

Surname					Other Names				
Centre Number					Candidate Number				
Candidate Signature									

General Certificate of Secondary Education
Spring 2003



SCIENCE: DOUBLE AWARD (MODULAR) 346001
SCIENCE: BIOLOGY (MODULAR)
Humans as Organisms (Module 01)

Wednesday 5 March 2003 Morning Session

In addition to this paper you will require:

- an HB pencil and a rubber;
- an answer sheet.

You may use a calculator.

Time allowed: 30 minutes

Copyright © 2003 AQA and its licensors. All rights reserved.

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.
- Answer **all** the questions for the Tier you are attempting.
- 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.
- Mark your responses on the separate answer sheet only. Rough work may be done on the question paper.
- Mark the best responses by using a thick pencil stroke to fill in the box. Use an HB pencil. Make sure the pencil stroke does **not** extend beyond the box. Do **not** use ink or ball-point pen. If you wish to change your answer, rub out your first answer completely. See below.

Examples:

	1	2	3	4
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

<input checked="" type="checkbox"/>
<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

QUESTION XXX				
xxx.1	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
xxx.2	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
xxx.3	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
xxx.4	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D

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 rub 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 12 of this booklet.

FOUNDATION TIER

SECTION A

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

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

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

Mark your choices on the answer sheet.

QUESTION ONE

The diagram shows part of the digestive system.

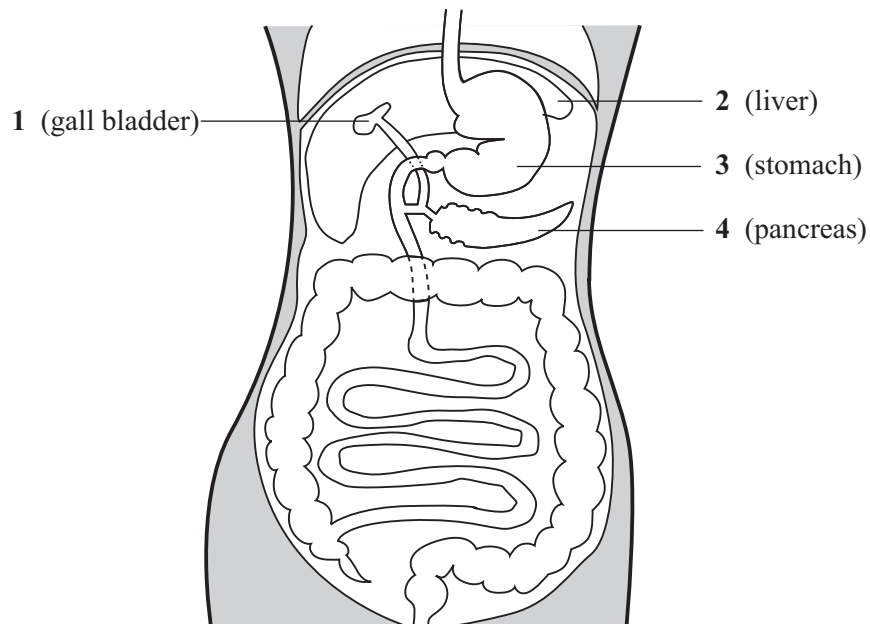
Match words from the list with each of the labels **1–4** on the diagram.

makes bile

makes lipase

provides acid conditions

stores bile



QUESTION TWO

The diagram shows a section through the heart.

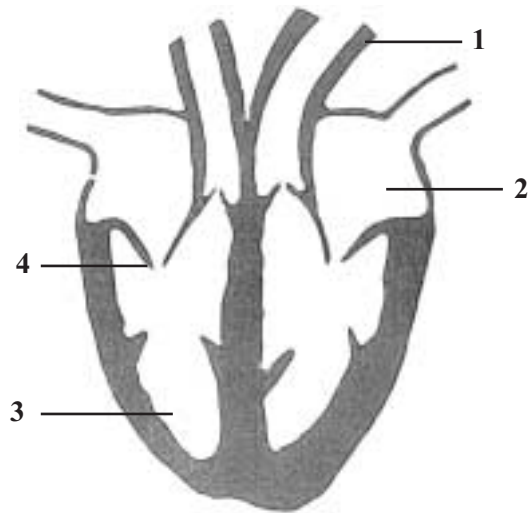
Match words from the list with each of the labels 1–4 on the diagram.

atrium

carries blood away from the heart

prevents backflow of blood

ventricle

**QUESTION THREE**

The table is about substances that help the body to defend itself against microorganisms.

