

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education
March 2006

SCIENCE: DOUBLE AWARD A (MODULAR)
BIOLOGY A (MODULAR)
Humans as Organisms (Module 01)

346001



Wednesday 8 March 2006 Morning Session

For this paper you must have:

- a black ball-point pen
- an objective test answer sheet

You may use a calculator.

Time allowed: 30 minutes

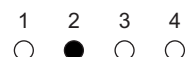
Instructions

- Fill in the boxes at the top of this page.
- Check that your name, candidate number and centre number are printed on the separate answer sheet.
- Check that the separate answer sheet has the title 'Humans as Organisms' printed on it.
- Attempt **one Tier only**, either the Foundation Tier or the Higher Tier.
- Make sure that you use the correct side of the separate answer sheet; the Foundation Tier is printed on one side and the Higher Tier on the other.
- Answer **all** the questions for the Tier you are attempting.
- Record your answers on the separate answer sheet only.
- Do all rough work in this book, **not** on your answer sheet.

Instructions for recording answers

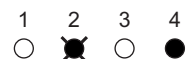
- Use a **black ball-point pen**.

- For each answer **completely fill in the circle** as shown:

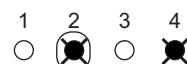


- Do **not** extend beyond the circles.

- If you want to change your answer, **you must** cross out your original answer, as shown:



- If you change your mind about an answer you have crossed out and now want to choose it, draw a ring around the cross as shown:



Information

- The maximum mark for this paper is 36.

Advice

- Do **not** choose more responses than you are asked to. You will lose marks if you do.
- Make sure that you hand in both your answer sheet and this question paper at the end of the test.
- If you start to answer on the wrong side of the answer sheet by mistake, make sure that you cross out **completely** the work that is not to be marked.

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Higher Tier starts on page 14 of this booklet.

FOUNDATION TIER

SECTION A

Questions **ONE** to **FIVE**.

In these questions match words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows a section through the heart.

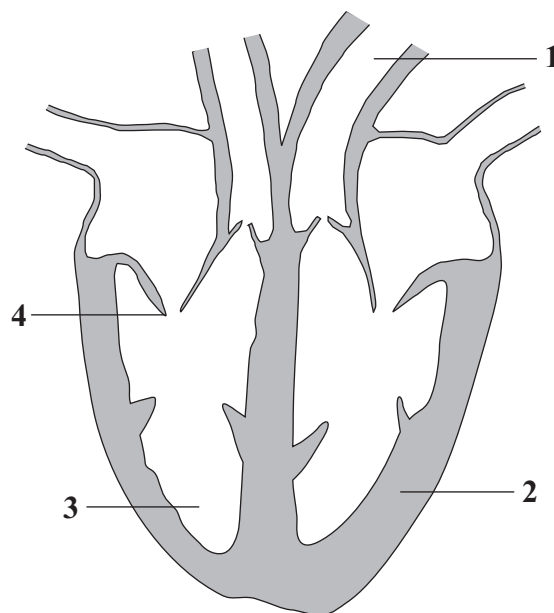
Match words from the list with the labels **1–4** on the diagram.

a blood vessel which takes blood out of the heart

a valve

a ventricle

muscle in the wall of the heart



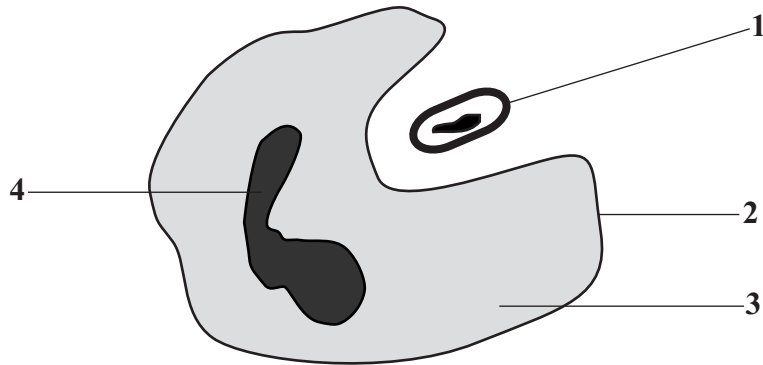
QUESTION TWO

Bacteria can cause disease in the body.

White blood cells can destroy bacteria by ingesting them.

The diagram shows a white blood cell ingesting a bacterium.

(They are not drawn to the same scale.)



Match words from the list with the labels **1–4** on the diagram.

cell membrane

cell wall

cytoplasm

nucleus

Turn over for the next question

Turn over ►

QUESTION THREE

This question is about substances linked with digestion.

Match words from the list with the numbers **1–4** in the table.

enzymes

faeces

fats

sugars

Substance	Link with digestion
1	are broken down by lipase
2	are formed from the breakdown of starch
3	leave the body through the anus
4	speed up the breakdown of large molecules to small molecules

QUESTION FOUR

The body is able to protect itself from microorganisms in a number of ways.

Match words from the list with the numbers **1–4** in the table.

acid

mucus

skin

white blood cell

Structure or substance	How the body is protected from microorganisms
1	acts as a barrier
2	destroys microorganisms present in food
3	produces substances to counteract toxins
4	traps microorganisms which we breathe in

QUESTION FIVE

The diagram shows some of the structures in the thorax.

