



SINGAPORE CHINESE GIRLS' SCHOOL PRELIMINARY EXAMINATION

CANDIDATE NAME

CLASS

REGISTER NUMBER

CENTRE NUMBER

INDEX NUMBER

BIOLOGY

6093/02

Paper 2

Friday, 22 August 2025

1 hour 45 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your class, register number, centre number and index number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, glue or correction fluid/tape.

Section A

Answer **all** questions.

Write your answers in the spaces provided.

Section B

Answer **one** question.

Write your answers in the spaces provided.

The use of an approved scientific calculator is expected, where appropriate.

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

For Examiner's Use	
Section A	70
Section B	10
Total	80

Section A

Answer **all** questions.

- 1** Fig. 1.1 is a diagram of the alimentary canal in the human body. Letters **A** to **K** represent structures.

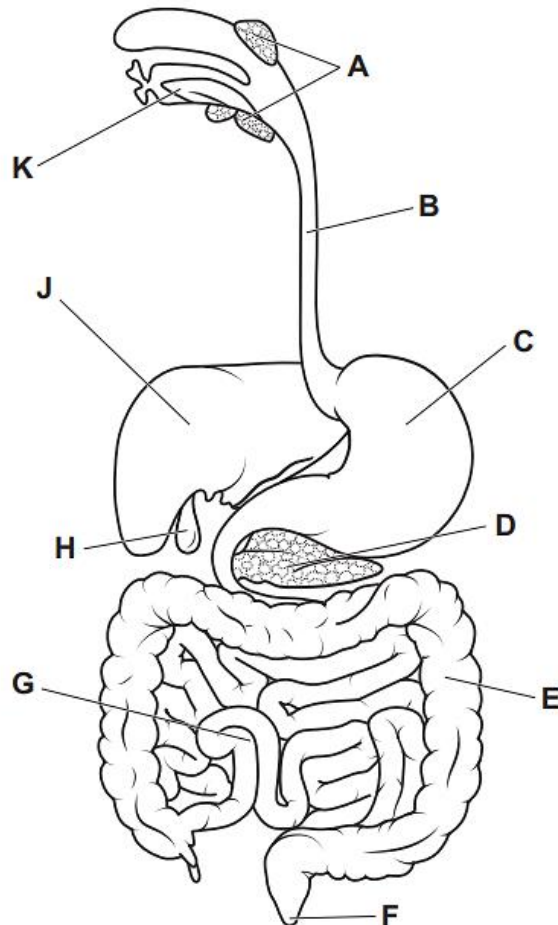


Fig. 1.1

- (a)** State the letter from Fig. 1.1 that identifies the structure where [3]

(i) alcohol is broken down

(ii) egestion occurs

(iii) most absorption of water occurs

- (b)** Outline the role of structure **H** in the digestion of a named nutrient. [2]

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- (c) Disease-causing bacteria may enter the alimentary canal through contaminated food.

State a letter from Fig. 1.1 to indicate the structure which acts as a barrier to these bacteria. Explain your answer. [2]

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[Total : 7]

2 Large quantities of plastic waste are polluting the oceans.

A survey published in March 2018 showed the increase in plastic waste in the Pacific Ocean. One area of the Pacific Ocean is known as the Great Pacific Garbage Patch (GPGP).

Data were collected from areas inside and outside the GPGP from 1965 to 2015 to estimate the quantity of plastic waste. The results are shown in Fig. 2.1.

