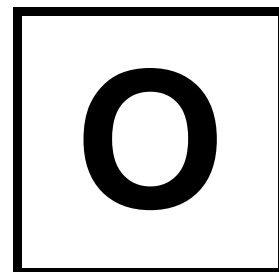




NAVAL BASE SECONDARY SCHOOL PRELIMINARY EXAMINATION, 2025



Name: _____ ()

Class: _____

SCIENCE (BIOLOGY)

5088/04

Paper 4 Biology

26 August 2025

Setter : Mr Alfiyan

1 hour 15 minutes

No additional materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class at the top of the page.

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

Write in dark blue or black pen.

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 (55 marks)

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

Section B (10 marks)

Answer only **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.

For Examiner's Use	
Section A	55
Section B	10
Total	65
Parent's/ Guardian's Signature	

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Section A

Answer **all** questions in the spaces provided.

- 1** The liver is an organ with many different functions.

Fig. 1.1 shows the liver, its blood supply and other associated organs. The blood vessels are labelled **P** to **R**.

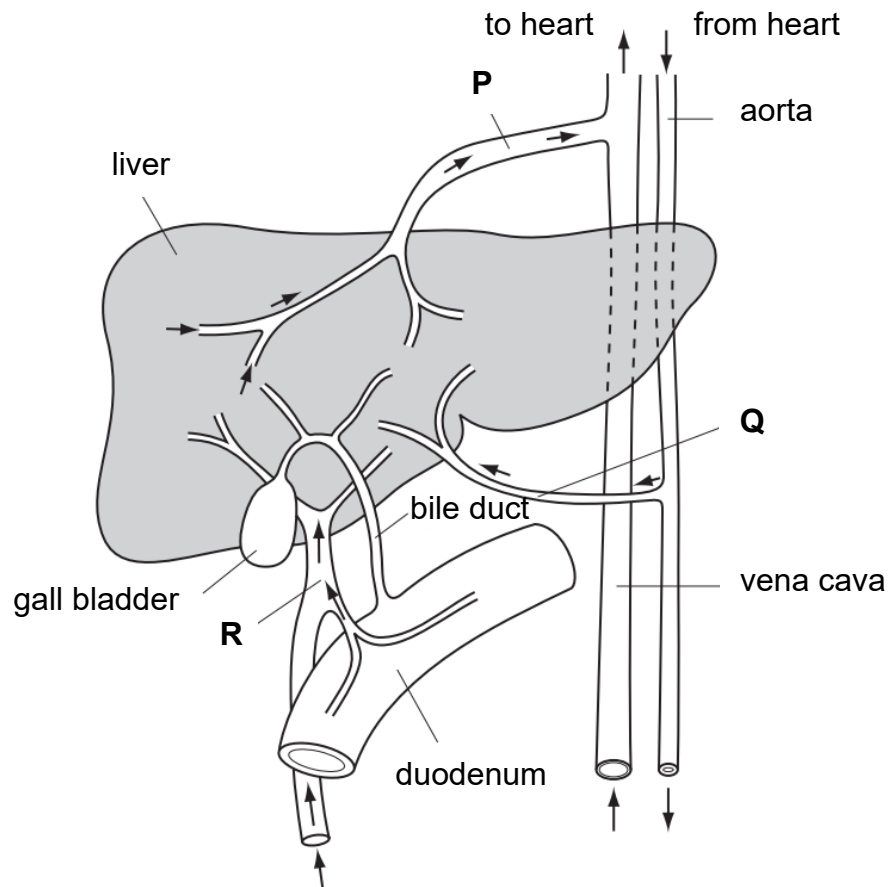


Fig. 1.1

- (a) (i)** A person eats a meal containing protein and carbohydrate.

Complete Table 1.1 to show which blood vessel **P**, **Q** or **R** has the highest concentration of glucose, oxygen and urea respectively as this meal is absorbed.

Table 1.1

substance transported by blood	letter of blood vessel in Fig. 1.1
glucose	
oxygen	
urea	

[3]

[Turn over

(ii) State one difference in the structure of blood vessel **P** and blood vessel **Q**.

.....

..... [1]

(b) Cholesterol can accumulate in the gall bladder to form gall stones. These gall stones may stop bile flowing from the liver through the bile duct and into the duodenum.