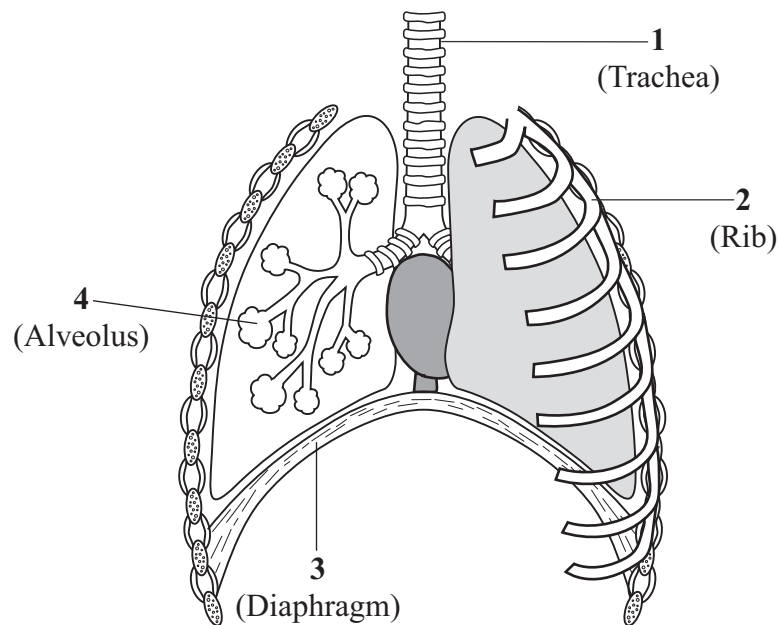
Match words from the list with the labels **1–4** on the diagram.

allows air to pass into the lungs

flattens when we breathe in

protects the lungs

where oxygen enters the blood



Turn over for the next question

Turn over ►

SECTION B

Questions **SIX** and **SEVEN**.

In these questions choose the best **two** answers.

Do **not** choose more than two.

Mark your choices on the answer sheet.

QUESTION SIX

Which **two** of the following are features of arteries?

their walls are very thin

their walls contain elastic fibres

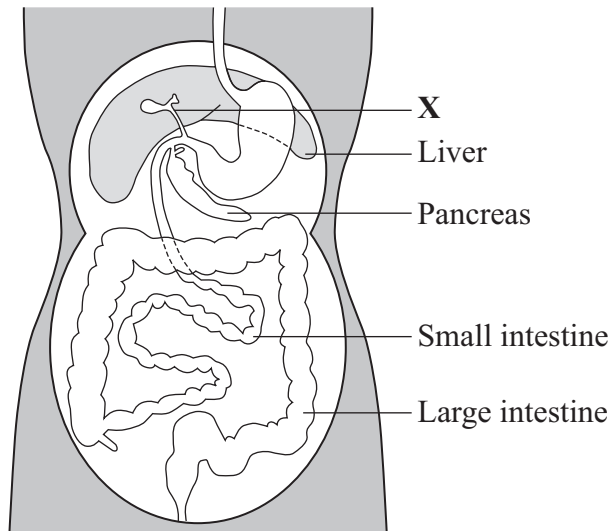
their walls contain muscular tissue

they are very narrow

they contain valves

QUESTION SEVEN

The diagram shows parts of the digestive system.



Which **two** of the following would occur if tube **X** were blocked?

acid from the stomach would not be neutralised

bile could not be made by the liver

bile could not reach the intestine

fat-digesting enzymes could not reach the pancreas

starch-digesting enzymes would not be released

Turn over for the next question

Turn over ►

SECTION CQuestions **EIGHT** to **TEN**.

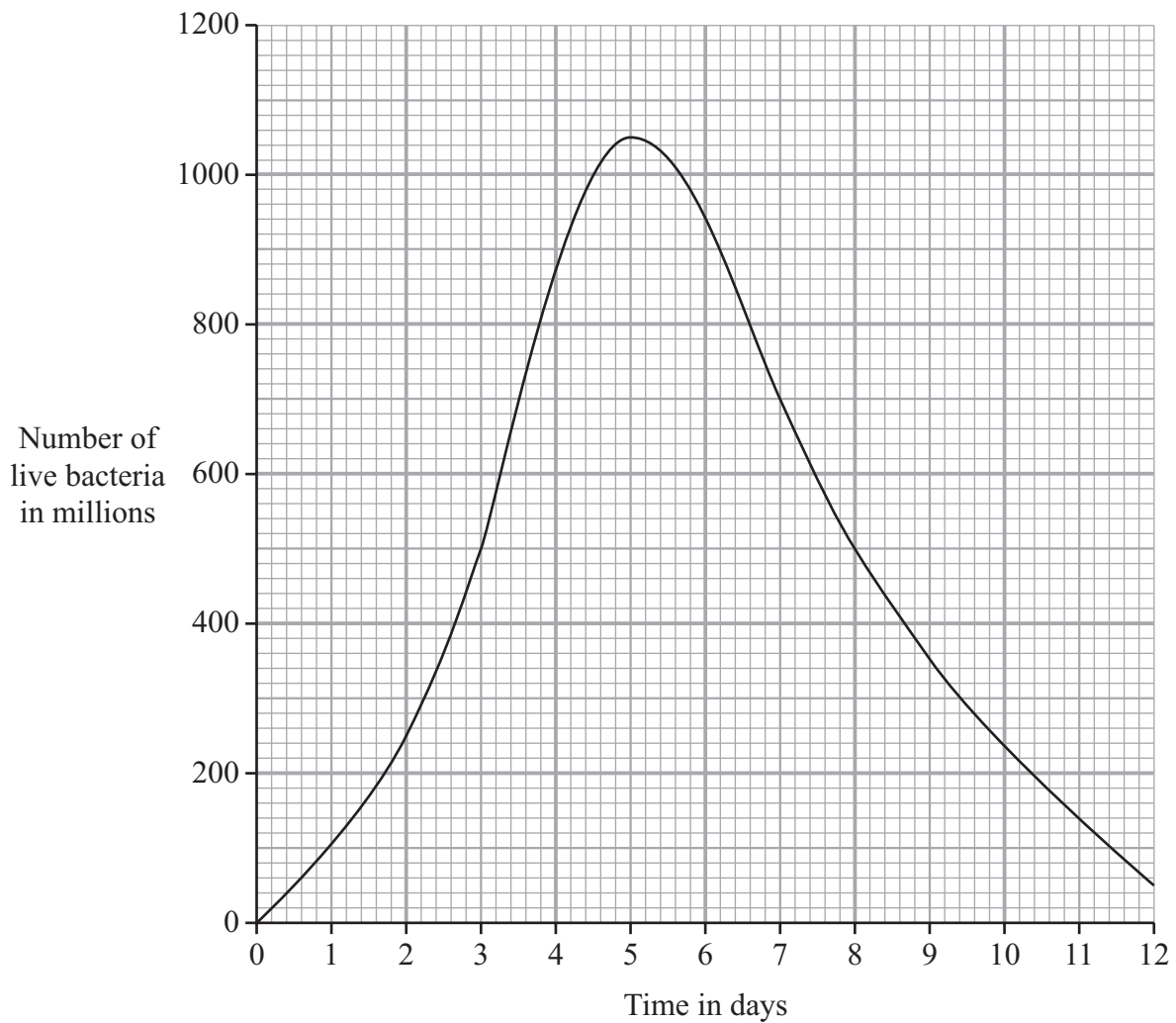
Each of these questions has four parts.

