

Surname		Other Names	
Centre Number		Candidate Number	
Candidate Signature			

General Certificate of Secondary Education  
March 2007



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

**346001**

Wednesday 7 March 2007 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**

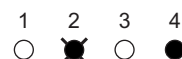
- Use a **black ball-point pen**.

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

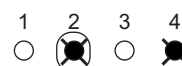


- Do **not** extend beyond the circles.

- 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.

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

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**FOUNDATION TIER**

**SECTION A**

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

In these questions, match words from the list with the numbers.

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

Mark your choices on the answer sheet.

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**QUESTION ONE**

The diagrams show a liver cell and a virus.  
(The diagrams are not drawn to the same scale.)

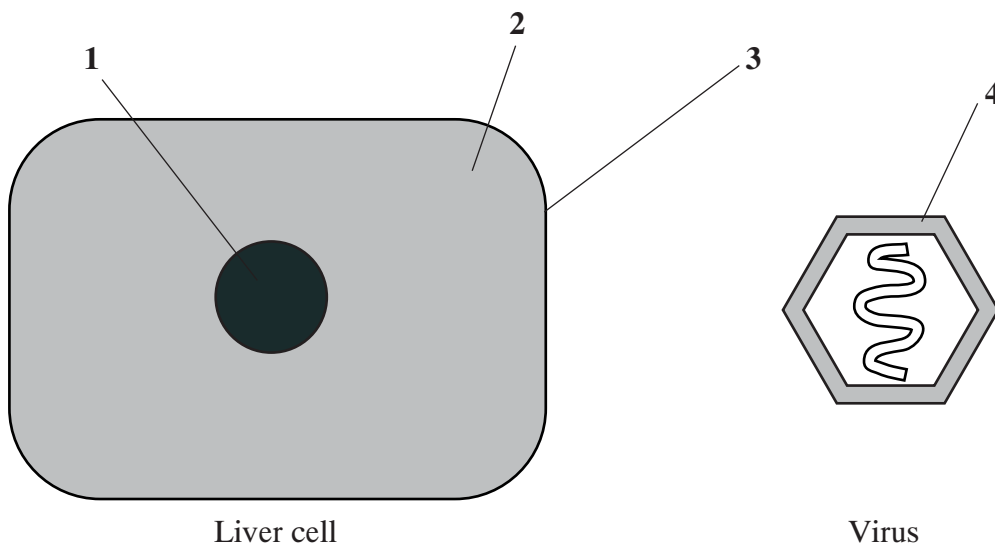
Match words from the list with the labels **1–4** on the diagrams.

**cell membrane**

**cytoplasm**

**nucleus**

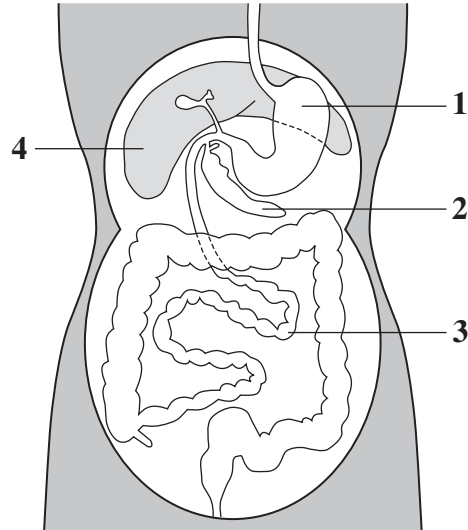
**protein coat**



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**QUESTION TWO**

The diagram shows the digestive system.



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

**liver**

**pancreas**

**small intestine**

**stomach**

**Turn over for the next question**

**Turn over ►**

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**QUESTION THREE**

The diagram shows a section through the heart.