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

antibody

antitoxin

blood clot

mucus

Substance	Feature
1	kills microorganisms
2	neutralises poisons produced by microorganisms
3	seals cuts to prevent entry of microorganisms
4	traps microorganisms

Turn over ►

QUESTION FOUR

The diagram shows a nerve cell. This cell passes information to other cells.

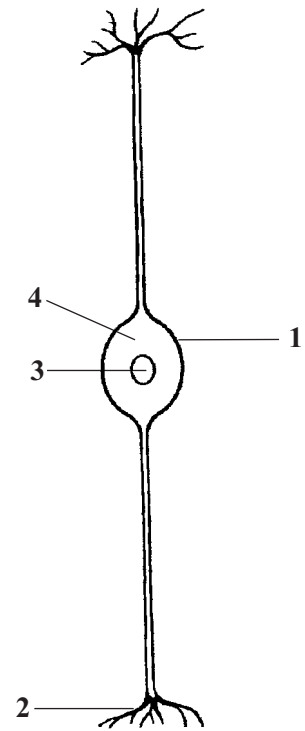
Match words from the list with each of the labels 1–4 on the diagram.

cell membrane

controls the activities of the cell

cytoplasm

passes information to other cells

**QUESTION FIVE**

The diagram shows some parts of the blood as seen through a microscope.

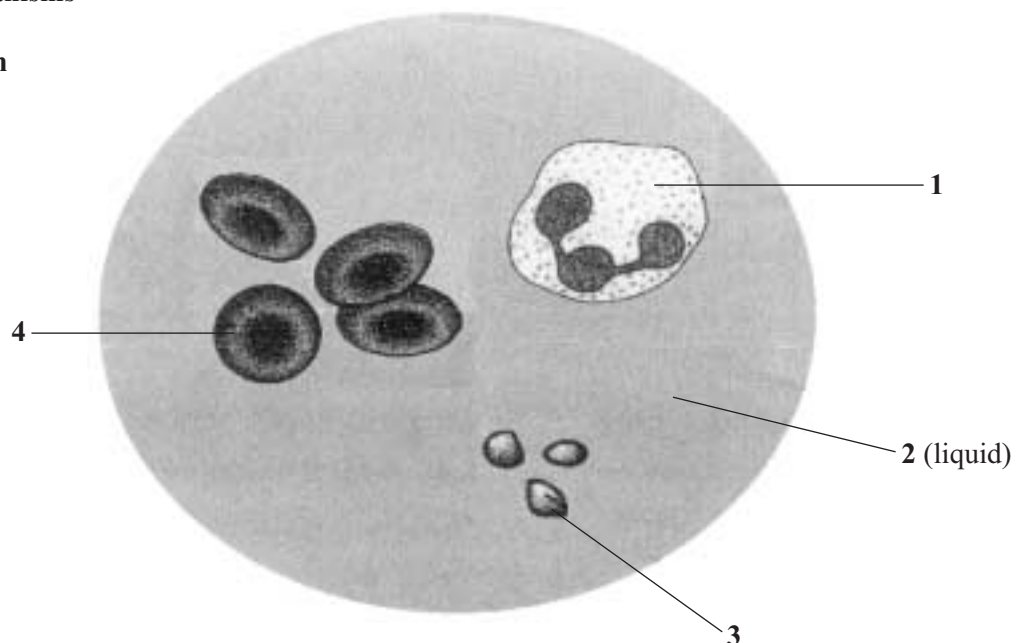
Match words from the list with each of the labels 1–4 on the diagram.

clots blood

ingests microorganisms

transports oxygen

transports urea



SECTION BQuestions **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

The body is divided into the abdomen and the thorax.

Which **two** of the following organs are found in the abdomen?**heart****liver****lungs****stomach****windpipe****QUESTION SEVEN**

Bacteria and viruses both cause diseases.