In each part choose only **one** answer.Mark your choices on the answer sheet.

QUESTION EIGHT

In an investigation, cultures of bacteria were grown on agar plates.

The graph shows the change in the number of live bacteria over a period of 12 days.

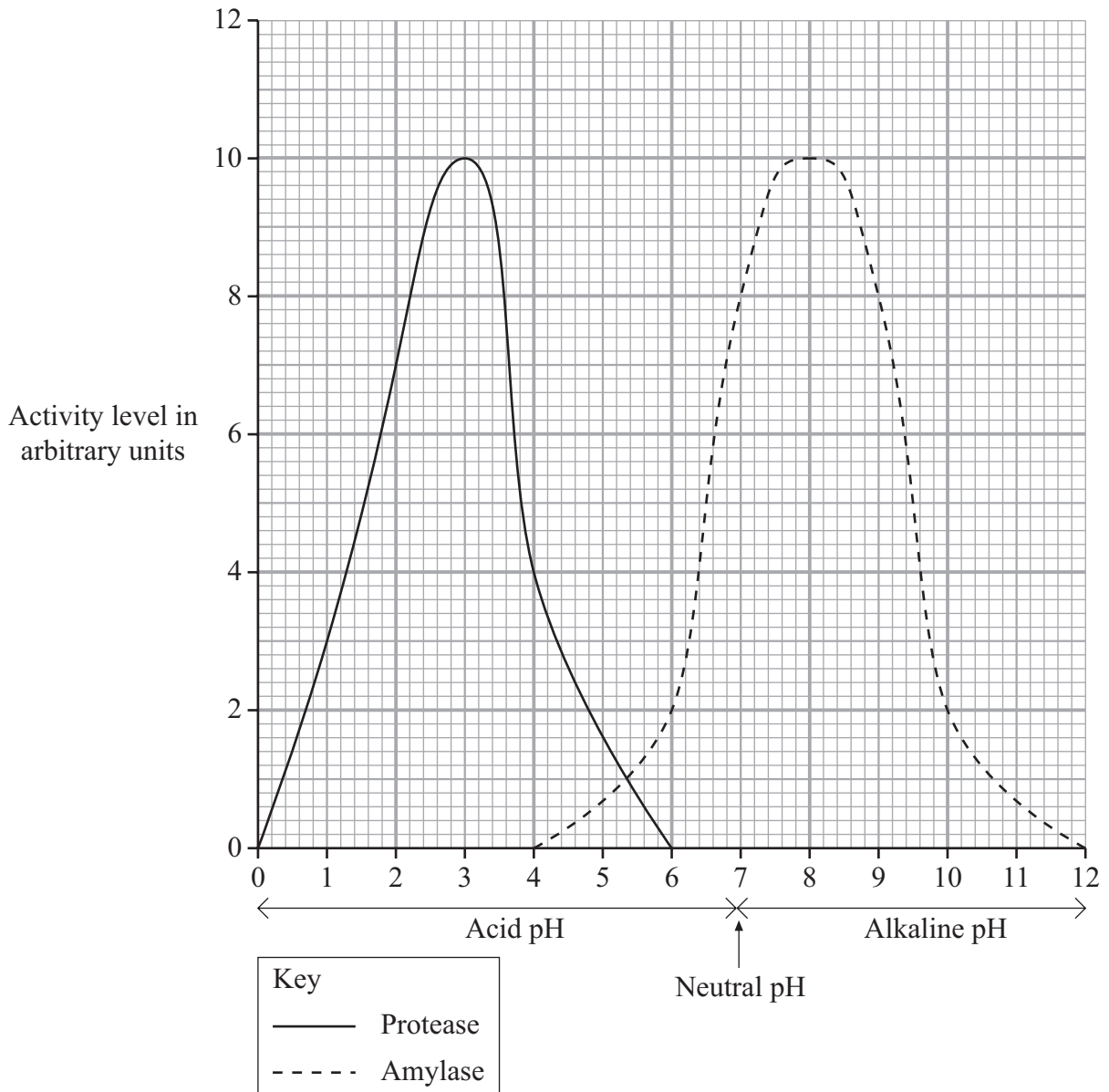


- 8.1** What was the maximum number of live bacteria present?
- A** 105
 - B** 105 million
 - C** 1050 million
 - D** 1100 million
- 8.2** How long did it take to reach the maximum number of live bacteria?
- A** 4.5 days
 - B** 5 days
 - C** 5.5 days
 - D** 12 days
- 8.3** What do white blood cells produce to destroy live bacteria?
- A** Amino acids
 - B** Antibodies
 - C** Antitoxins
 - D** Toxins
- 8.4** Between day 2 and day 3, the number of live bacteria . . .
- A** doubled.
 - B** increased by 50 %.
 - C** increased by $\frac{1}{4}$.
 - D** increased from 25 million to 65 million.