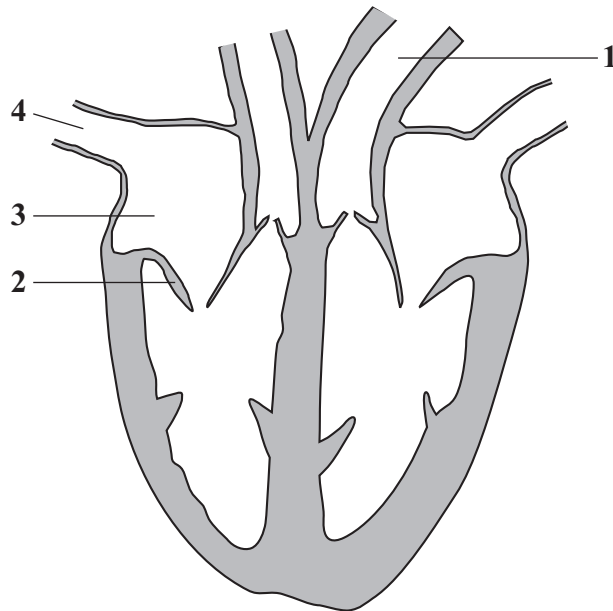
Match words from the list with the labels 1–4 on the diagram.

**artery**

**atrium**

**valve**

**vein**



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**QUESTION FOUR**

The body is able to defend itself against microorganisms.

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

**blood clot**

**mucus in the breathing organs**

**skin covering the body**

**stomach acid**

<b>Feature</b>	<b>How it defends the body</b>
<b>1</b>	kills bacteria in food
<b>2</b>	stops bacteria from entering a cut
<b>3</b>	stops bacteria from entering the body
<b>4</b>	stops bacteria from reaching the lungs

**Turn over for the next question**

**Turn over ►**

**QUESTION FIVE**

The diagram shows some of the structures in the thorax.

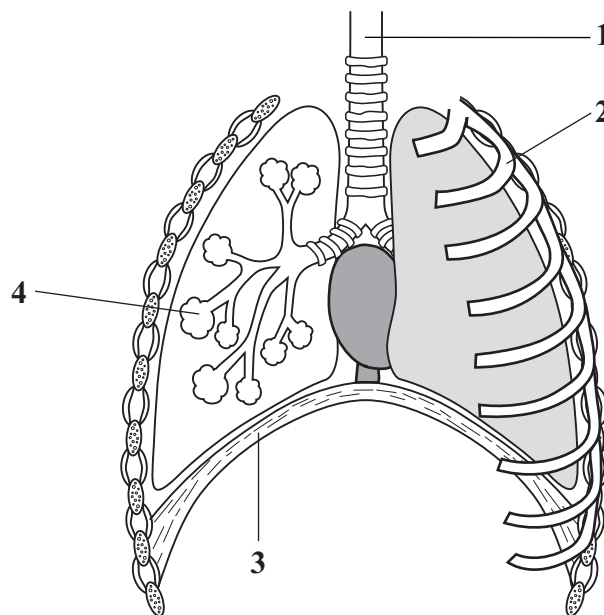
Match words from the list with the labels 1–4 on the diagram.

**becomes flatter when we breathe in**

**brings air to the lungs**

**moves inwards when we breathe out**

**where gases enter and leave the blood**



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**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.

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**QUESTION SIX**

Foods are made soluble during digestion.

Which **two** of the following are soluble?**amino acid****fat****protein****starch****sugar****QUESTION SEVEN**

Many substances are exchanged at surfaces in the body.

Which **two** of the following provide a large surface area for absorbing materials?**alveoli****antibodies****bile****ventilation****villi****Turn over ►**

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**SECTION C**Questions **EIGHT** to **TEN**.

Each of these questions has four parts.

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

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**QUESTION EIGHT**

The information is from a tin of peas.

	<b>Amount per 100 g of peas</b>
Energy	500 kJ
Protein	7 g
Carbohydrate	16 g
Fat	3 g

**8.1** The recommended daily intake of energy for a 16 year-old girl is 10 000 kJ.

What fraction of her daily energy need is provided by 100 g of peas?

- A**  $\frac{1}{500}$
- B**  $\frac{1}{20}$
- C**  $\frac{1}{5}$
- D**  $\frac{1}{2}$



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**8.2** A small tin contains 225 g of peas. A large tin contains 375 g of peas.

