KUO CHUAN PRESBYTERIAN SECONDARY SCHOOL
2024 PRELIMINARY EXAMINATION

Secondary 4 Express / 4 Normal Academic (SBB)

NAME	

CLASS		**REG. NO**		

SCIENCE (CHEMISTRY/BIOLOGY) 5088 / 04

Paper 4 Biology

Paper 4: 1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, index number and name on all the work you hand in.
Write in dark blue or black pen on both sides of the paper.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate units.

Section **A**
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section **B**
Answer **one** question.
Write your answers in the spaces provided on the question paper.

The number of marks is given in brackets [ ] at the end of each question or part question.

……………….…..……….…..…….
Parent's signature/ Date

FOR EXAMINER'S USE	
Section **A**	
Section **B**	
Total	

This document consists of **21** printed pages, including the cover page.

Section A

Answer **all** questions.

Write your answer in the spaces provided.

1 Fig. 1.1 represents an enzyme and substrate involved in a reaction which takes place in the mouth.

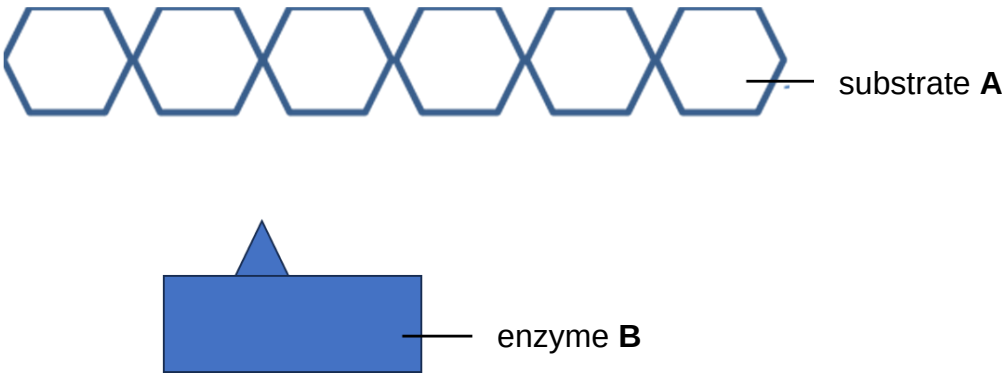

Fig. 1.1

(a) Name **A** and **B**.

A ……

B …… [1]

(b) In the space below, draw the enzyme-substrate complex and the final products formed during the reaction.

Label your drawing.

enzyme-substrate complex	final product

[2]

(c) A student carried out the Benedicts' test on a solution of substrate **A** and a solution consisting of the final products drawn in **(b)**.

Predict the observation for the two solutions.

solution of the substrate **A** ……

solution of final products in **(b)** ……

[1]

[Total: 4]

2 Fig. 2.1 represents what the human alimentary canal would look like if it was removed from a person and straightened out.

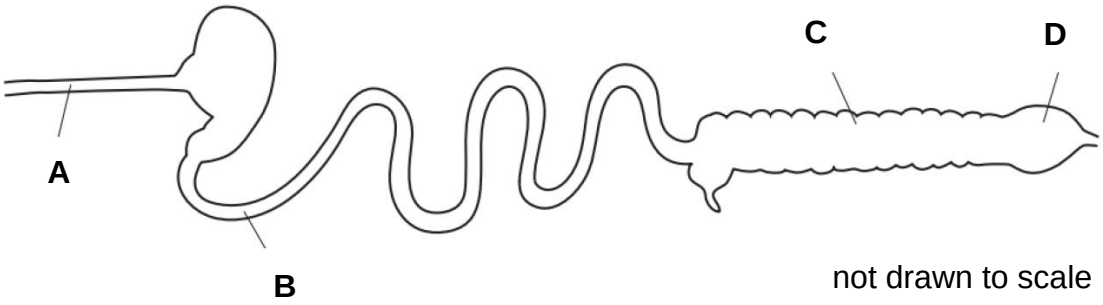

Fig. 2.1

(a) **(i)** Identify parts **A** to **D**.

A ……

B ……

C ……

D …… [2]

(ii) Diarrhoea is a condition where a patient has watery stools.