Explain the possible effect of gall stones on the digestion of fats.

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..... [2]

[Total: 6]

2 Fig. 2.1 shows the internal structure of the human heart and associated blood vessels.

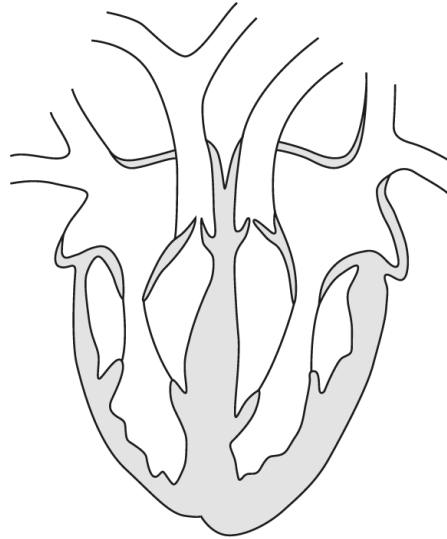


Fig. 2.1

(a) On the diagram, draw a line to name **and** label the following:

(i) the blood vessel that transports blood to the lungs, and

(ii) the chamber that exerts the greatest force when its walls contract.

[2]

(b) Fig. 2.2 shows a semi-lunar (aortic) valve in the open and closed positions.

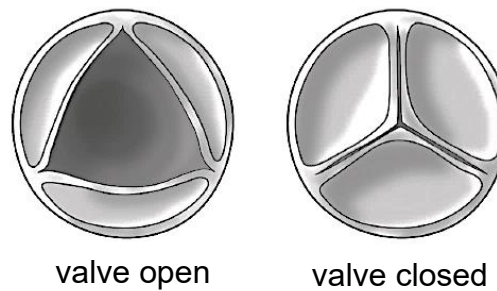


Fig. 2.2

Fig. 2.3 shows the same heart valve in the open and closed positions in a person with Aortic Valve Disease (AVD).

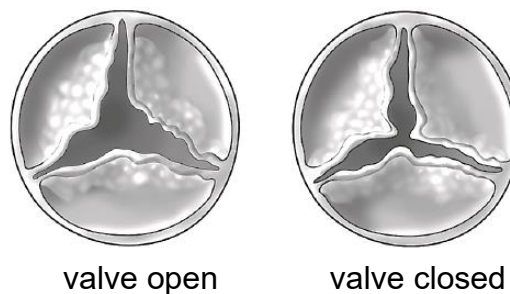


Fig. 2.3

[Turn over

- (i) Explain how AVD affects the flow of blood when the heart contracts and relaxes.

.....

.....

.....

.....

.....

.....[3]

- (ii) Suggest some effects that AVD could have on the person.

.....

.....

.....

.....

.....[2]

- (c) Oxygen is transported in the blood by red blood cells.

Explain **two** adaptations of the red blood cell for its function.

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.....

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.....[2]

[Total: 9]

- 3 Fig. 3.1 shows the percentage of antibiotic resistance in a certain strain of bacteria compared to the years since a new antibiotic was introduced.