Turn over ►

QUESTION NINE

The graph shows how the activity of a protease and an amylase varies with pH.



9.1 At what pH does the amylase work best?

- A 3.0
- B 5.4
- C 8.0
- D 10.0

9.2 Which of the following statements is correct?

- A The amylase and protease work best in acidic conditions.
- B The amylase and protease work best in alkaline conditions.
- C The amylase works best in acidic conditions and the protease in alkaline conditions.
- D The amylase works best in alkaline conditions and the protease in acidic conditions.

9.3 Which line of the table shows the products of the action of the two enzymes?

	Products of enzyme action	
	Amylase	Protease
A	amino acids	amino acids
B	amino acids	sugars
C	sugars	amino acids
D	sugars	sugars

9.4 Which line of the table shows places where these enzymes work?

	Amylase	Protease
A	large intestine	small intestine
B	small intestine	stomach
C	stomach	large intestine
D	stomach	small intestine

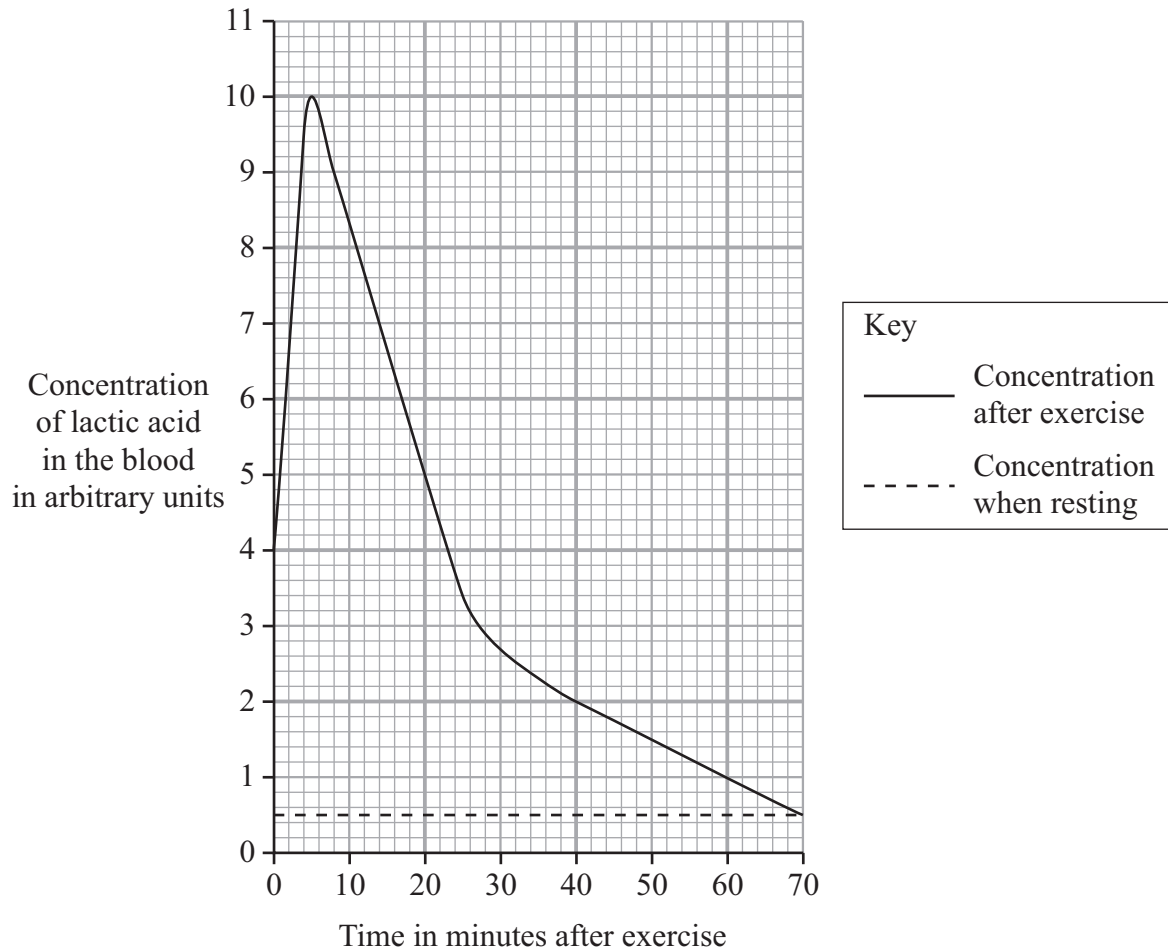
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QUESTION TEN

We produce lactic acid when we exercise.

The graph shows the concentration of lactic acid in the blood after a period of exercise. It also shows the concentration of lactic acid in the blood when we are resting.



10.1 How high above the resting level was the maximum concentration of lactic acid in the blood?

- A 0.5 units
- B 4.0 units
- C 9.5 units
- D 10.0 units

10.2 What was the average rate of fall in lactic acid concentration between 5 minutes and 20 minutes after exercise?

- A 0.25 units per minute
- B 0.33 units per minute
- C 0.50 units per minute
- D 0.66 units per minute

10.3 Why does the concentration of lactic acid in the blood fall after 5 minutes?

- A It is broken down using oxygen.
- B It is converted into oxygen.
- C It is used in anaerobic respiration.
- D The kidneys remove it from the blood.

10.4 Lactic acid is produced by anaerobic respiration.

Which statement is true?

- A Aerobic respiration builds up an oxygen debt, but anaerobic respiration does not.
- B Aerobic respiration produces carbon dioxide, water and energy, but anaerobic respiration does not.
- C Anaerobic respiration needs oxygen, but aerobic respiration does not.
- D Anaerobic respiration uses glucose, but aerobic respiration does not.