State which part, **A** – **D**, is likely to be affected in this condition.

…….. [1]

(b) Fig 2.2 shows a person's blood glucose concentration before and after a meal containing carbohydrates is eaten.

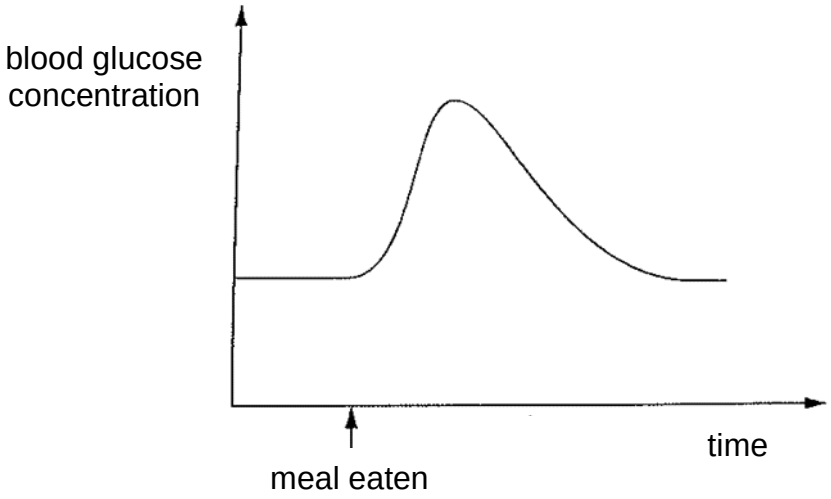

Fig. 2.2

(i) State **one** function of insulin.

……..

…… [1]

(ii) A person suffering from type 1 diabetes is unable to make insulin. This person normally receives an injection of insulin before a meal.

With reference to Fig. 2.2, predict the shape of the graph if this person did not receive an insulin injection.

……..

…… [1]

[Total: 5]

3 Fig. 3.1 shows an angiogram of a heart before treatment for coronary heart disease. An angiogram is an image of the blood flow through the blood vessels on the surface of the heart.

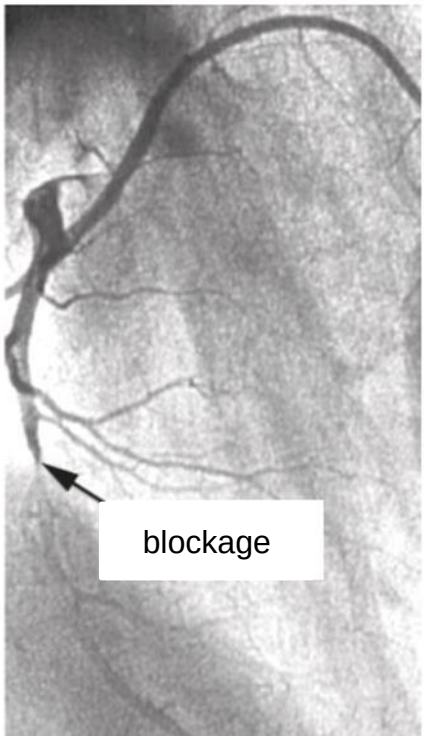

Fig. 3.1

The arrow on Fig. 3.1 shows the position of a blockage in a blood vessel due to a blood clot.

(a) State the name of the blocked blood vessel.

…….. [1]

(b) State one factor, other than diet, that can increase a person's risk of developing coronary heart disease.

…… [1]

(c) Suggest and explain how this blockage in Fig. 3.1 may affect the heart.

……

……

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……

……

……

……

…… [4]

[Total: 6]

4 (a) Fig. 4.1 shows a setup with a number of respiring maggots placed in a large test tube. The apparatus was left for 20 minutes and then a drop of coloured liquid was introduced into the capillary tube as shown.