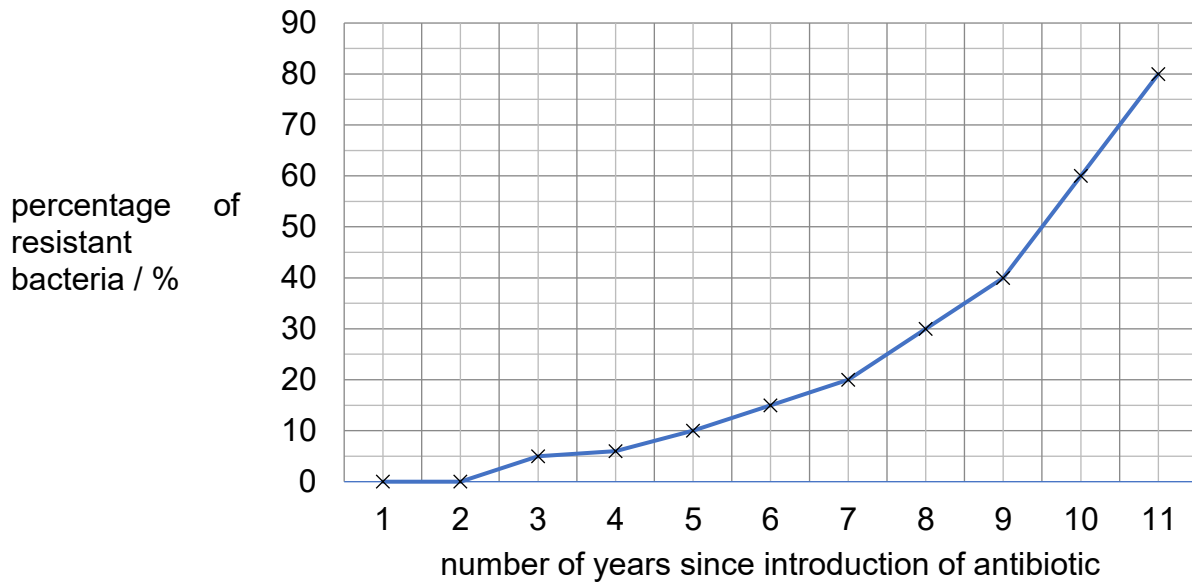


Fig 3.1

- (a) Compare the percentage increase in antibiotic resistance between years 2 and 4 and years 6 to 8 in Fig. 3.1.

.....
[1]

- (b) Superbugs are bacteria that develop antibiotic resistance, which may be accelerated by the misuse of antibiotics.

Explain how the misuse of antibiotics may lead to the creation of superbugs.

.....

[3]

- (c) Suggest **two** methods of reducing transmission of bacterial diseases.

1
 2[2]

[Total: 6]

[Turn over]

4 Fig. 4.1 shows the male reproductive system.

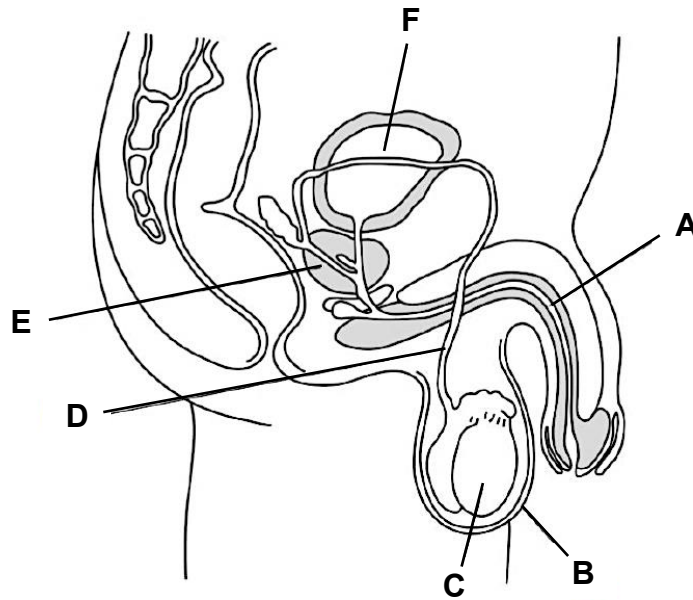


Fig. 4.1

(a) Define *sexual reproduction*.

.....
[2]

(b) Table 4.1 describes the male reproductive system in Fig. 4.1.
 Complete Table 4.1.

Table 4.1

letter in Fig. 4.1	name of structure	function
	testis	
		transports urine and semen
	prostate gland	

[3]

[Total: 5]

- 5 Fig. 5.1 shows the changes in the thickness of the uterine lining of a woman over a period of time.