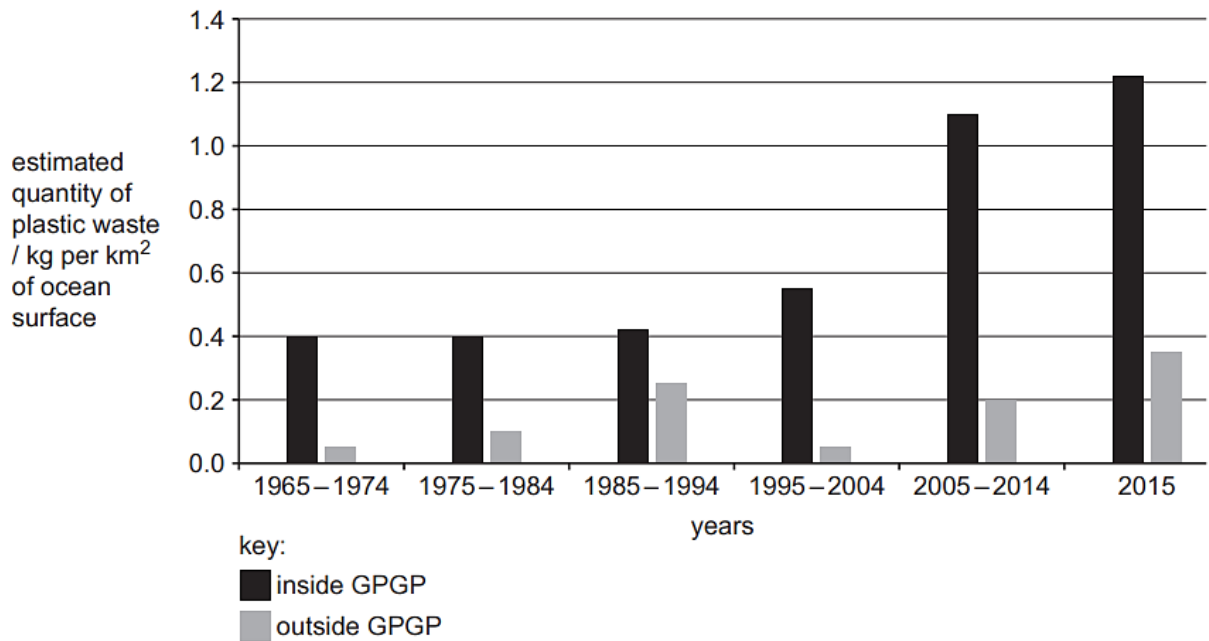


Fig. 2.1

(a) Describe the results of the survey from 1965 to 2015 as shown in Fig. 2.1. [3]

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- (b) The green turtle, *Chelonia mydas*, is a species of marine animal that is harmed by plastic waste.

Fig. 2.2 shows a green turtle swimming past a plastic bag in the Pacific Ocean.



Fig. 2.2

- (i) Outline the dangers of non-biodegradable plastic waste to marine animals, such as green turtles. [2]

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- (ii) Suggest two ways to reduce the quantity of plastic waste. [2]

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[Total : 7]

- 3 Antibodies are proteins that are produced by white blood cells. Antitoxins are antibodies which neutralise the toxins released by some bacteria.

The transmissible disease diphtheria is caused by a bacterium that releases a toxin that can cause serious damage to the body.

A person is suspected of having caught diphtheria. At a clinic, the person is given an injection of antitoxin antibodies that provide protection against the diphtheria toxin. She is also given an injection of the vaccine for diphtheria.

A few weeks later she is given a second injection of the diphtheria vaccine.

Fig. 3.1 shows the changes in concentration of the antitoxin antibodies and the antibodies produced in response to the vaccine.