What is the difference between the amount of carbohydrate in a small tin of peas and that in a large tin of peas?

- A 12 g
- B 24 g
- C 28 g
- D 36 g

**8.3** A boy ate a meal of fish, chips and peas.  
The total amount of fat in the meal was 40 g.  
There were 50 g of peas in the meal.

How much fat was in the fish and chips?

- A 1.5 g
- B 37.0 g
- C 38.5 g
- D 47.0 g

**8.4** During digestion, the protein in the meal is broken down into . . .

- A amino acids.
- B glucose.
- C glycerol.
- D urea.

**Turn over ►**

**QUESTION NINE**

The table shows the concentration of lactic acid in an athlete's blood during and after a period of exercise. The athlete exercised for the first 10 minutes of the experiment and then rested.

<b>Time in minutes</b>	<b>Concentration of lactic acid in arbitrary units</b>
0	0.4
5	0.4
10	7.8
15	10.2
20	6.0
25	5.0
30	4.6
35	3.6
40	3.0
45	2.4
50	2.0
55	1.6
60	1.2

- 9.1** How much higher does the concentration of lactic acid rise after the exercise period has finished?
- A** 2.4 arbitrary units
  - B** 3.4 arbitrary units
  - C** 7.4 arbitrary units
  - D** 9.8 arbitrary units

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**9.2** After the 60 minutes shown in the table, the lactic acid concentration continues to fall at the same rate. How long after the exercise ends will it be before the lactic acid concentration falls to the resting level?

- A 60 minutes
- B 70 minutes
- C 75 minutes
- D 80 minutes

**9.3** Lactic acid is produced during anaerobic respiration.

One difference between anaerobic respiration and aerobic respiration is that . . .

- A aerobic respiration produces less energy.
- B only aerobic respiration needs oxygen.
- C only anaerobic respiration uses glucose.
- D only anaerobic respiration produces carbon dioxide.

**9.4** Some of the energy released during respiration is used to . . .

- A allow the muscles to contract.
- B transport carbon dioxide.
- C transport heat energy.
- D transport oxygen.