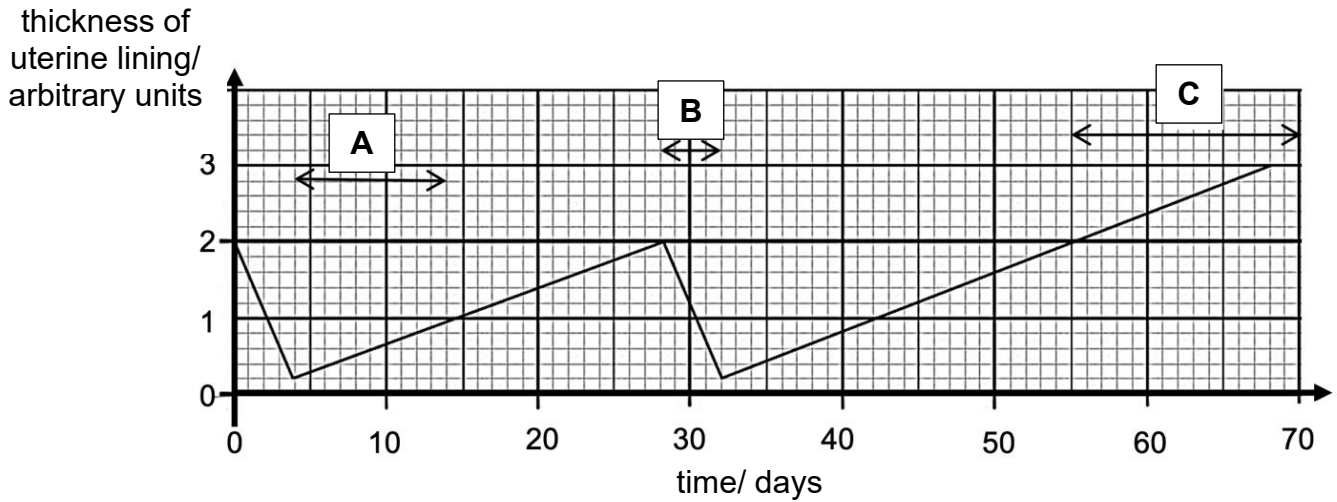


Fig. 5.1

- (a) With reference to Fig. 5.1, explain the process that is occurring at **B**.

.....

[2]

- (b) Explain the change in thickness of the uterine lining at **A**.

.....

[2]

- (c) Suggest a possible cause for the change in uterine lining thickness at **C**.

.....

[2]

[Total: 6]

[Turn over]

- 6 The American writer Ernest Hemingway lived on the island of Key West in Florida, USA in the 1930s. During this time he was given a male cat by a sea captain.

The cat had more toes than usual. This inherited condition is called polydactyly. The allele for polydactyly is dominant.