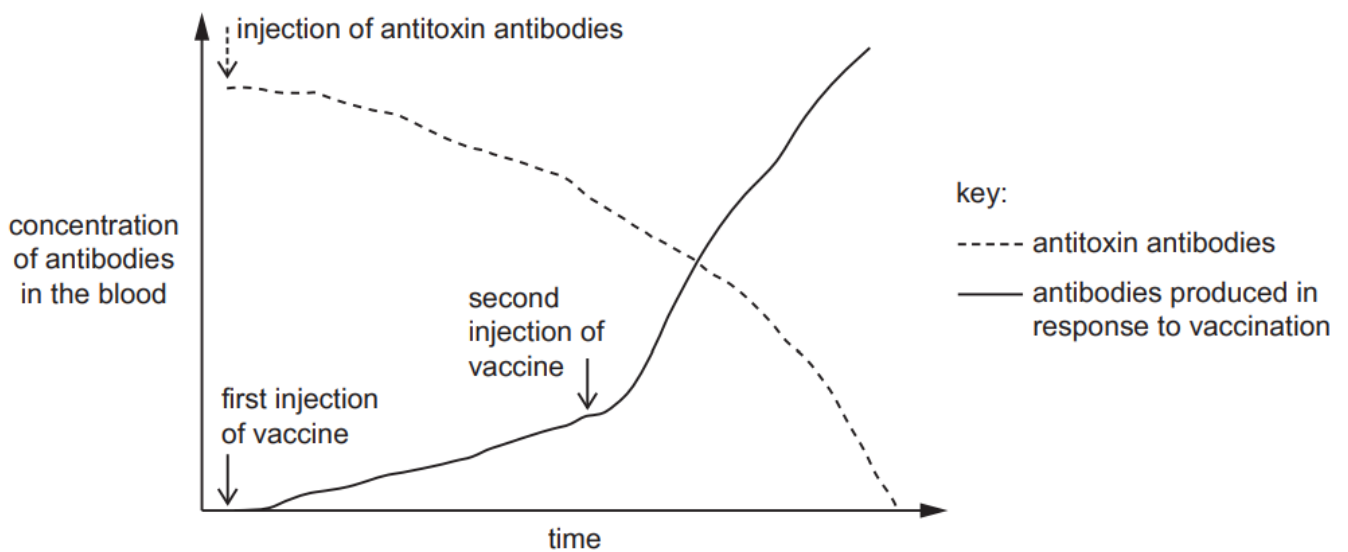


Fig. 3.1

- (a) State the name of white blood cells that produce antibodies. [1]

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- (b) List two advantages of giving the person an injection of antitoxin antibodies. [2]

1

.....

2

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- (c) Suggest how the two injections of the vaccine result in better protection against diphtheria than the injection of antitoxin antibodies. [3]

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[Total : 6]

4 Enzymes are used in genetic engineering.

(a) Define the term enzyme.

[2]

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(b) The process of genetic engineering often starts with the steps shown in Fig. 4.1.

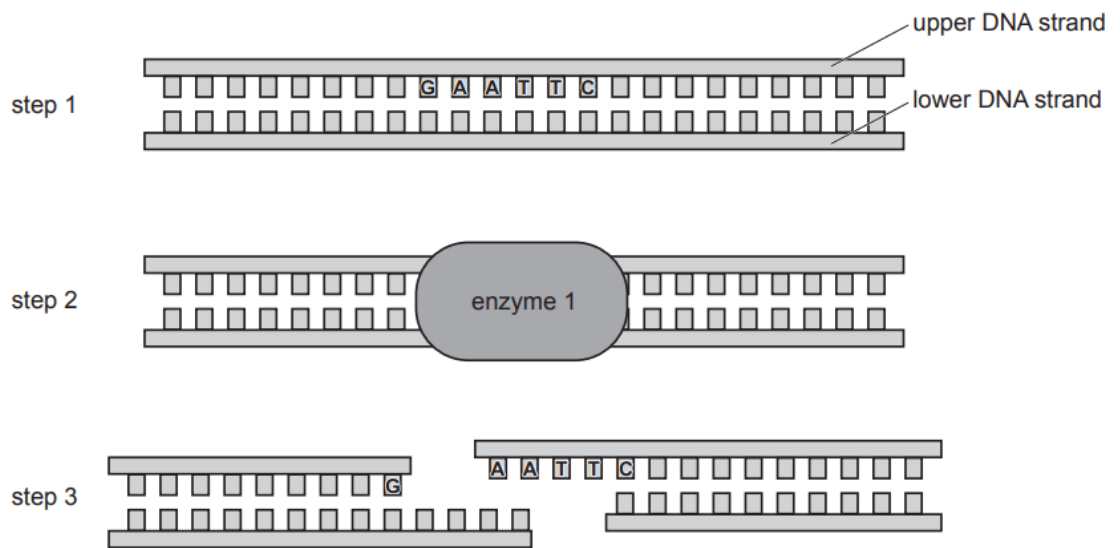


Fig. 4.1

(i) Complete the sequence of bases on the lower strand of the DNA molecule in step 1. [1]

upper DNA strand	G	A	A	T	T	C
lower DNA strand						

(ii) State the name of enzyme 1 and describe its importance in genetic engineering. [3]

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(c) Another enzyme, enzyme 2, is used later in the process of genetic engineering.

Fig. 4.2 is a diagram showing the action of enzyme 2.