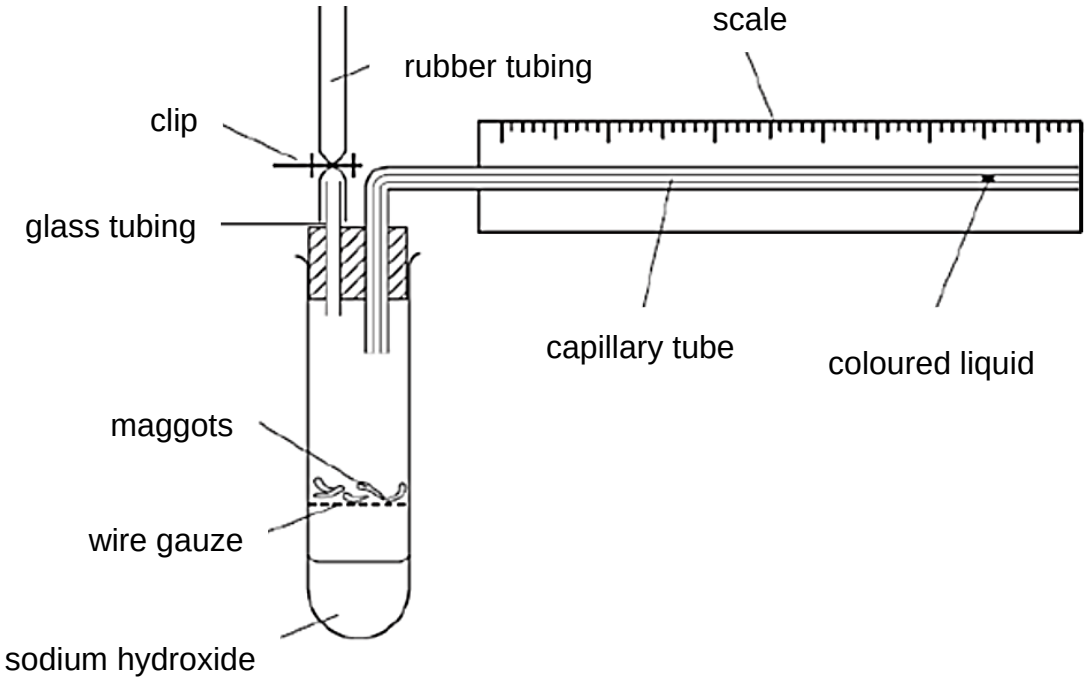


Fig. 4.1

(i) What is the function of sodium hydroxide in the setup?

……... [1]

(ii) Explain why the drop of coloured liquid moved towards the boiling tube.

……

……... [1]

(b) Humans respires similarly to maggots, but a by-product called lactic acid may be present in the human muscle cells.

Table 4.1 shows the concentration of lactic acid and glycogen in a person's leg muscle. The measurements were made at rest and after vigorous exercise.

Table 4.1

	concentration in leg muscle / arbitrary units	
	at rest	after vigorous exercise
lactic acid	0.9	23.5
glycogen	75.0	22.0

(i) Explain the decrease in glycogen concentration in the muscle after a vigorous exercise.

……

……

……

…….. [2]

(ii) Explain the increase in lactic acid concentration in the muscle after a vigorous exercise.

……

……

……

…….. [2]

[Total: 6]

5 COVID-19 is an infectious disease.

Fig. 5.1 shows the number of new COVID-19 infections in a country between week 11 and week 26 of year 2020.