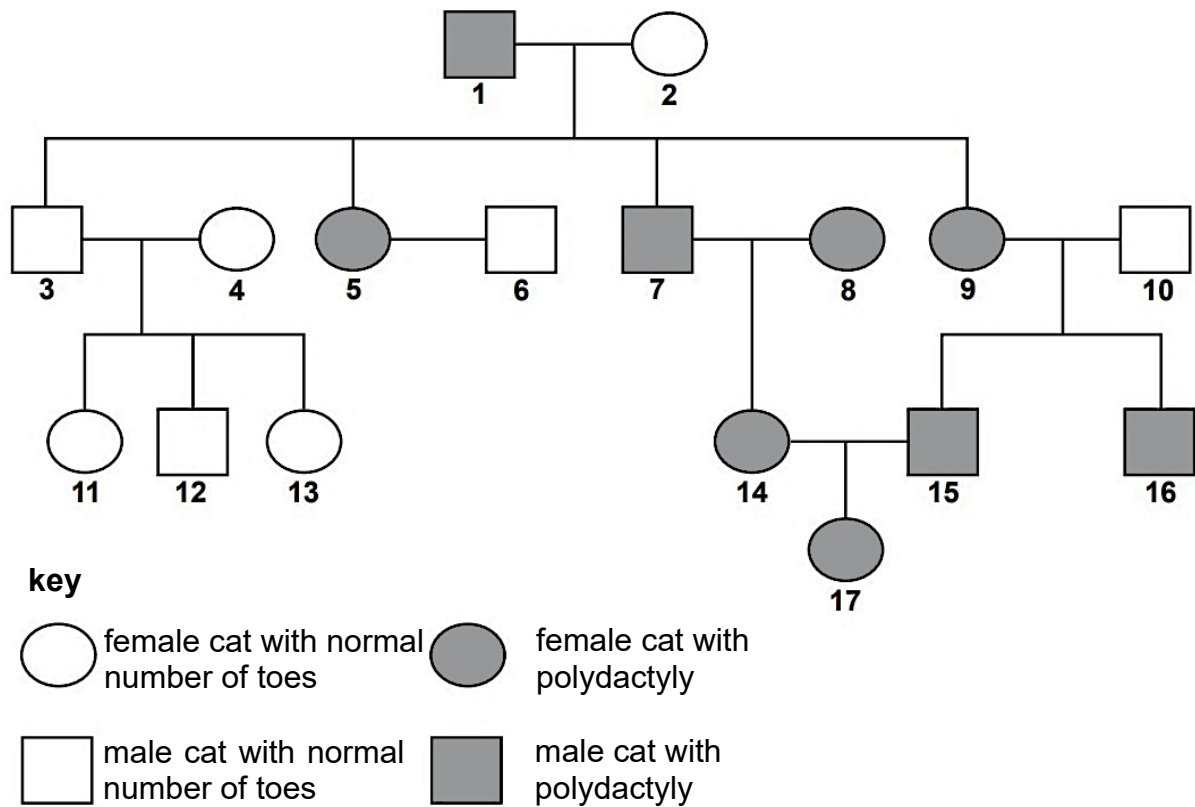


Fig. 6.1

- (a) State the genotypes of cats 4, 7 and 14 in the pedigree diagram in Fig. 6.1 using letters **Q** and **q**.

cat 4

cat 7

cat 14

[3]

- (b) Explain why two parent cats with polydactyly could have an offspring who is **not** affected by polydactyly condition.

Complete the Punnett square to show all possible genotypes and resulting phenotypes in the offspring.

phenotypic ratio: [2]

- (c) Scientists published the results of an investigation into the DNA of cats with and without polydactyly. They compared the base sequence from a particular region of DNA that controls the development of the limbs.

Table 6.1 shows the base sequences.

Table 6.1

cats with / without polydactyly	base sequence
cats without polydactyly	AGA CAC AGA AAT GAG
cats with polydactyly	AGA CAC GGA AAT GAG

Describe how the base sequence of the cats with polydactyly differs from the base sequence of cats without polydactyly.

.....

[2]

(d) Fig. 6.2 shows part of a DNA molecule from a chromosome of a cat.

Complete Fig. 6.2 by writing the letters for the base sequence of the other strand of the DNA molecule.

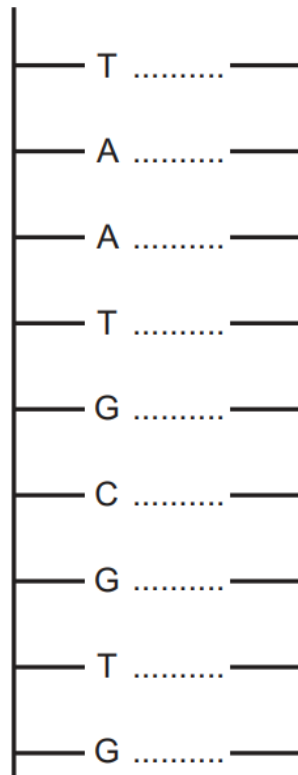


Fig. 6.2

[1]

[Total: 8]

- 7 Fig. 7.1 shows several organisms living together.

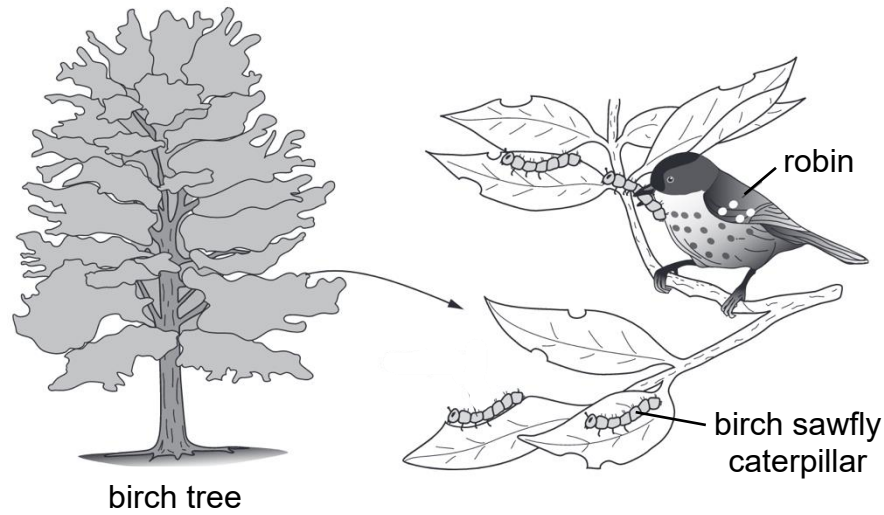


Fig. 7.1

- (a) With reference to Fig. 7.1, draw a food chain linking the organisms shown.