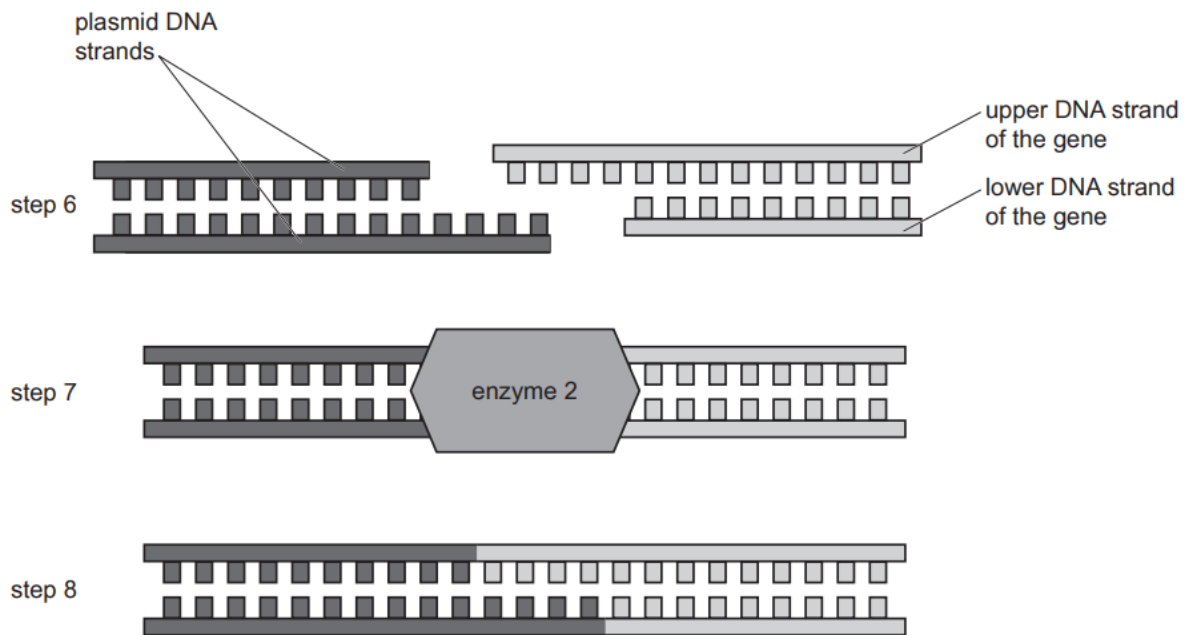


Fig. 4.2

Using Fig. 4.2, explain the function of enzyme 2 in step 7 and describe the result seen in step 8. [2]

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[Total : 8]

- 5 (a) Events in the menstrual cycle related to the uterine lining are shown. Hormones play a part in these events.

- A** uterine lining is shed out of the body
B thickness of uterine lining remains constant
C thickness of uterine lining continues to increase

Using **A** to **C**, identify the events which involve named hormones in the menstrual cycle and describe their roles. [2]

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- (b) Fig. 5.1 shows part of the female human reproductive system.

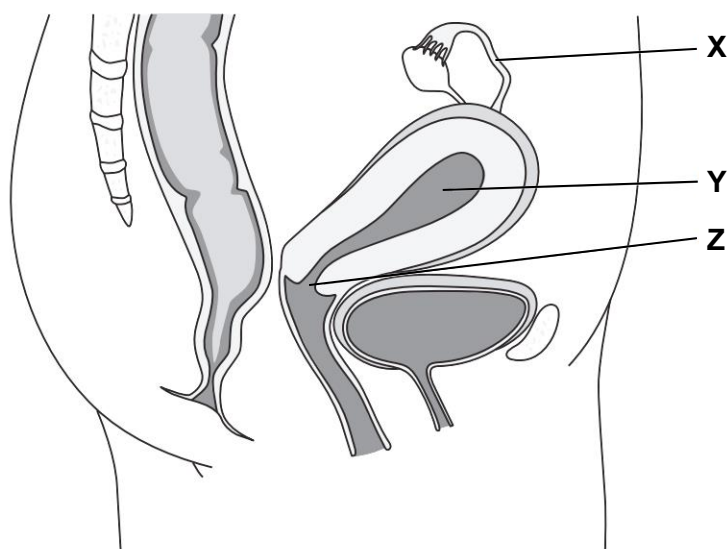


Fig. 5.1

- (i) State the names of the structures labelled **X** and **Y** on Fig. 5.1. [2]

X

Y

- (ii) Describe the early development of the zygote after fertilisation has occurred. [2]

.....

- (iii) Suggest a role of structure **Z** in supporting pregnancy. [1]

.....
 [Total : 7]

- 6 Table 6.1 shows four functions of the human gas exchange system.