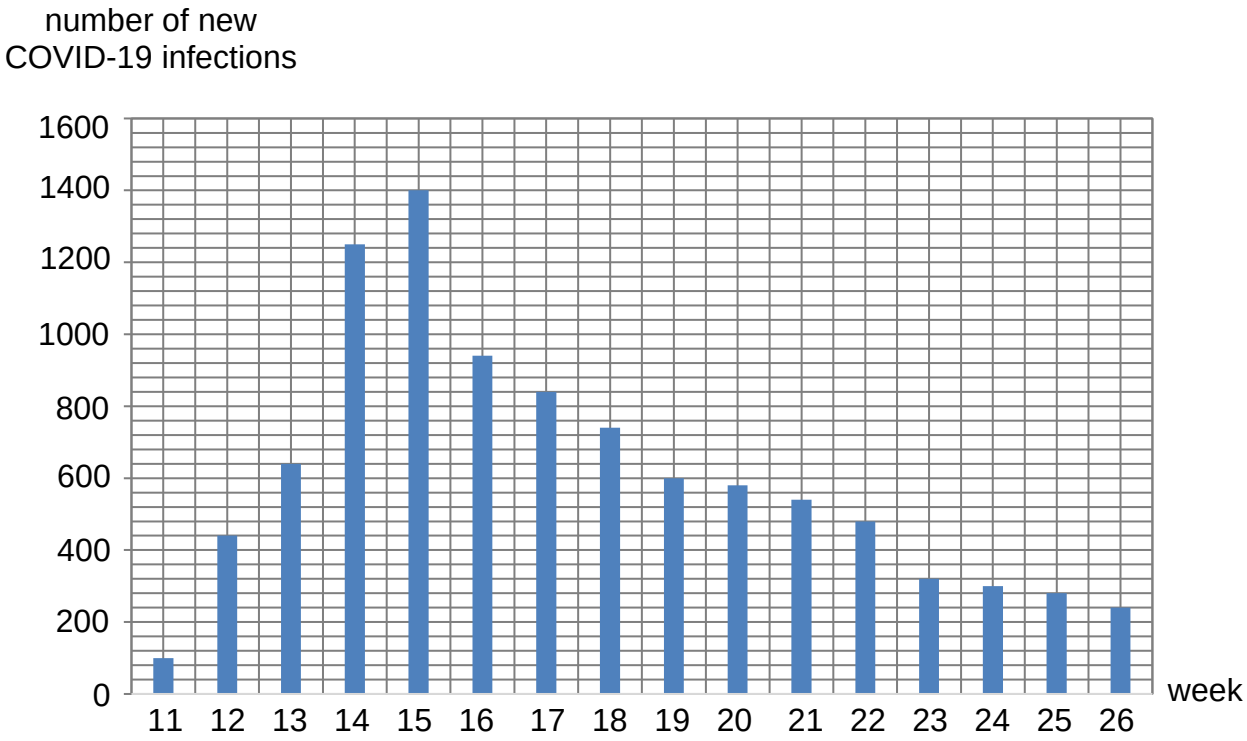


Fig. 5.1

(a) **(i)** Calculate the percentage change in cases between week 15 to week 26. Show your working and give your answers to three significant figure.

…… % [2]

(ii) Vaccine for COVID-19 was introduced in week 15 of year 2020.
Explain how the introduction of vaccines caused the change in **(a)(i)**.

……

……

……

……

……

……... [3]

(b) State the type of pathogen that causes COVID-19.

…… [1]

[Total: 6]

6 Fig 6.1 illustrates the effect of light intensity on the rate of photosynthesis of a species of aquatic plant, at combinations of two different temperatures and carbon dioxide concentrations.

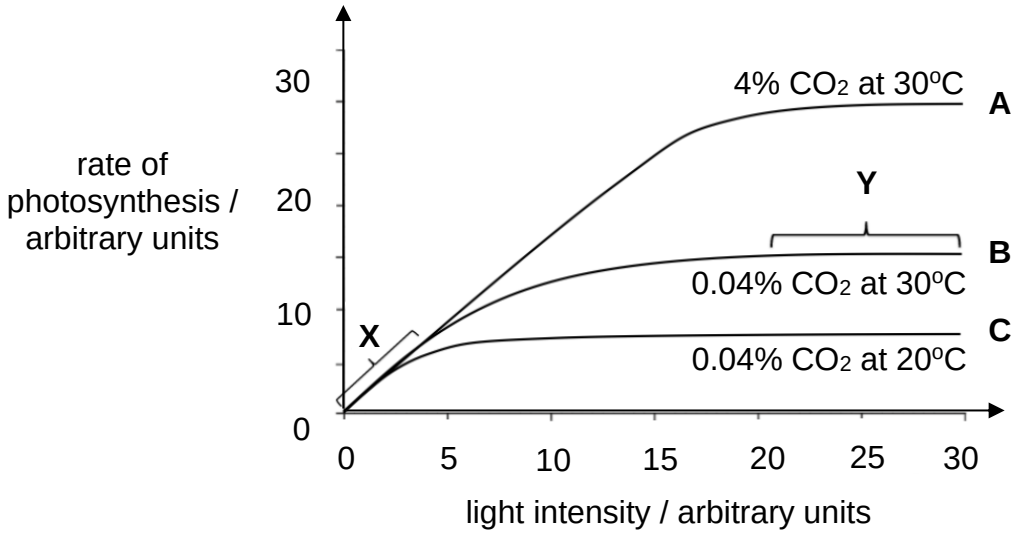


Fig. 6.1

(a) Write the word equation for photosynthesis.