[1]

- (b) Draw and label a pyramid of biomass for the organisms in this habitat.

[2]

- (c) Energy is lost from a food chain between each trophic level.

Outline **two** ways in which this energy is lost.

1

.....

2

..... [2]

[Total: 5]

[Turn over]

8 Fig. 8.1 shows the cross-section of a leaf.

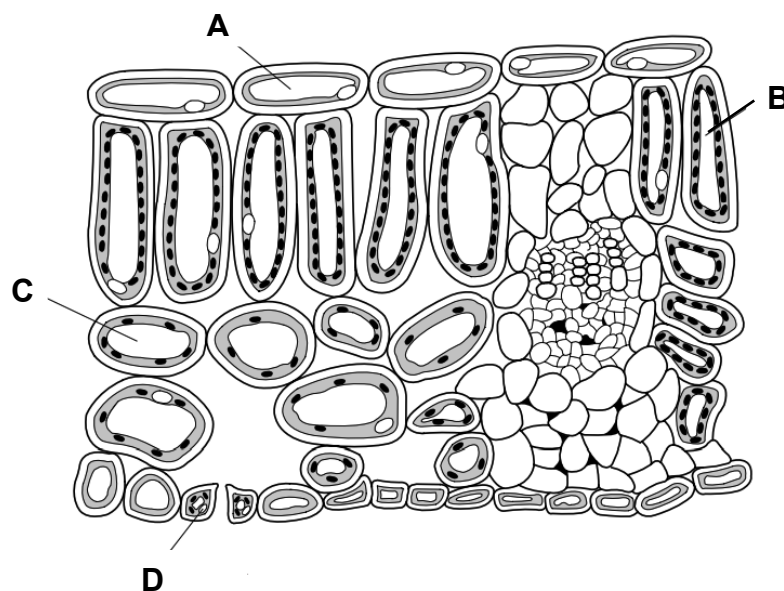


Fig. 8.1

(a) Name cells **A**, **B**, **C** and **D**.

A

B

C

D

[2]

(b) An experiment was conducted to investigate the effect of light intensity on rate of photosynthesis.

Table 8.2 shows the changes in the number of oxygen bubbles released per minute from the stem of an aquatic plant at varying distances from the light source.