Complete Table 6.1 by identifying the part of the human gas exchange system that carries out each function. [4]

Table 6.1

function	part of the human gas exchange system
muscles in this part contracts, part is flattened	
allows air to flow between the larynx and the bronchi	
muscles in this part contracts to lower the ribs	
site of gas exchange	

[Total : 4]

- 7 Xerophytes grow in habitats with low rainfall and soils that often have high concentrations of salts.

Fig. 7.1 shows the xerophyte *Yucca treculeana* growing on salt flats.



Fig. 7.1

- (a) State three ways in which the roots of *Yucca treculeana* are adapted to absorb sufficient water in the conditions in which they live. [3]

1

2

3

- (b) Suggest how the leaves of xerophytes are adapted to reduce water loss to the atmosphere. [2]

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[Total : 5]

- 8 Fig. 8.1 shows some parts of a plant. The circle shows a magnified cross-section of part of the stem.

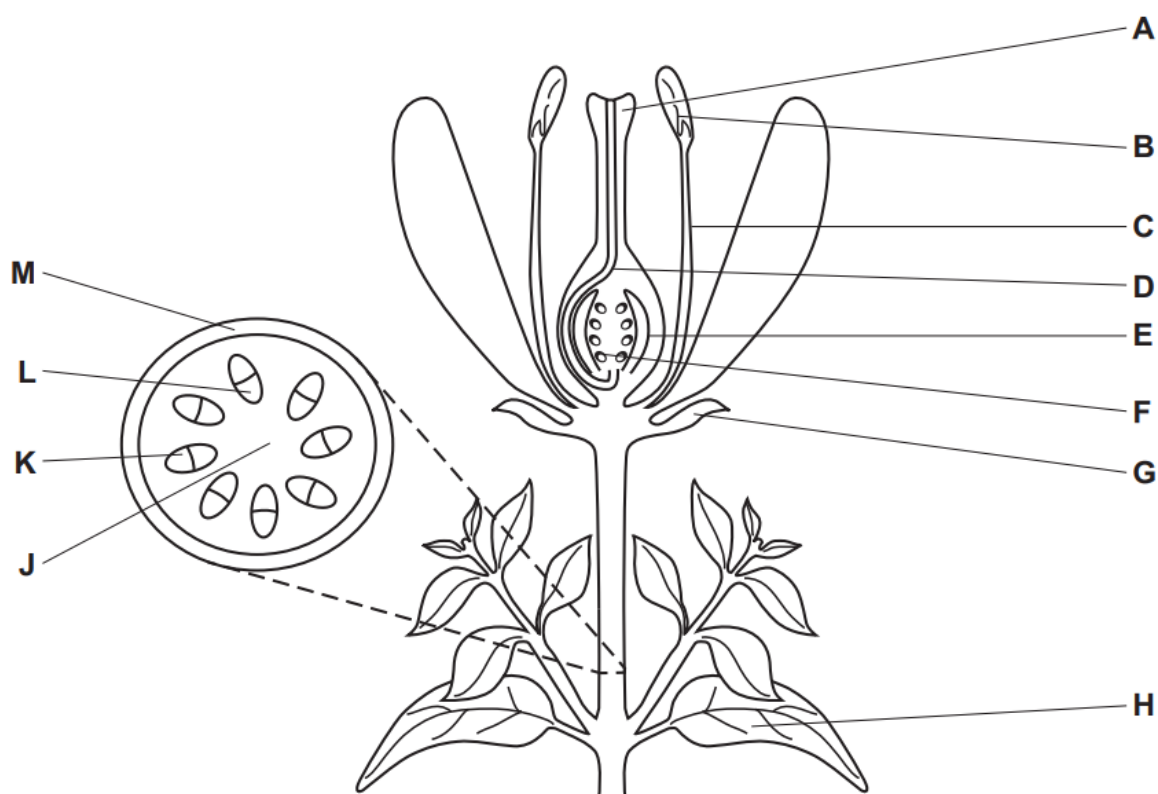


Fig. 8.1

not to scale

- (a) Table 8.1 contains statements about the functions of some of the structures in Fig. 8.1.

Complete the table by:

- stating the name of the structure
- identifying the letter that labels that structure

[5]

Table 8.1

function	name of structure	letter from Fig. 8.1
provides support to the stem		
protects flower bud		
produces glucose		
produces pollen		
delivers male nuclei to site of fertilisation		

- (b) State the letter from Fig. 8.1 that identifies a structure containing a haploid nucleus of a female gamete. [1]

.....
[Total : 6]

- 9 The American writer Ernest Hemingway had cats that had more toes than usual. This inherited condition is called polydactyly. The allele for polydactyly is dominant.