Which **two** of the following are true of bacteria and viruses?**they are both microorganisms****they both contain cytoplasm****they both contain genes****they both have a nucleus****they both have a protein coat****Turn over ►**

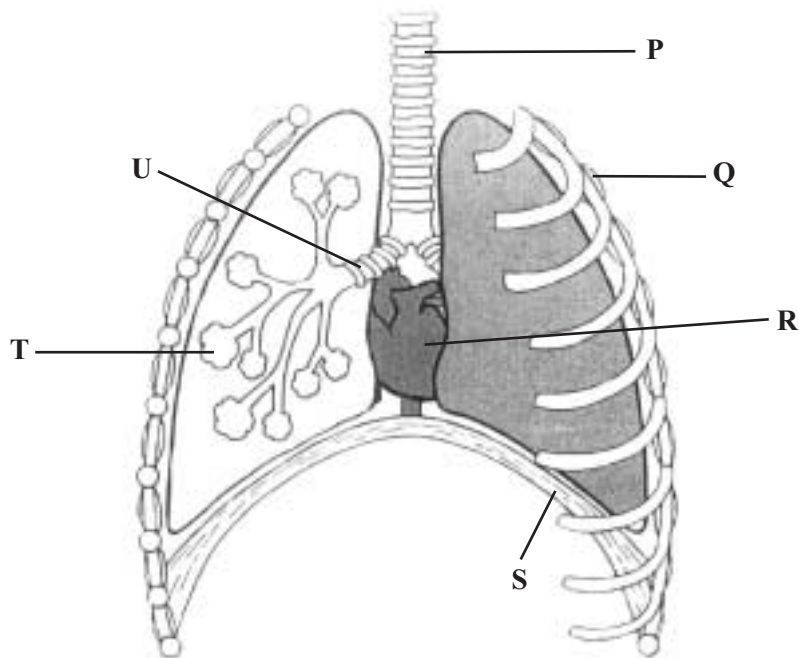
SECTION CQuestions **EIGHT** to **TEN**.

Each of these questions has four parts.

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

QUESTION EIGHT

The diagram shows the parts of the thorax.

**8.1** Which parts make air move into the lungs?

- A P and Q
- B P and U
- C Q and R
- D Q and S

8.2 The movement of air into and out of the lungs is called

- A circulation.
- B diffusion.
- C respiration.
- D ventilation.

8.3 In which part does oxygen move into the blood?

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

8.4 In bronchitis, the breathing system produces too much mucus.

This might cause problems by

- A** blocking blood vessels.
- B** increasing the amount of carbon dioxide in the lungs.
- C** making the walls of the capillaries thicker.
- D** slowing down the rate of diffusion of oxygen.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

The information is from a box containing breakfast cereal.

	Amount per 100 g
Energy	1800 kJ
Protein	6 g
Carbohydrate	83 g
Fat	3 g

9.1 The recommended daily intake of energy for a young adult male is 12 000 kJ.

A 40 g serving of cereal will provide

- A $\frac{3}{100}$ (3%) of the daily requirement for energy.
- B $\frac{6}{100}$ (6%) of the daily requirement for energy.
- C $\frac{15}{100}$ (15%) of the daily requirement for energy.
- D $\frac{3}{10}$ (30%) of the daily requirement for energy.

9.2 The amount of protein that a young adult female needs each day is 60 g.

How much cereal would the female have to eat to get this amount of protein?

- A 10 g
- B 100 g
- C 500 g
- D 1000 g

9.3 During digestion the starch in the cereal will be broken down into

- A amino acids.
- B fatty acids.
- C glycerol.
- D sugars.

- 9.4** Starch digesting enzymes are produced in the
- A** pancreas and small intestine.
 - B** salivary glands only.
 - C** salivary glands, pancreas and small intestine.
 - D** small intestine only.

TURN OVER FOR THE NEXT QUESTION

QUESTION TEN

Respiration is the process during which energy is released. This energy comes from the food we have digested.

10.1 The food substance which is used in respiration is

- A glucose.
- B glycerol.
- C lipase.
- D starch.

10.2 The gas released during aerobic respiration is

- A carbon dioxide.
- B lactic acid.
- C nitrogen.
- D oxygen.

The table gives the body mass and rate of oxygen use of different mammals.