END OF TEST

You must do **one Tier** only, **either** the Foundation Tier **or** the Higher Tier.
The Foundation Tier is earlier in this booklet.

HIGHER TIER

SECTION A

Questions **ONE** and **TWO**.

In these questions match words in the list with the numbers.

Use **each** answer only **once**.

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows some of the structures in the thorax.

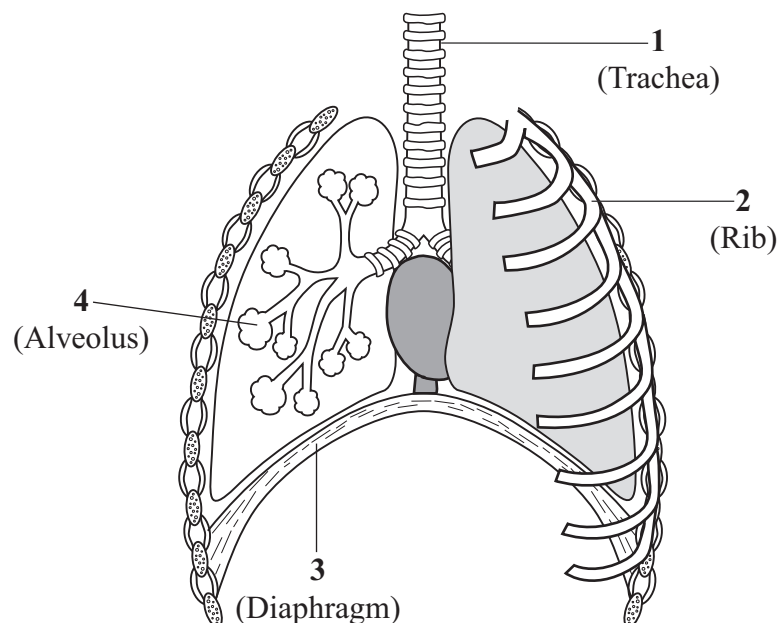
Match words from the list with the labels **1–4** on the diagram.

allows air to pass into the lungs

flattens when we breathe in

protects the lungs

where oxygen enters the blood



QUESTION TWO

The function of red blood cells is to transport oxygen around the body.

Match words from the list with the numbers **1–4** in the sentences.

haemoglobin

nucleus

oxygen

oxyhaemoglobin

Red blood cells do not possess a . . . **1**

They contain a red pigment called . . . **2**

In the lungs, the red pigment reacts to make . . . **3**

In the tissues, this splits up to release . . . **4**

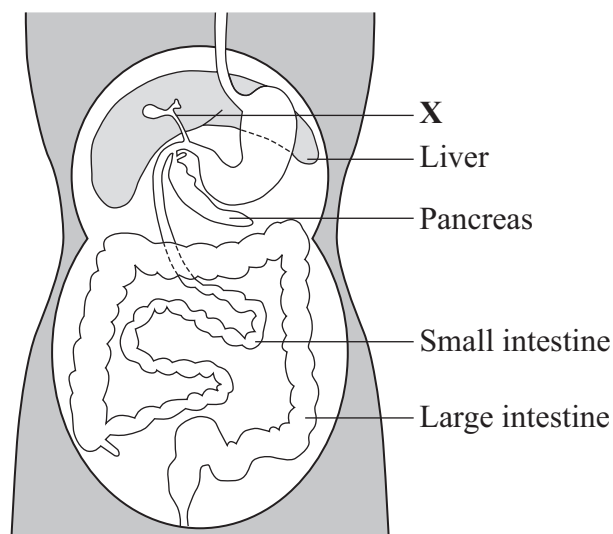
Turn over for the next question

Turn over ►

SECTION BQuestions **THREE** and **FOUR**.In these questions choose the best **two** answers.Do **not** choose more than two.Mark your choices on the answer sheet.

QUESTION THREE

The diagram shows parts of the digestive system.

Which **two** of the following would occur if tube **X** were blocked?**acid from the stomach would not be neutralised****bile could not be made by the liver****bile could not reach the intestine****fat-digesting enzymes could not reach the pancreas****starch-digesting enzymes would not be released**

QUESTION FOUR

This question is about digestion.

In which **two** parts of the digestive system does absorption take place?

gullet

large intestine

liver

pancreas

small intestine

Turn over for the next question

Turn over ►

SECTION CQuestions **FIVE** to **TEN**.