…… [2]

(b) State the factor limiting the rate of photosynthesis in region **X**.

…… [1]

(c) **(i)** Using Fig. 6.1, explain why the limiting factor stated in **(b)** is not the limiting factor in region **Y**.

……

…….. [1]

(ii) Suggest **one** possible limiting factor in region **Y**.

…….. [1]

[Total: 5]

7 (a) Draw the structure of one nucleotide of DNA. Label the components.

[2]

Table 7.1 shows the percentages of bases found in a particular virus.

Table 7.1

cytosine (C) / %	adenine (A) / %	thymine (T) / %	guanine (G) / %
21	21	29	29

(b) Explain whether the genetic material found in the virus is DNA.

……

……

……

……

……

…… [3]

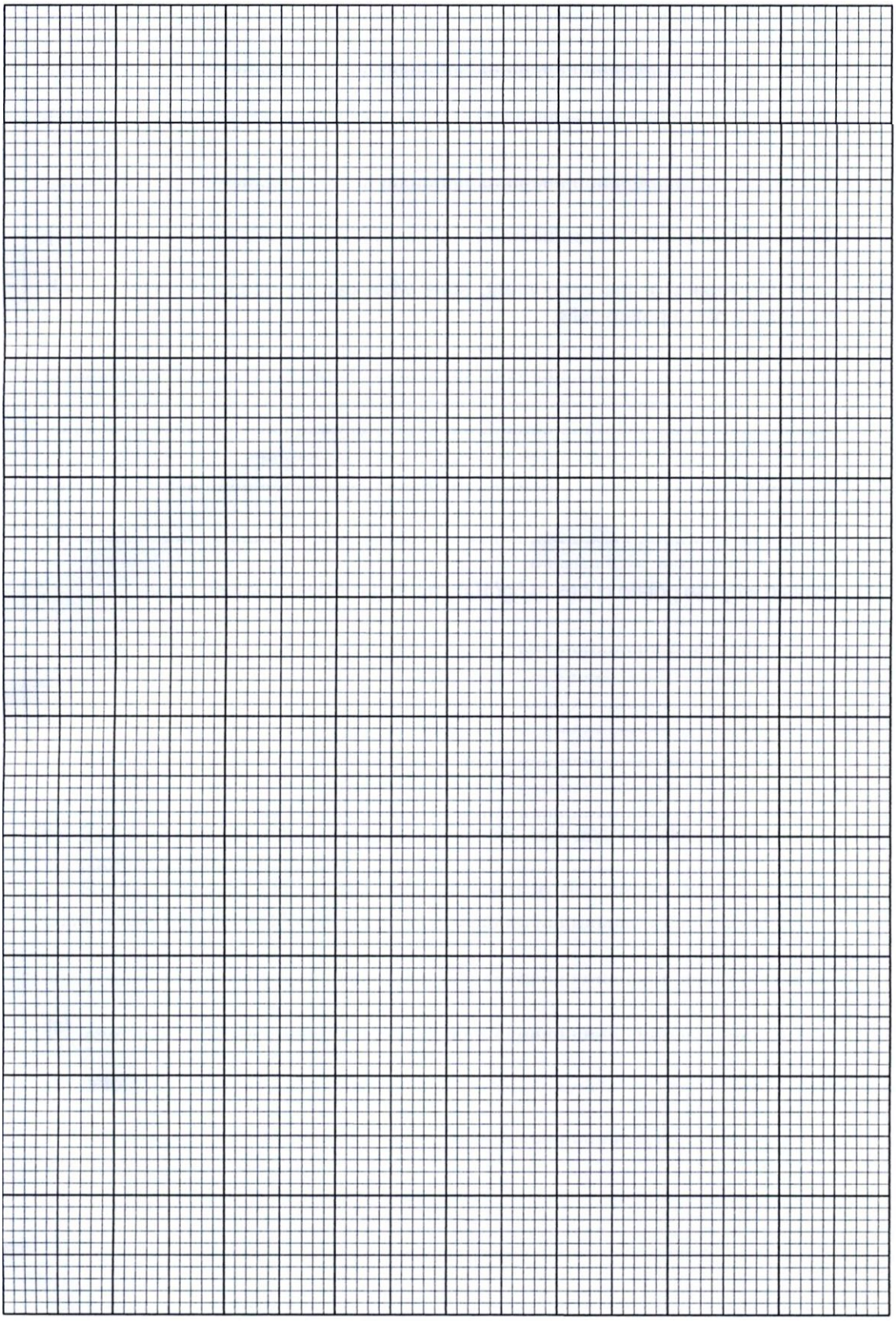
[Total: 5]