**Turn over for the next question**

**Turn over ►**

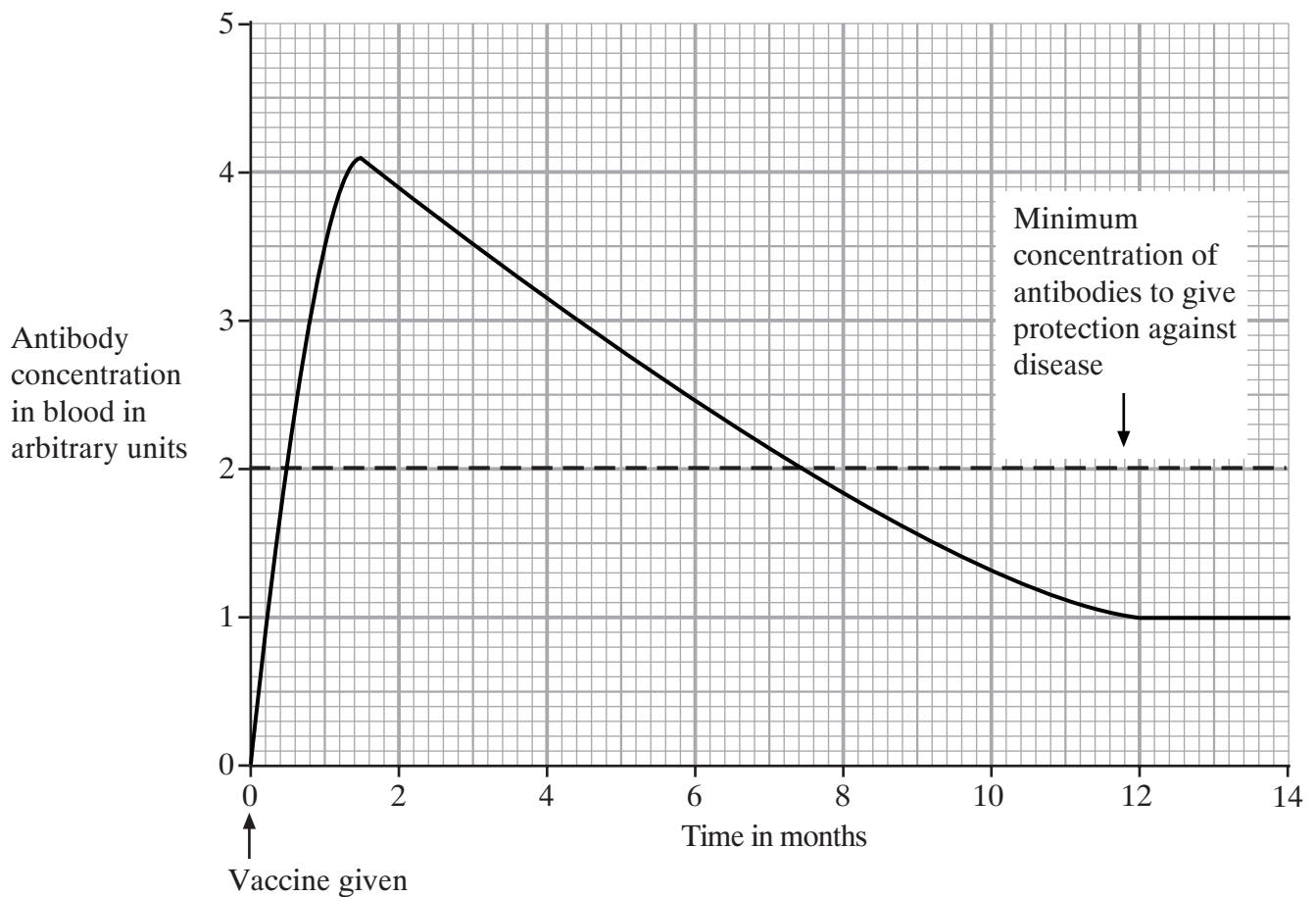
**QUESTION TEN**

Vaccines protect us from disease.

**10.1** A vaccine contains . . .

- A** dead or weakened microorganisms.
- B** enzymes.
- C** platelets.
- D** white blood cells.

The graph shows the concentration of antibodies in a person's blood after a vaccination.



- 10.2** To remain immune to the disease, this person will need a second (booster) dose of vaccine after . . .
- A** 1 month.
  - B** 2 months.
  - C** 7 months.
  - D** 11 months.
- 10.3** What happens to the level of antibodies between months 1 and 5?
- A** Decreases by 1.4 arbitrary units
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  - C** Increases by 0.6 arbitrary units and then falls by 1.3 arbitrary units
  - D** Increases by 1.1 arbitrary units and then falls by 1.3 arbitrary units
- 10.4** Why does it take a few days after vaccination for the concentration of antibodies in the blood to reach its maximum level?
- A** It takes time for the white blood cells to produce the antibodies.
  - B** Microorganisms are increasing rapidly in the blood.
  - C** Platelets destroy antibodies.
  - D** Toxins are being produced to destroy poisons.

**END OF TEST**

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

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## HIGHER TIER

### SECTION A

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

In these questions, match words from the list with the numbers.

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

Mark your choices on the answer sheet.

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#### QUESTION ONE

The diagram shows some of the structures in the thorax.