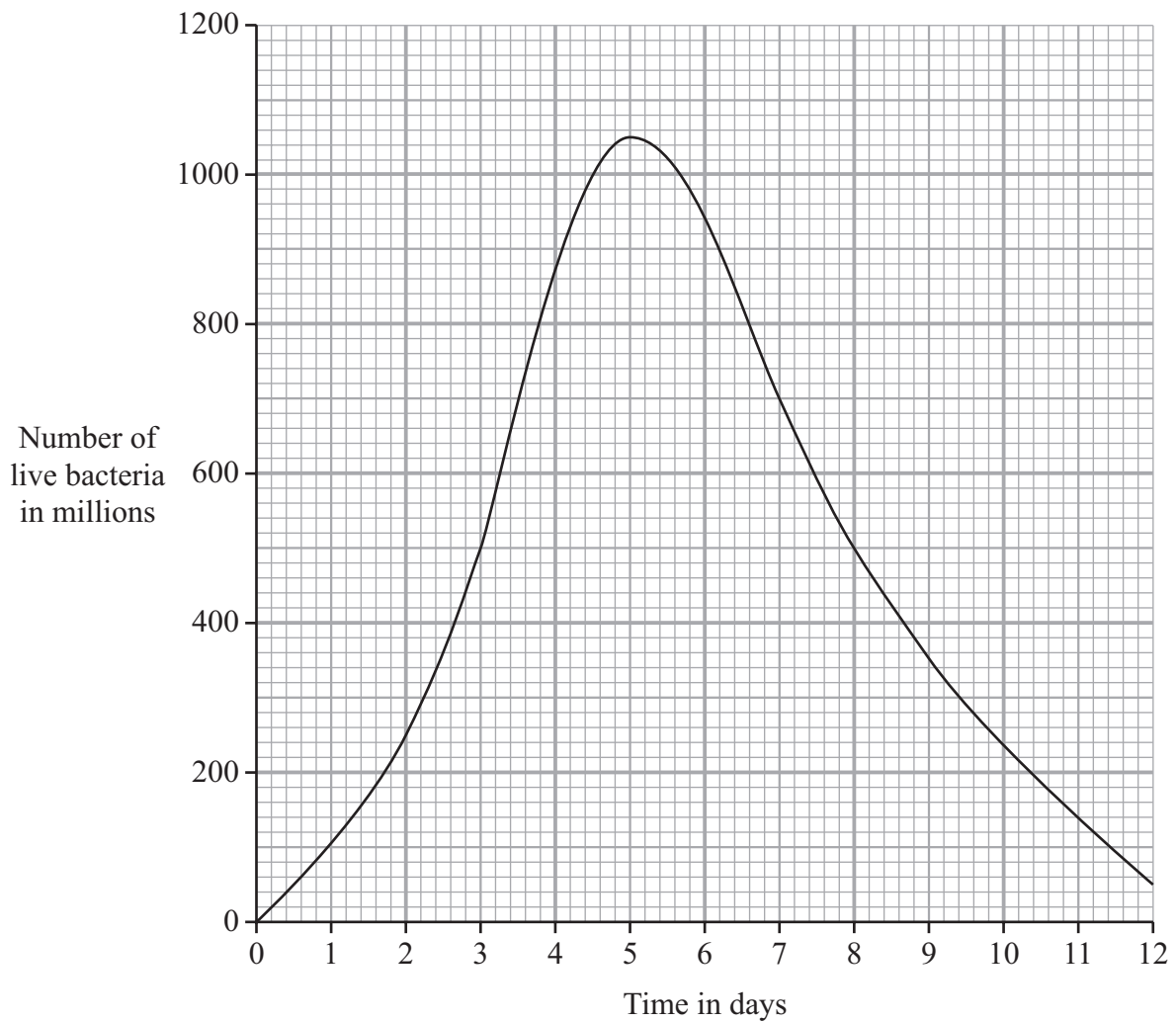
Each of these questions has four parts.

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QUESTION FIVE

In an investigation, cultures of bacteria were grown on agar plates.

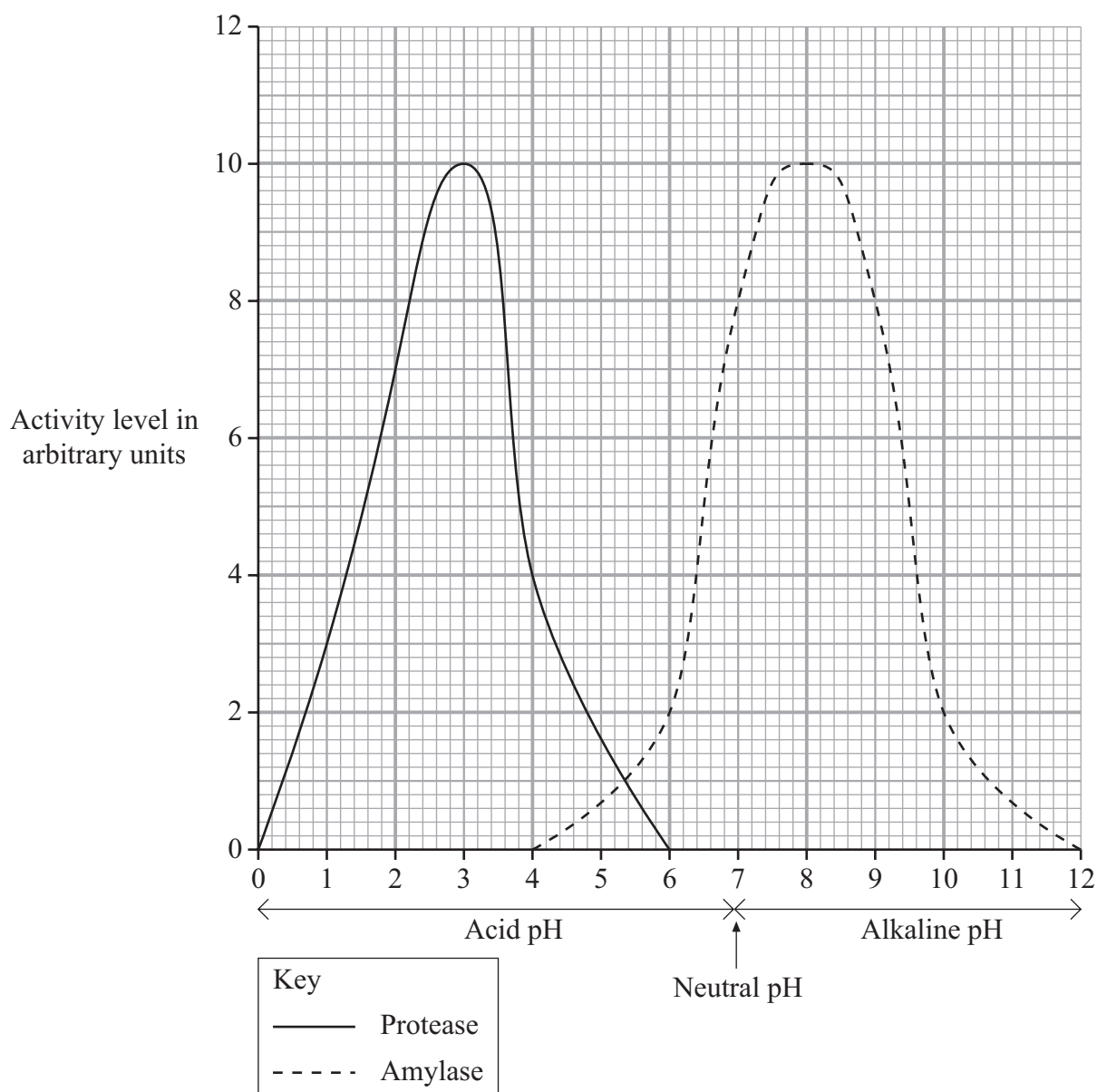
The graph shows the change in the number of live bacteria over a period of 12 days.