8 Table 8.1 shows the probability of a woman becoming pregnant during a menstrual cycle.

Table 8.1

day of menstrual cycle	probability of pregnancy / %
0	0
4	2
8	14
12	54
16	30
20	10
24	4
28	2

(a) Plot these data on the grid provided.



[4]

(b) Describe and explain the change in probability of a woman getting pregnant between Day 16 to Day 28.

……

……

……

……..... [2]

(c) Explain how the concentration of progesterone would be like at day 28, if the woman is pregnant.

……

……

……

……..... [2]

[Total: 8]

9 Achondroplasia is a genetic bone growth disorder that leads to short-limbed dwarfism. It is caused by a mutation in the fibroblast growth factor receptor 3 gene.
The allele causing achondroplasia is dominant.

Fig. 9.1 shows the inheritance of achondroplasia in a family.

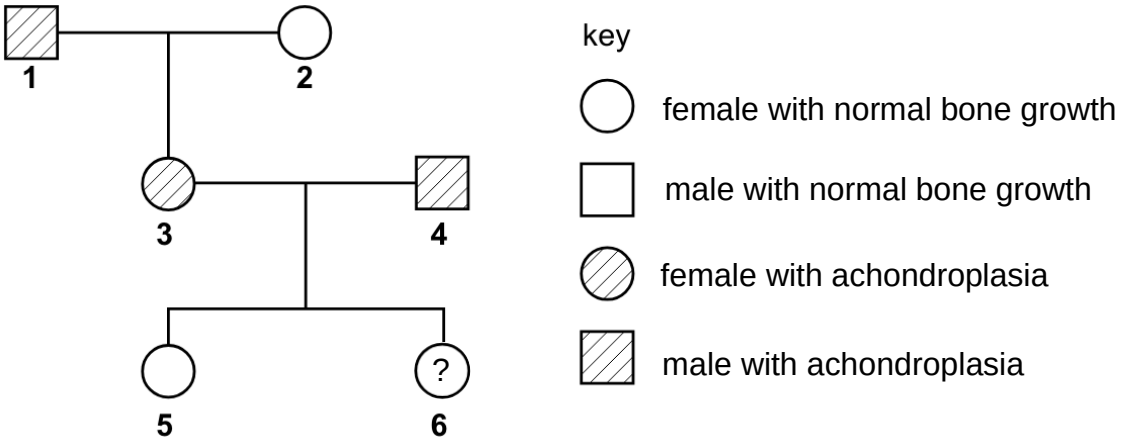


Fig. 9.1

(a) **(i)** Explain the meaning of the terms *gene* and *mutation*.

gene ……

……...

mutation ……..

……... [2]

(ii) Name **one** other disease caused by a mutation in the structure of a gene.

……... [1]

(b) Explain if the inheritance of Achondroplasia shows a continuous or discontinuous variation.

……..……..

……..……..

……..……..

……..... [2]

(c) The symbols **A** and **a** represent the dominant and recessive alleles respectively.

(i) State the genotype of individual **2**.

…….. [1]

(ii) Complete the genetic diagram to explain the possible phenotypes of individual 6.

genotype of parents	……..	x	……..	
gametes	…… ……		…… ……	
genotypes of children	…… ……		…… ……	
phenotypes of children	…… ……		…… ……	

[4]

[Total: 10]

Section B

Answer **one** question from this section in the spaces provided.