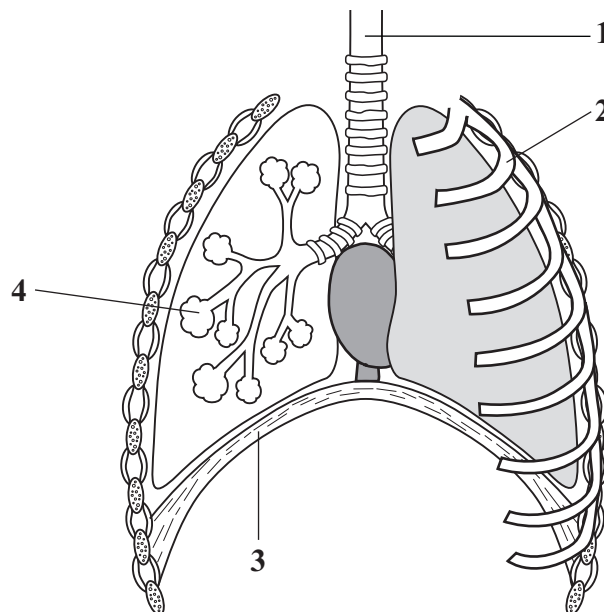
Match words from the list with the labels **1–4** on the diagram.

**becomes flatter when we breathe in**

**brings air to the lungs**

**moves inwards when we breathe out**

**where gases enter and leave the blood**



**QUESTION TWO**

The body breathes in gases that affect respiration.

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

**carbon monoxide**

**haemoglobin**

**mitochondria**

**oxygen**

The cytoplasm of a cell contains structures called . . . **1** . . . , which release energy during respiration.

Breathing in . . . **2** . . . is dangerous because it causes less . . . **3** . . . gas to combine

with . . . **4** . . . in the blood.

**Turn over for the next question**

**Turn over ►**

**SECTION B**

Questions **THREE** and **FOUR**.

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

Do **not** choose more than two.

Mark your choices on the answer sheet.

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**QUESTION THREE**

Many substances are exchanged at surfaces in the body.

Which **two** of the following provide a large surface area for absorbing materials?

**alveoli**

**antibodies**

**bile**

**ventilation**

**villi**

**QUESTION FOUR**

Bile is released into the digestive system.

In which **two** ways does bile speed up the digestion of fats?

**it contains enzymes that emulsify fats**

**it increases the surface area of fat droplets for lipase action**

**it makes small droplets of fats into larger droplets**

**it makes the contents of the small intestine more acidic**

**it neutralises the contents of the small intestine**



**Turn over for the next question**

**Turn over ►**

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**SECTION C**Questions **FIVE** to **TEN**.

Each of these questions has four parts.

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---

**QUESTION FIVE**

The information is from a tin of peas.

	<b>Amount per 100 g of peas</b>
Energy	500 kJ
Protein	7 g
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Fat	3 g

**5.1** The recommended daily intake of energy for a 16 year-old girl is 10 000 kJ.

What fraction of her daily energy need is provided by 100 g of peas?

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---

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The total amount of fat in the meal was 40 g.  
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How much fat was in the fish and chips?

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**5.4** During digestion, the protein in the meal is broken down into . . .

- A amino acids.
- B glucose.
- C glycerol.
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**QUESTION SIX**

The table shows the concentration of lactic acid in an athlete's blood during and after a period of exercise. The athlete exercised for the first 10 minutes of the experiment and then rested.

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- 6.1** How much higher does the concentration of lactic acid rise after the exercise period has finished?
- A** 2.4 arbitrary units
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**Turn over for the next question**