- 5.1** What was the maximum number of live bacteria present?
- A** 105
 - B** 105 million
 - C** 1050 million
 - D** 1100 million
- 5.2** How long did it take to reach the maximum number of live bacteria?
- A** 4.5 days
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- A** Amino acids
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QUESTION SIX

The graph shows how the activity of a protease and an amylase varies with pH.



6.1 At what pH does the amylase work best?

- A** 3.0
- B** 5.4
- C** 8.0
- D** 10.0

6.2 Which of the following statements is correct?

- A The amylase and protease work best in acidic conditions.
- B The amylase and protease work best in alkaline conditions.
- C The amylase works best in acidic conditions and the protease in alkaline conditions.
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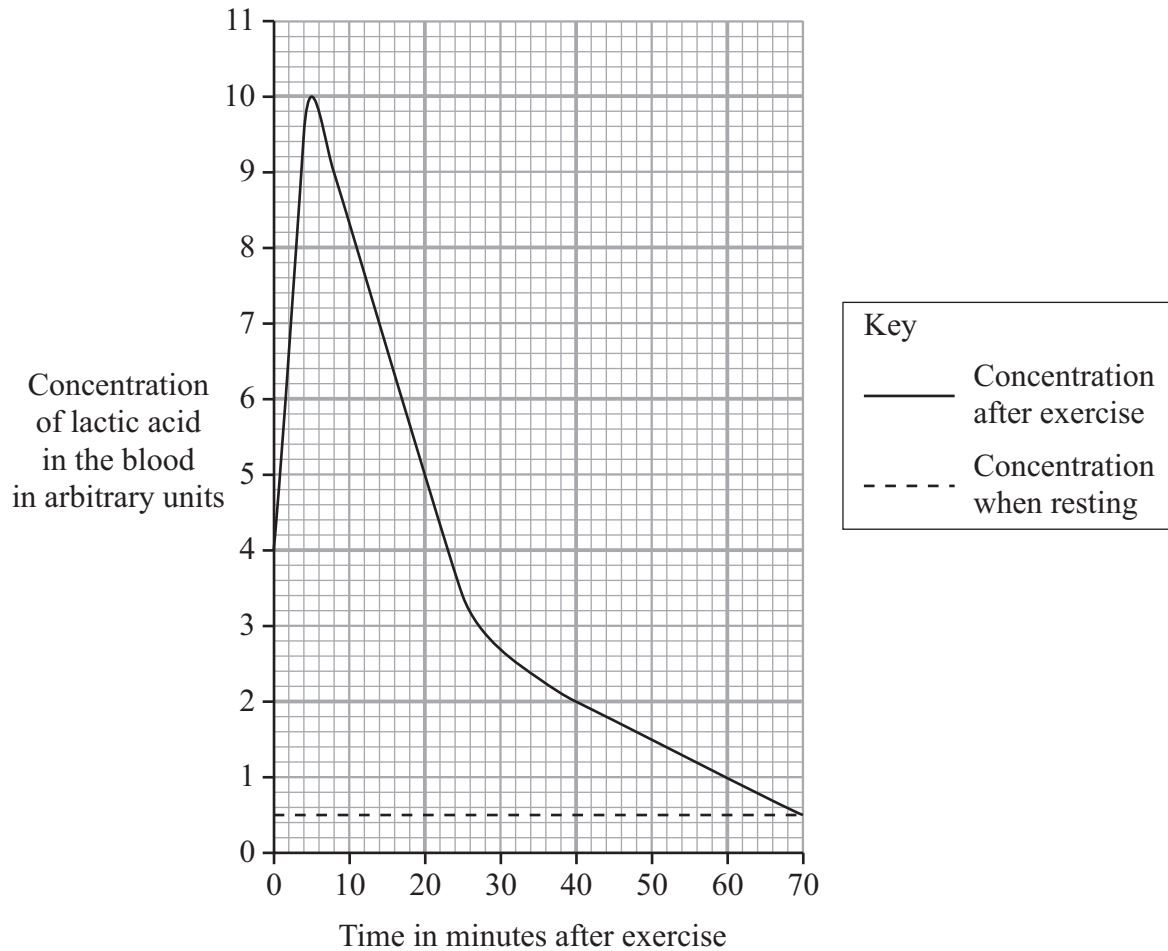
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Turn over ►

QUESTION SEVEN

We produce lactic acid when we exercise.

The graph shows the concentration of lactic acid in the blood after a period of exercise. It also shows the concentration of lactic acid in the blood when we are resting.



7.1 How high above the resting level was the maximum concentration of lactic acid in the blood?

- A** 0.5 units
- B** 4.0 units
- C** 9.5 units
- D** 10.0 units

7.2 What was the average rate of fall in lactic acid concentration between 5 minutes and 20 minutes after exercise?

- A** 0.25 units per minute
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7.3 Why does the concentration of lactic acid in the blood fall after 5 minutes?

- A** It is broken down using oxygen.
- B** It is converted into oxygen.
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- D** The kidneys remove it from the blood.