10 Fig. 10.1 shows the internal structure of a leaf.

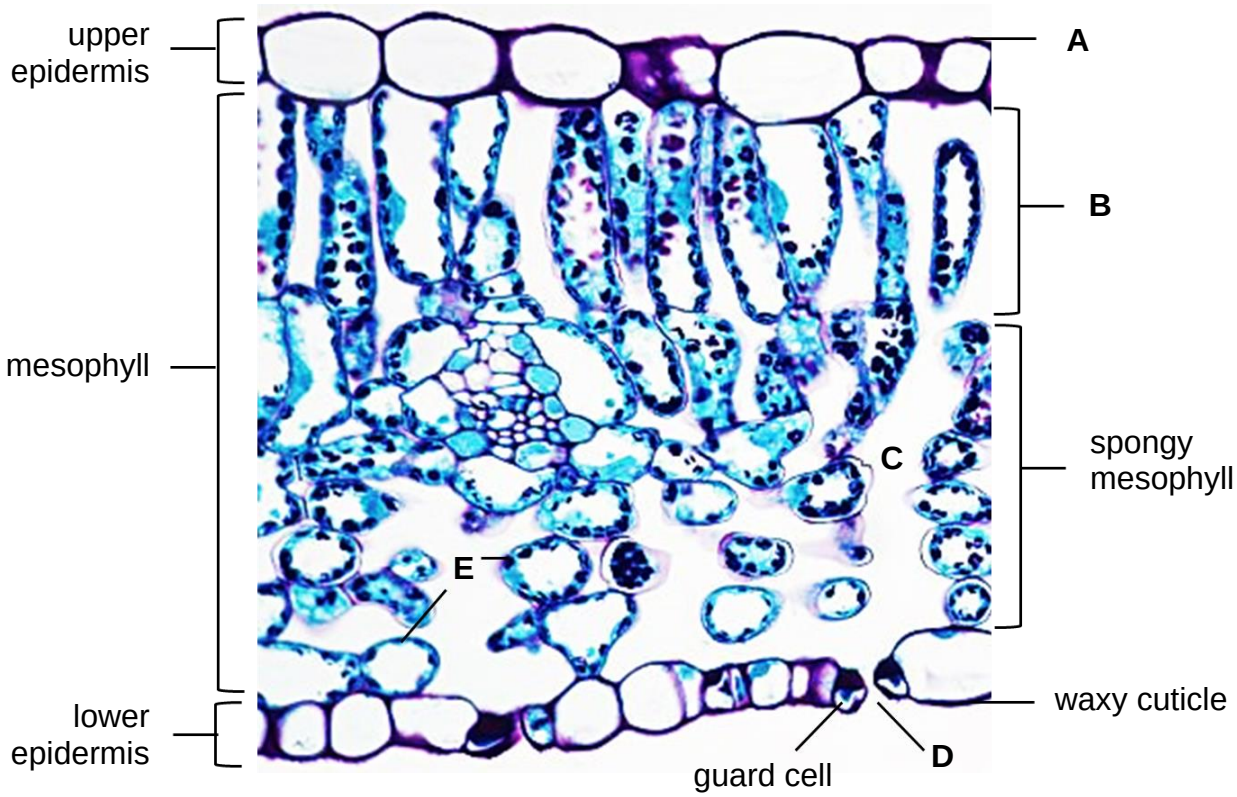


Fig. 10.1

(a) Explain how each of the structures labelled **A** – **E** are adapted for photosynthesis.

……

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……

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…… [5]

(b) Explain how water passes from the surrounding soil water to the xylem vessels.

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……

……

…… [4]

(c) State **one** factor that increases the rate of transpiration.

…… [1]

[Total: 10]

11 Below shows a food chain in a woodland.

oak tree → leaf beetle (insects) → blackbirds (birds) → parasitic worms

(a) For this food chain, draw labelled diagrams of a pyramid of numbers and a pyramid of biomass.

[5]

(b) In the recent decades, the expansion of human activities such as agriculture, urban development, and infrastructure projects had led to significant land clearing across the globe. This practice often involves the removal of forests and other vegetation that act as crucial carbon sinks.

(i) State what is meant by the term *carbon sink*.

…….. [1]

(ii) Suggest how removal of forests affect the carbon cycle and contribute to climate change.

……

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……

……

…….. [4]

[Total: 10]

End of Paper