**Turn over ►**

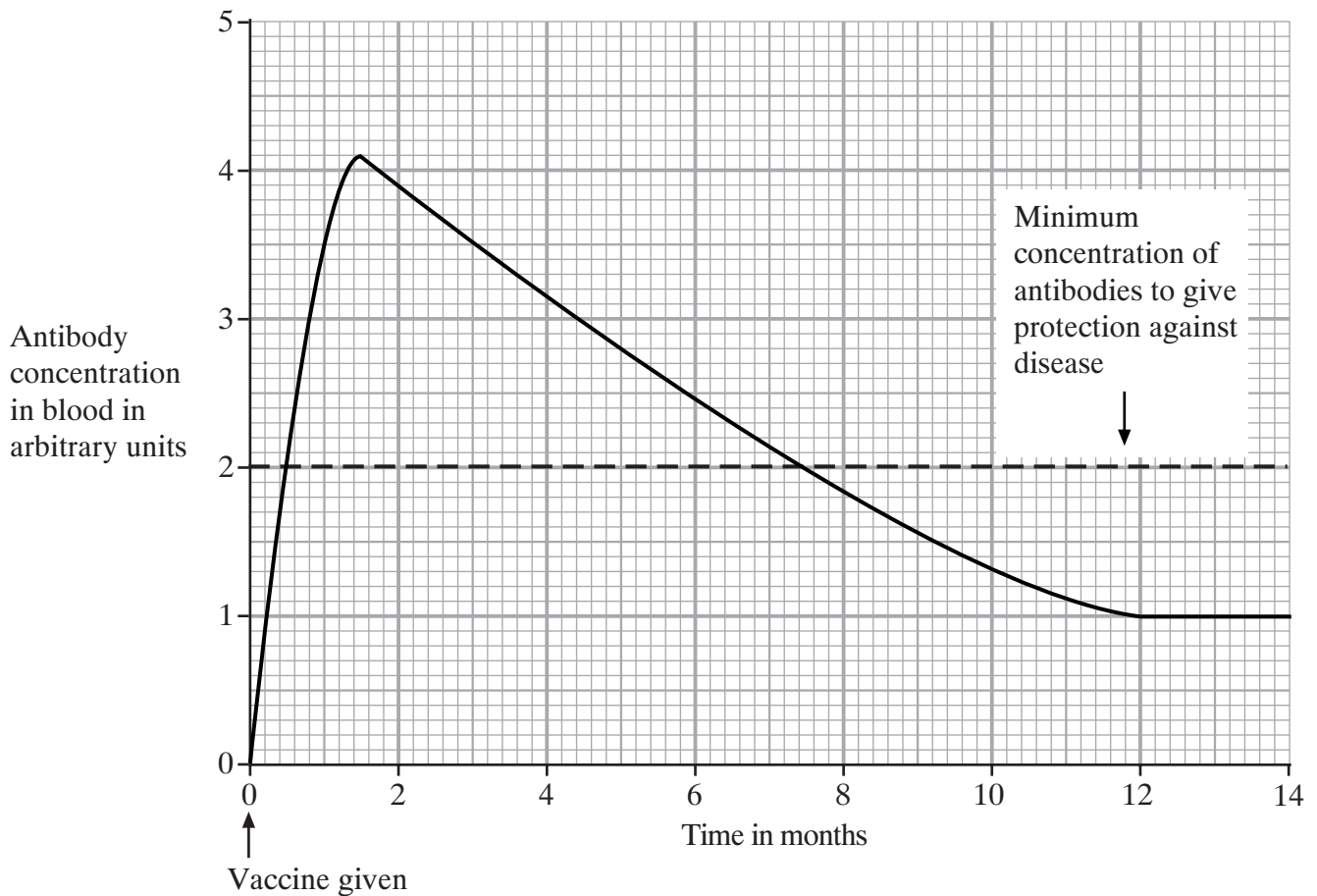
**QUESTION SEVEN**

Vaccines protect us from disease.

7.1 A vaccine contains . . .

- A dead or weakened microorganisms.
- B enzymes.
- C platelets.
- D white blood cells.

The graph shows the concentration of antibodies in a person's blood after a vaccination.



- 7.2** To remain immune to the disease, this person will need a second (booster) dose of vaccine after . . .
- A** 1 month.
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- A** It takes time for the white blood cells to produce the antibodies.
  - B** Microorganisms are increasing rapidly in the blood.
  - C** Platelets destroy antibodies.
  - D** Toxins are being produced to destroy poisons.

**Turn over for the next question**

**Turn over ►**

**QUESTION EIGHT**

Blood has many important functions in the body.

**8.1** Which part of the blood transports carbon dioxide?

- A** Plasma
- B** Platelets
- C** Red blood cells
- D** White blood cells

**8.2** In which part of the blood, and where in the body, may oxyhaemoglobin split up to form haemoglobin and oxygen?

- A** In the plasma, in the lungs
- B** In the platelets, in the kidneys
- C** In the red blood cells, in the muscles
- D** In the white blood cells, at a site of infection

**8.3** In some diseases the blood will not clot when a wound occurs.

This is most likely to be caused by a shortage of . . .