(a) Define the term dominant.

[1]

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(b) Fig. 9.1 is part of a pedigree diagram for Hemingway's cats.

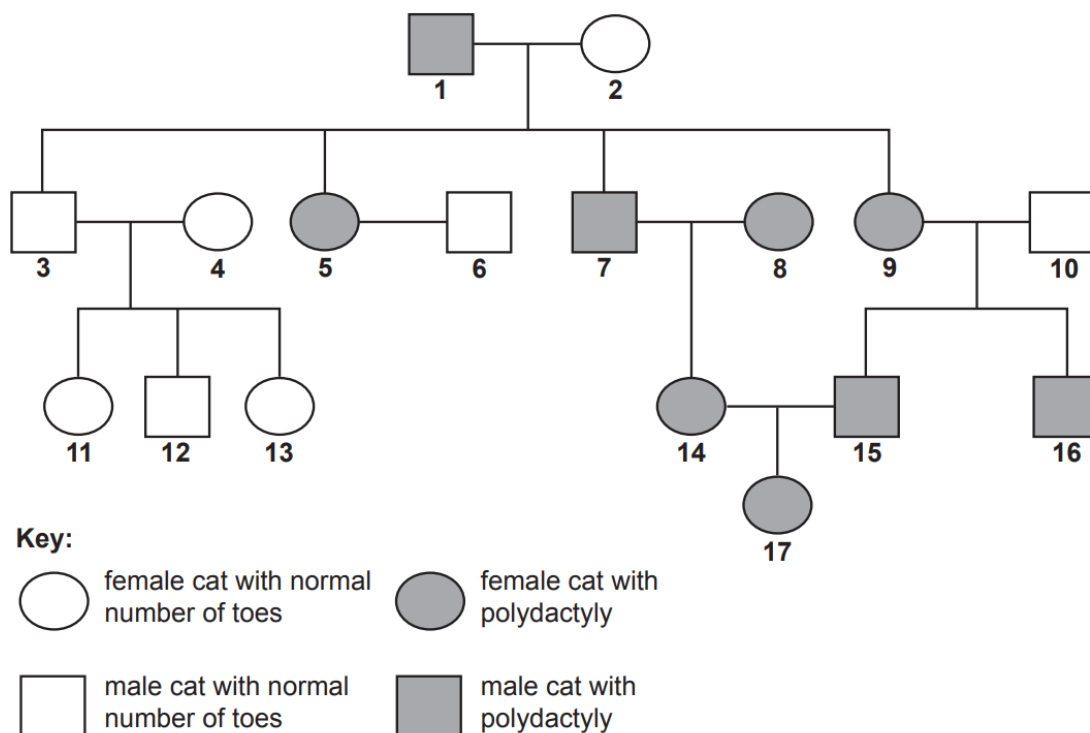


Fig. 9.1

- (i) State the possible genotypes of cats **5**, **6** and **14** in the pedigree diagram in Fig. 9.1.

Use the letters **T** and **t**.

[3]

cat **5**

cat **6**

cat **14**

- (ii) Explain why offsprings of cats **3** and **4** did not inherit polydactyly. [2]

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- (c) Explain why polydactyly is an example of discontinuous variation. [2]

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[Total : 8]

- 10** Table 10.1 shows the relationship between heart rate and the emptying time and the filling time of the left ventricle of a human heart.