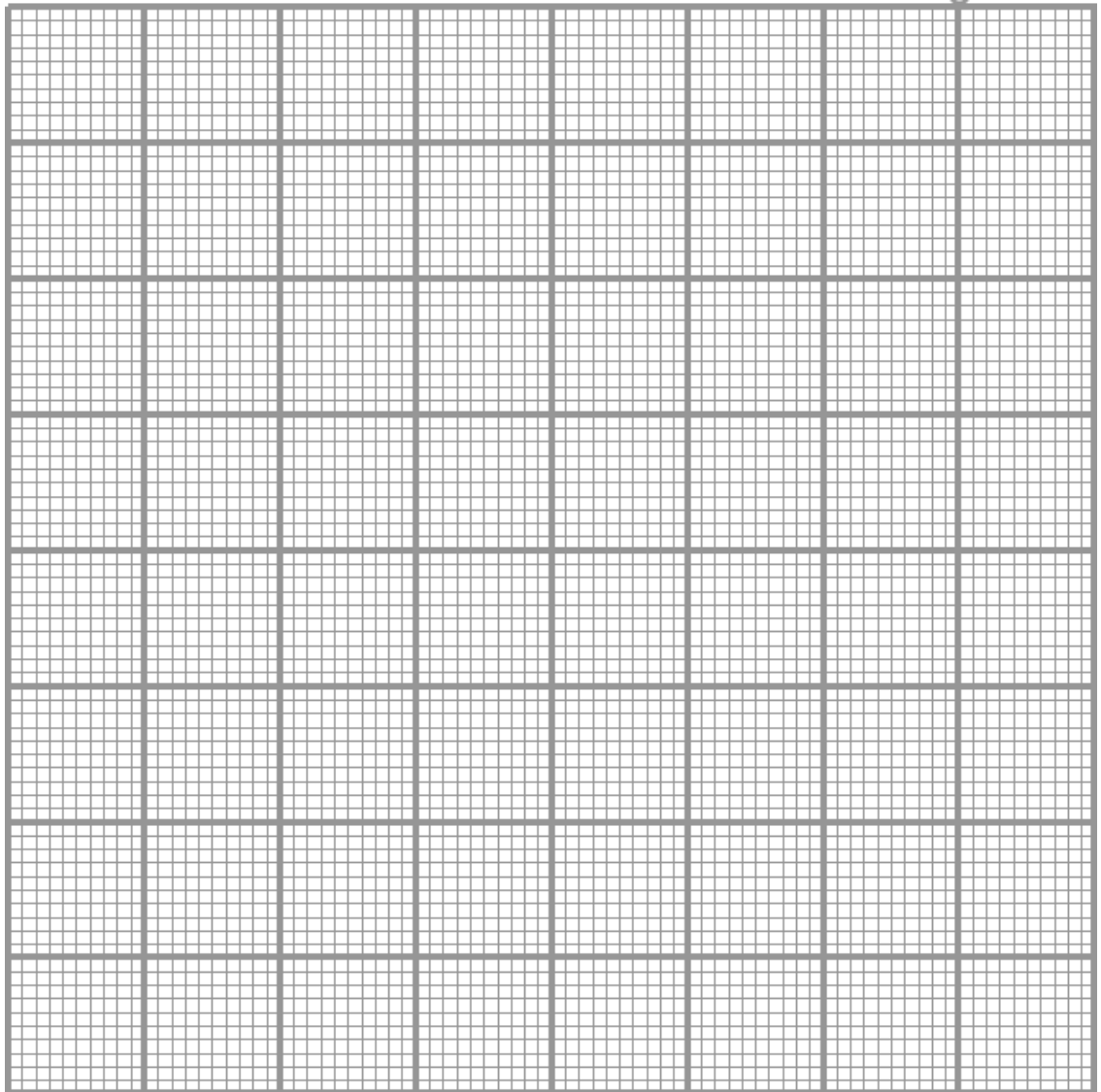
Table 8.2

distance from light source / cm	number of oxygen bubbles released per minute
10	78
15	52
20	39
25	25
30	17
35	12
40	5

- (i) State the word equation for photosynthesis.

..... [1]

- (ii) Plot a graph to show the results in Table 8.2.
Draw a best-fit line through the points plotted.



[4]

- (iii) Using your graph, describe and explain how the change in distance from light source affects the amount of oxygen given out by the aquatic plant.

.....

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..... [3]

[Total: 10]

End of Section A

Section B

Answer only **one** question from this section.

Write your answers in the spaces provided.

- 9 In an investigation, an athlete ran at different speeds.

Fig. 9.1 shows the concentration of lactic acid in the blood and the heart rate of this athlete while running.