Mammal	Body mass in kg	Rate of oxygen use per hour in mm³ per g of body mass
Mouse	0.025	1580
Rat	1.226	872
Rabbit	2.200	466
Dog	11.700	318
Human	70.0	202
Horse	700.0	106
Elephant	3800.0	67

10.3 How much oxygen does a mouse use in 1 hour?

- A 39.5 mm³
- B 63.2 mm³
- C 2370 mm³
- D 39 500 mm³

10.4 Which of the following statements is supported by the data in the table?

- A The bigger the mammal the faster it breathes
- B The bigger the mammal the more oxygen it uses per gram of body mass
- C The smaller the mammal the more active it is
- D The smaller the mammal the more oxygen it uses per gram of body mass

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 the 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 parts of the blood as seen through a microscope.

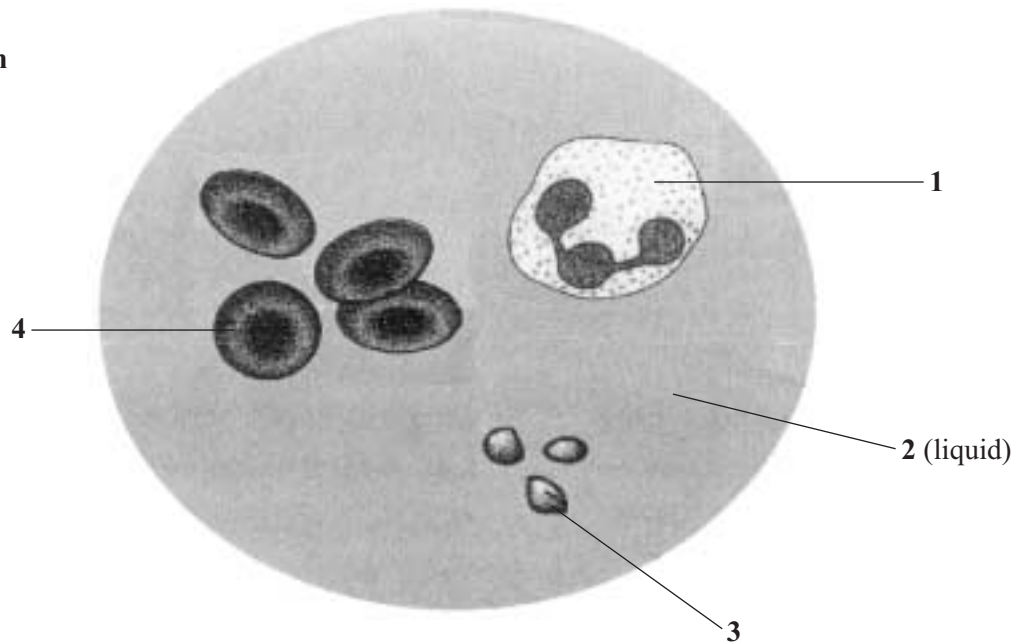
Match words from the list with each of the labels **1–4** on the diagram.

clots blood

ingests microorganisms

transports oxygen

transports urea



QUESTION TWO

During vigorous exercise, our muscles obtain energy from both aerobic respiration and anaerobic respiration.

Match words from the list with each of the spaces **1–4** in the sentences.

glucose

lactic acid

oxygen

water

Anaerobic respiration in a muscle may happen when there is a shortage of **1**

Anaerobic respiration is the incomplete breakdown of **2**

Oxygen debt is the amount of oxygen needed to oxidise **3** into carbon dioxide and **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

Bacteria and viruses both cause diseases.

Which **two** of the following are true of bacteria and viruses?**they are both microorganisms****they both contain cytoplasm****they both contain genes****they both have a nucleus****they both have a protein coat****QUESTION FOUR**

Energy is released during respiration. This energy has many uses in the body.

Which **two** of the following do **not** need energy from respiration?**building up large molecules from smaller ones****digesting food by using enzymes****maintaining body temperature****movement of food along the small intestine****movement of oxygen out of blood capillaries**