7.4 Lactic acid is produced by anaerobic respiration.

Which statement is true?

- A** Aerobic respiration builds up an oxygen debt, but anaerobic respiration does not.
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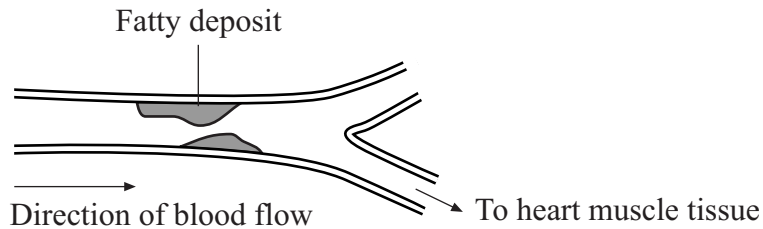
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Turn over ►

QUESTION EIGHT

Heart disease can be caused by fat building up on the inside walls of the arteries which supply blood to the muscles of the heart.

The diagram shows how the fatty deposits can cause an artery to become blocked.



8.1 When the artery is blocked, the muscle cells in the heart cannot contract normally because they do not have enough . . .

- A carbon dioxide.
- B glucose.
- C lactic acid.
- D urea.

8.2 Blood clots are sometimes produced as blood squeezes past the blockage.

Blood clots are formed by . . .

- A capillaries.
- B plasma.
- C platelets.
- D white blood cells.

8.3 Carbon dioxide is transported around the body mainly in the . . .

- A plasma.
- B platelets.
- C red blood cells.
- D white blood cells.

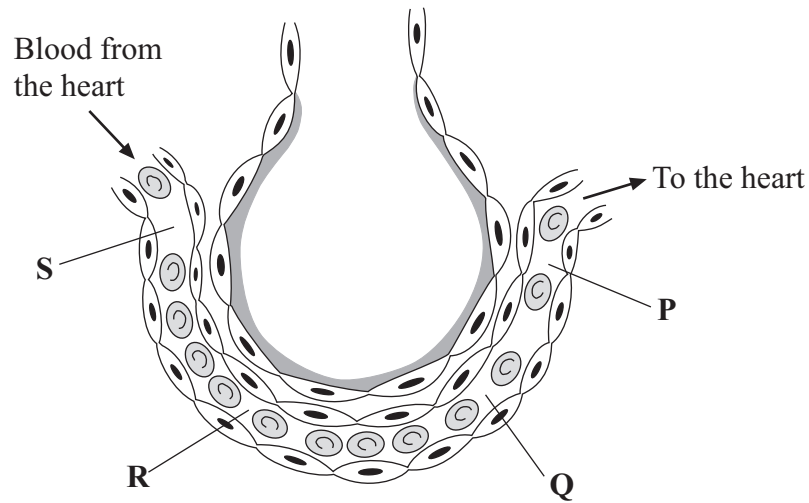
- 8.4** Arteries can control the amount of blood flowing through them because they have . . .
- A** elastic tissue in their walls.
 - B** muscle tissue in their walls.
 - C** thin walls.
 - D** valves.

Turn over for the next question

Turn over ►

QUESTION NINE

The diagram shows an alveolus in a lung, and a capillary surrounding it.



9.1 Which line in the table represents the correct relative concentrations of carbon dioxide at points P, Q and S?

	Concentration of carbon dioxide		
	P	Q	S
A	low	low	high
B	high	high	high
C	high	low	high
D	high	low	low

9.2 Where is the lowest concentration of oxygen found?

- A** P
- B** Q
- C** R
- D** S

- 9.3** Which feature of the alveoli does **not** increase the rate at which oxygen moves into the blood?
- A** The alveoli have a large surface area.
 - B** The walls of the alveoli are very thin.
 - C** There is a large volume of cytoplasm in the cells of the alveoli.
 - D** There are many blood capillaries surrounding the alveoli.
- 9.4** Oxygen enters the blood in the capillaries around the alveoli by . . .
- A** active transport.
 - B** circulation.
 - C** diffusion.
 - D** respiration.

Turn over for the next question

Turn over ►

QUESTION TEN

Aircraft pilots are required by regulation to use an extra supply of oxygen when flying above certain heights. The amount required is one extra litre per minute for every 1000 feet above sea level.

10.1 How much extra oxygen is required when flying at 26 500 feet?

- A 2.65 litres per minute
- B 26.5 litres per minute
- C 265 litres per minute
- D 26 500 litres per minute

10.2 The Effective Performance Time of a pilot is the amount of time during which a pilot is able to fly his aircraft effectively without an extra supply of oxygen. The table shows how the effective performance time changes as altitude changes.

Altitude in feet	Effective Performance Time without extra oxygen
15 000 to 18 000	30 minutes or more
22 000	5 to 10 minutes
25 000	3 to 5 minutes
28 000	2.5 to 3 minutes
30 000	1 to 2 minutes
35 000	20 to 50 seconds
40 000	15 to 20 seconds
45 000	9 to 15 seconds

What is the maximum change in a pilot's Effective Performance Time as an aircraft climbs from 22 000 feet to 28 000 feet?

- A Minus 2.5 minutes
- B Minus 7.5 minutes
- C Plus 2 minutes
- D Plus 8 minutes

10.3 As a plane climbs above 45 000 feet, the pilot may pass out unless given extra oxygen.

What is the most likely cause of this?

- A** A build-up of lactic acid in the body.
- B** A lack of glucose in the muscles.
- C** A lack of oxygen in the brain.
- D** A reduced breathing rate.

10.4 As oxygen levels fall, the breathing rate and depth of breathing increase.

What is the advantage of this?

- A** Carbon dioxide diffuses out of the blood into the alveoli more quickly.
- B** The blood flow to the muscles increases.
- C** The blood passes through the lungs more quickly.
- D** The surface area of the alveoli increases.

END OF TEST

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