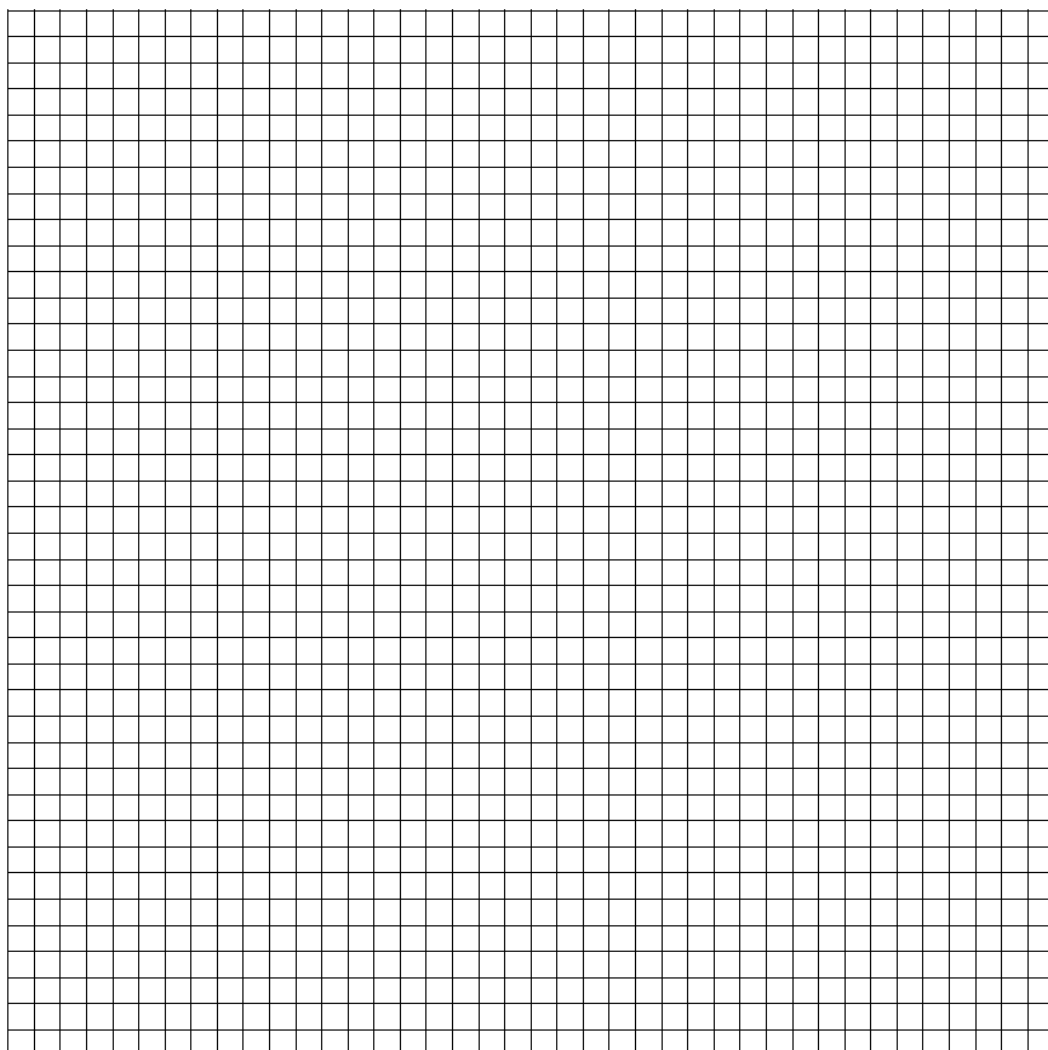
The emptying time refers to the time taken for blood to leave the left ventricle into the aorta.

The filling time refers to the time taken for the left ventricle to be filled with blood.

Table 10.1

heart rate / beats per min	emptying time / ms	filling time / ms
60	320	720
76	260	520
90	X	Y
104	180	380
120	180	340
128	140	300

- (a)** Plot two labelled graphs based on the data in Table 10.1 on the grid. [4]



(b) State two suitable conclusions based on your graphs in **(a)**. [2]

1
.....

2
.....

(c) Use your graphs in **(a)** to determine the values of X and Y in Table 10.1. [2]

X

Y

(d) Explain how filling time of the heart affects muscle cells during intense physical activity. [4]

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[Total : 12]

Section B

Answer **one** question from this section.

- 11 Fig. 11.1 shows how glucose is used by different organisms.