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

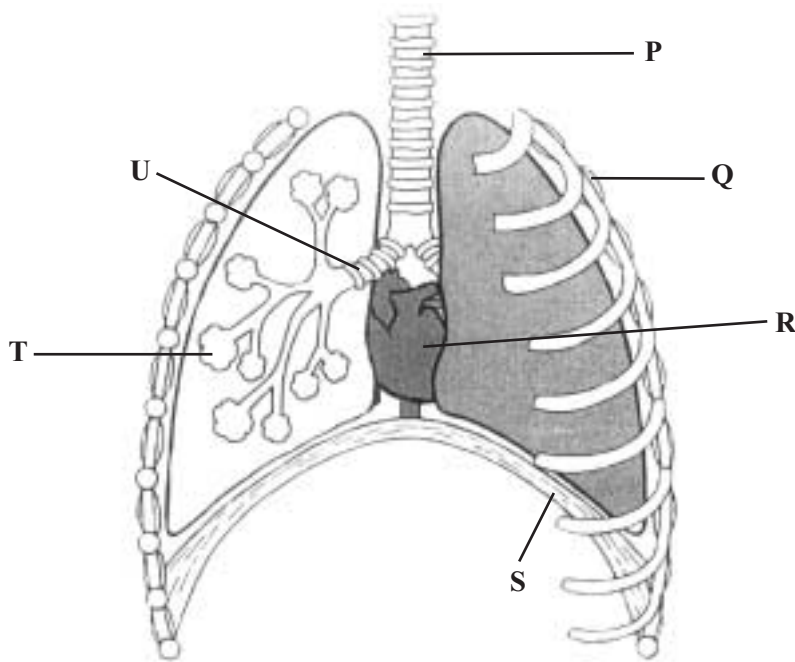
Each of these questions has four parts.

In each part choose only **one** answer.

Mark your choices on the answer sheet.

QUESTION FIVE

The diagram shows the parts of the thorax.

**5.1** Which parts make air move into the lungs?

- A P and Q
- B P and U
- C Q and R
- D Q and S

5.2 The movement of air into and out of the lungs is called

- A circulation.
- B diffusion.
- C respiration.
- D ventilation.

5.3 In which part does oxygen move into the blood?

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

5.4 In bronchitis, the breathing system produces too much mucus.

This might cause problems by

- A** blocking blood vessels.
- B** increasing the amount of carbon dioxide in the lungs.
- C** making the walls of the capillaries thicker.
- D** slowing down the rate of diffusion of oxygen.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION SIX

The information is from a box containing breakfast cereal.

	Amount per 100 g
Energy	1800 kJ
Protein	6 g
Carbohydrate	83 g
Fat	3 g

6.1 The recommended daily intake of energy for a young adult male is 12 000 kJ.

A 40 g serving of cereal will provide

- A $\frac{3}{100}$ (3%) of the daily requirement for energy.
- B $\frac{6}{100}$ (6%) of the daily requirement for energy.
- C $\frac{15}{100}$ (15%) of the daily requirement for energy.
- D $\frac{3}{10}$ (30%) of the daily requirement for energy.

6.2 The amount of protein that a young adult female needs each day is 60 g.

How much cereal would the female have to eat to get this amount of protein?

- A 10 g
- B 100 g
- C 500 g
- D 1000 g

6.3 During digestion the starch in the cereal will be broken down into

- A amino acids.
- B fatty acids.
- C glycerol.
- D sugars.

- 6.4** Starch digesting enzymes are produced in the
- A** pancreas and small intestine.
 - B** salivary glands only.
 - C** salivary glands, pancreas and small intestine.
 - D** small intestine only.

TURN OVER FOR THE NEXT QUESTION

QUESTION SEVEN

Respiration is the process during which energy is released. This energy comes from the food we have digested.

7.1 The food substance which is used in respiration is

- A glucose.
- B glycerol.
- C lipase.
- D starch.

7.2 The gas released during aerobic respiration is

- A carbon dioxide.
- B lactic acid.
- C nitrogen.
- D oxygen.

The table gives the body mass and rate of oxygen use of different mammals.

Mammal	Body mass in kg	Rate of oxygen use per hour in mm³ per g of body mass
Mouse	0.025	1580
Rat	1.226	872
Rabbit	2.200	466
Dog	11.700	318
Human	70.0	202
Horse	700.0	106
Elephant	3800.0	67

7.3 How much oxygen does a mouse use in 1 hour?

- A** 39.5 mm³
- B** 63.2 mm³
- C** 2370 mm³
- D** 39 500 mm³

7.4 Which of the following statements is supported by the data in the table?

- A** The bigger the mammal the faster it breathes
- B** The bigger the mammal the more oxygen it uses per gram of body mass
- C** The smaller the mammal the more active it is
- D** The smaller the mammal the more oxygen it uses per gram of body mass

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION EIGHT

Protease enzymes digest boiled egg white.

A student carried out an investigation using proteases from two different regions, **P** and **R**, of the human digestive system.

