole** numbers.

(2)

Answer



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- (ii) Scientists determined the minimum inhibitory concentration (MIC_{50}) of nourseothricin, S-F and S-D.

The MIC₅₀ is the concentration of the chemical that kills 50% of one type of bacteria.

The table shows these values.

Chemical	MIC ₅₀ / a.u
S-F	2.00
S-D	0.25
nourseothricin	0.50

Analyse all the information in (d) to comment on the relative effects of S-F, S-D and nourseothricin on these bacteria.

(4)

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(Total for Question 8 = 12 marks)

TOTAL FOR PAPER = 80 MARKS