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

**8.4** During an illness caused by bacteria, there will be . . .

- A** a lower number of white blood cells.
- B** a reduced number of platelets.
- C** an increase in the antibody content of the plasma.
- D** an increase in the number of red blood cells.



**Turn over for the next question**

**Turn over ►**

**QUESTION NINE**

Our rate and depth of breathing are affected by the concentration of carbon dioxide in the air we breathe in.

The table shows the results of an experiment on a scientist.

<b>Percentage of carbon dioxide in breathed-in air</b>	<b>Depth of breathing (volume of air per breath in cm<sup>3</sup>)</b>	<b>Rate of breathing (number of breaths per minute)</b>
0.04	673	14
1.0	739	14
2.0	794	15
3.0	911	15
4.0	1232	15

**9.1** What was the total volume of air breathed per minute when the percentage of carbon dioxide in the breathed-in air was 3.0?

- A 34.2 cm<sup>3</sup>
- B 60.7 cm<sup>3</sup>
- C 13 665 cm<sup>3</sup>
- D 47 640 cm<sup>3</sup>

**9.2** Which of the following conclusions can be drawn from the data?

As the percentage of carbon dioxide in the breathed-in air increased, . . .

- A the depth of breathing depended on the rate of breathing.
- B the depth of breathing increased at a constant rate.
- C the depth of breathing increased slowly at first, then more rapidly.
- D the depth of breathing increased quickly at first, then more slowly.

**9.3** The advantage of increasing the rate of breathing is that . . .

- A** blood will flow through the lungs more quickly.
- B** exchange of gases will take place faster.
- C** lactic acid will begin to pass out of the blood into the alveoli.
- D** the surface area of the alveoli will increase.

**9.4** In order to breathe in, . . .

- A** the volume of the thorax decreases 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 increases and the pressure inside it decreases.
- D** the volume of the thorax increases and the pressure inside it increases.

**Turn over for the next question**

**Turn over ►**

**QUESTION TEN**

Diffusion plays an important role in living organisms.

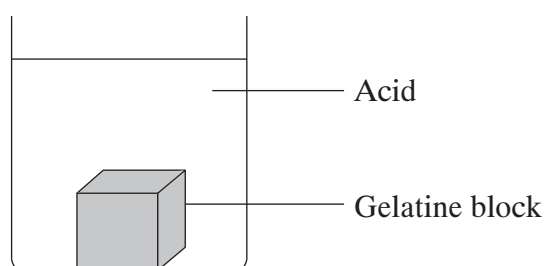
**10.1** Which of the following is the definition of diffusion?

- A** The breakdown of large molecules into smaller molecules outside the cells
- B** The movement of substances through cells
- C** The spreading of particles resulting in a net movement from a region of higher concentration to a region of lower concentration
- D** The spreading out of a liquid as it gets warmer

**10.2** Which of the following is an example of diffusion?

- A** The loss of mucus from the breathing organs
- B** The movement of bile from the gall bladder to the small intestine
- C** The movement of blood through the capillaries
- D** The movement of oxygen from the alveoli to the blood

**10.3** In an investigation, a block of gelatine was placed into a beaker of dilute acid. The gelatine contained a red dye. The dye changes to yellow when in contact with the acid.



Which of the following would increase the time taken for the whole block to turn yellow?

- A** Decreasing the surface area of the gelatine block
- B** Increasing the amount of dye in the gelatine block
- C** Increasing the volume of acid in the beaker
- D** Stirring the acid

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**10.4** Substances diffuse into and out of muscle cells.

Which row of the table correctly shows substances which diffuse in and out of muscle cells?

	<b>Diffuses into muscle cells</b>	<b>Diffuses out of muscle cells</b>
<b>A</b>	amino acids	oxygen
<b>B</b>	carbon dioxide	oxygen
<b>C</b>	carbon dioxide	urea
<b>D</b>	glucose	carbon dioxide

**END OF TEST**

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