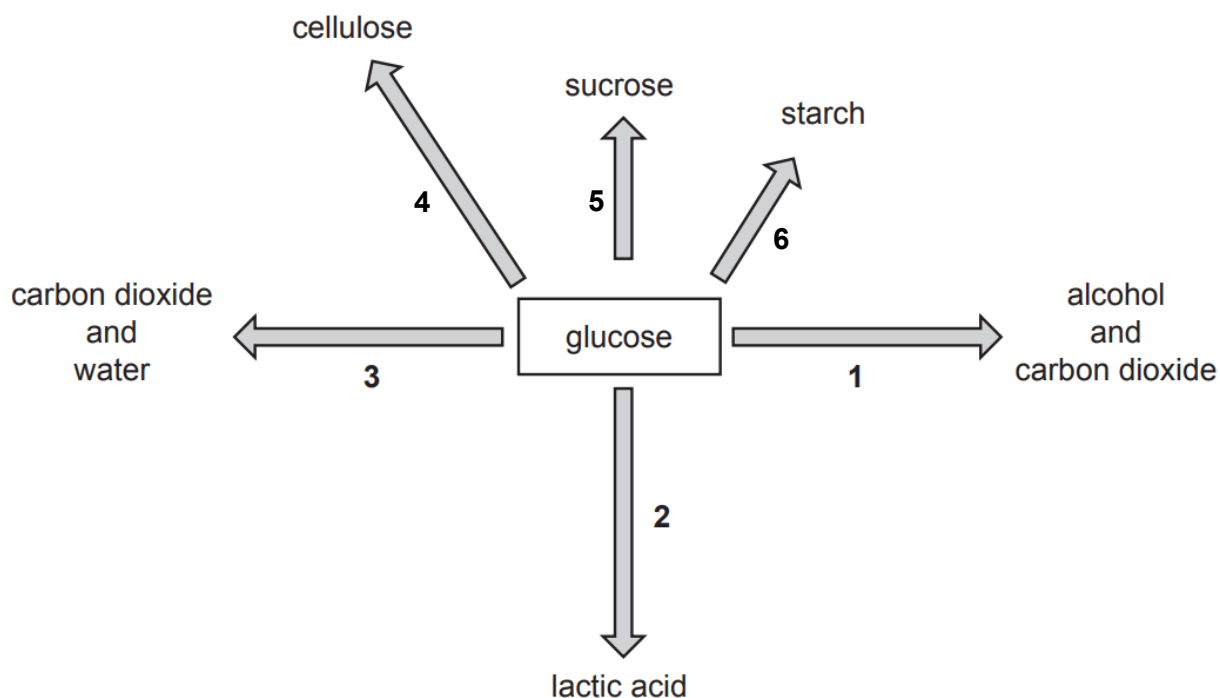


Fig. 11.1

- (a) State the numbers from Fig. 11.1 that identify the processes that do not take place in human bodies. [1]

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- (b) Outline how glucose is synthesized in a named organism. [3]

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- (c) Compare the features of cellulose and sucrose. [4]

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- (d) Describe how **excess** glucose in the human body is regulated. [2]

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[Total : 10]

12 Fig. 12.1 shows a neurone.

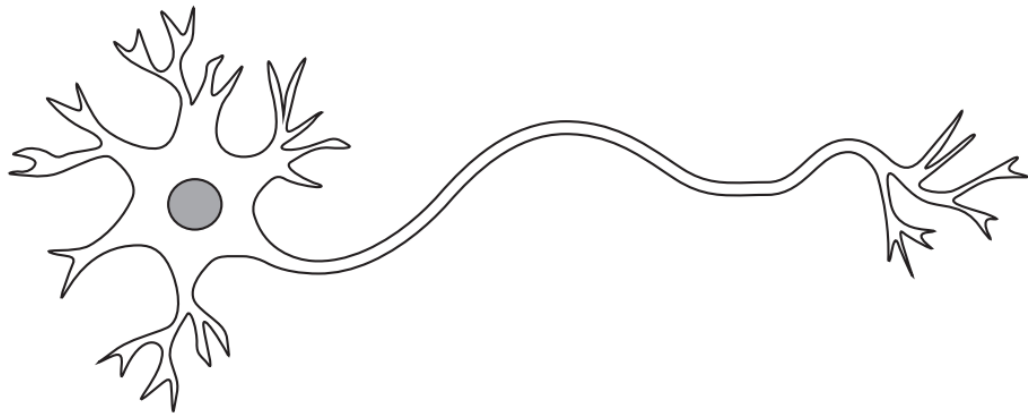


Fig. 12.1

- (a)** On Fig. 12.1, label two visible cell structures. [2]
- (b)** List differences between nervous and hormonal communication. [5]

[illegible]

(c) In Minamata disease, mercury enters the human body and damages relay neurones and disrupts the transmission of impulses.

(i) Suggest two ways how impulses can be prevented from being transmitted along damaged relay neurones. [2]

1

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2

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(ii) Name the ecological process by which humans develop Minamata disease after consuming food contaminated with poison such as mercury. [1]

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[Total : 10]

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