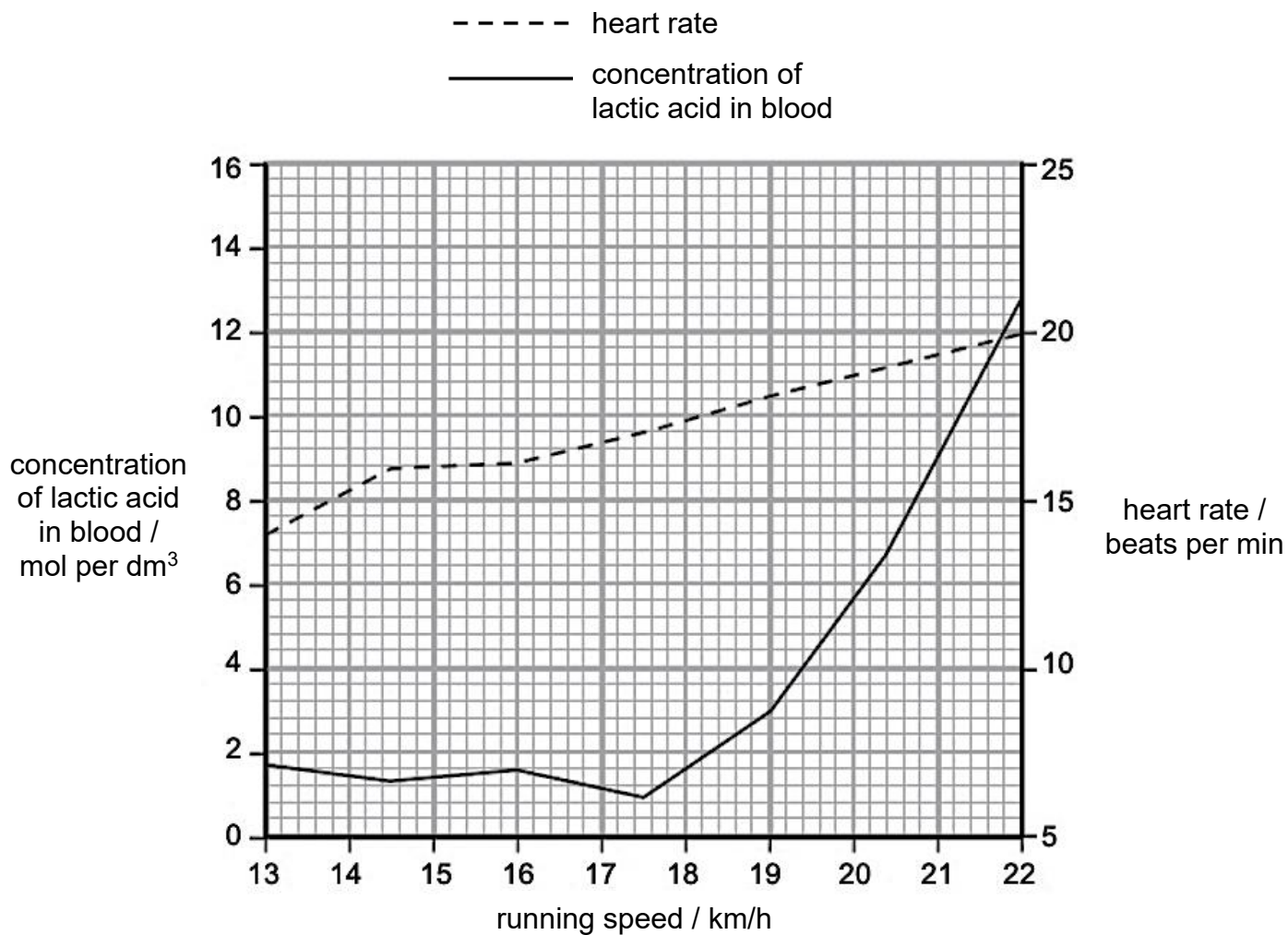


Fig. 9.1

- (a) Using the data in Fig. 9.1, compare and explain the changes in concentration of lactic acid in the blood and changes in heart rate from 13 km/h to 22 km/h.

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..... [4]

- (b) Compare the differences between aerobic and anaerobic respiration in humans.

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..... [3]

- (c) Explain why smoking tobacco may affect an athlete's performance.

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..... [3]

[Total: 10]

- 10** Table 10.1 shows the blood glucose concentrations of two people, **P1** and **P2**, between 0700 in the morning and 1500 in the afternoon. Both ate a piece of bread for breakfast.

Table 10.1

time of day	blood glucose concentration / mg per 100 cm ³	
	person P1	person P2
0700	90	120
0900	120	200
1100	88	220
1300	110	190
1500	100	120

- (a) With reference to Table 10.1, describe and explain the changes in blood glucose concentration between 0700 and 1100 for person **P1**.

..... [6]

(b) **P2** has Type 2 diabetes.

Describe and explain why the changes in blood glucose concentration in **P2** is different from **P1** after ingestion of glucose.

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..... [4]

[Total: 10]

End of Paper

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