The results of this investigation are shown in the table.

Region of human digestive system	Time taken for egg white to be digested (minutes)		
	in ACID conditions	in NEUTRAL conditions	in ALKALINE conditions
P	20	Egg white not digested after 120 minutes	Egg white not digested after 120 minutes
R	Egg white not digested after 120 minutes	80	40

8.1 Enzyme **R**

- A** works faster in neutral conditions than in alkaline conditions.
- B** works half as fast in alkaline conditions than enzyme **P** does in acid conditions.
- C** works ten times faster in alkaline conditions than enzyme **P** does in acid conditions.
- D** works twice as fast in alkaline conditions than enzyme **P** does in acid conditions.

8.2 Enzymes **P** and **R** are from different regions of the digestive system.

Which of the following are the most likely sites of enzymes **P** and **R**?

- A** Enzyme **P** is found in the gullet and enzyme **R** in the large intestine
- B** Enzyme **P** is found in the mouth and enzyme **R** in the stomach
- C** Enzyme **P** is found in the stomach and enzyme **R** in the large intestine
- D** Enzyme **P** is found in the stomach and enzyme **R** in the small intestine

8.3 The conditions in which enzyme **R** works best are provided by

- A** bile.
- B** hydrochloric acid.
- C** mucus.
- D** saliva.

8.4 A patient has a blockage in the tube leading from the gall bladder to the small intestine.

The most likely effect of this is that

- A** active transport of amino acids is slowed down.
- B** digestion of fats is slowed down.
- C** less faeces are produced.
- D** less water is absorbed.

TURN OVER FOR THE NEXT QUESTION

Turn over ►

QUESTION NINE

When we breathe, air moves into and out of the lungs.

- 9.1** Which of the following occurs when muscles surrounding the thorax contract to bring about inhalation?
- A** The volume of the thorax increases and the pressure inside it decreases
 - B** The volume of the thorax decreases and the pressure inside it increases
 - C** The volume of the thorax and the pressure inside it both decrease
 - D** The volume of the thorax and the pressure inside it both increase
- 9.2** After we inhale, oxygen enters the blood in the lung capillaries by
- A** active transport.
 - B** circulation.
 - C** diffusion.
 - D** respiration.
- 9.3** Breathing increases the rate at which oxygen enters the blood in the lungs because
- A** it causes the alveoli to expand.
 - B** it increases the rate of blood flow through the lungs.
 - C** it maintains a high concentration of oxygen in the alveoli.
 - D** it maintains a low concentration of carbon dioxide in the alveoli.
- 9.4** Which feature of alveoli does **not** increase the rate at which oxygen moves into the blood?
- A** Alveolus cells are very thin
 - B** Large surface area
 - C** Large volume of cytoplasm in cells
 - D** Rich supply of blood capillaries

QUESTION TEN

The volume of blood pumped by the heart changes during vigorous exercise.

The table shows the effect of exercise on the heart of a fit athlete.

	At rest	Moderate exercise	Strenuous exercise
Volume of blood pumped out of the heart in cm ³ per minute	6592	16 688	
Volume of blood pumped out of the heart during each heartbeat in cm ³	103	149	155
Heart rate in beats per minute	64	112	159

10.1 The volume of blood pumped out of the heart during strenuous exercise is

- A 9300 cm³ per minute
- B 9540 cm³ per minute
- C 24 645 cm³ per minute
- D 558 000 cm³ per minute

10.2 The percentage increase in the volume of blood pumped out of the heart during each heartbeat when the heart rate changes from 64 to 159 beats per minute is

- A 33.45%
- B 40.25%
- C 50.49%
- D 66.45%

10.3 The increase in volume of blood pumped out of the heart during exercise

- A increases the supply of energy to the muscles.
- B increases the supply of heat to the muscles.
- C increases the supply of oxygen to the muscles.
- D increases the supply of starch to the muscles.

10.4 Which of the following reactions occurs in red blood cells passing through the muscle capillaries?

- A** haemoglobin + oxygen \longrightarrow oxyhaemoglobin
- B** haemoglobin + carbon dioxide \longrightarrow oxyhaemoglobin
- C** oxyhaemoglobin \longrightarrow haemoglobin + oxygen
- D** oxyhaemoglobin \longrightarrow haemoglobin + carbon dioxide

END OF TEST