PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

BIOLOGY



EXAM QUESTION PACK

TOPIC 8: EXCHANGE AND TRANSPORT IN ANIMALS (PAPER 2)

SCORE	PERCENTAGE
/113	%

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Q1.

Figure 3 shows a cross-section of an artery and a vein.



(Source: © The University of Kansas Medical Center)

Figure 3

(i) Explain **one** difference between the artery wall and the vein wall shown in Figure 3.

(2)

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(ii) Name **one** structure that is found in veins but not found in arteries.

(1)

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(Total for question = 3 marks)

Q2.

A scientist investigated how the length of starch grains in potatoes changed when the potatoes were stored in the dark.

Figure 4 shows a potato after being stored in the dark.



© rodimov/Shutterstock

Figure 4

Three potatoes were used in the investigation.

The length of starch grains in potato 1 were measured at the start.

The length of starch grains in potato 2 were measured after 5 weeks in the dark.

The length of starch grains in potato 3 were measured after 10 weeks in the dark.

Figure 5 shows the results.

potato	time after placing in the dark in weeks	mean length of starch grains in μm
1	0	64
2	5	50
3	10	30

Figure 5

(i) Calculate the percentage difference in the mean length of starch grains in potato 2 at 5 weeks and in potato 3 at 10 weeks.

(2)

..... %

(ii) State **two** variables the scientist should have controlled to improve this investigation.

(2)

1 .....

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2 .....

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(iii) The starch grains in the potatoes became smaller as the starch was converted into glucose.

State why the potatoes need glucose.

(1)

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(iv) Describe how starch is broken down into glucose.

(2)

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(Total for question = 7 marks)

Q3.

Explain why people with asthma may start to respire anaerobically more quickly than people without asthma, when exercising at the same intensity.

(2)

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(Total for question = 2 marks)

Q4.

Figure 10 shows a cross-section of a blood vessel.

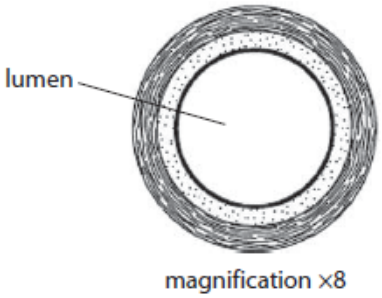


Figure 10

(i) The diameter of the lumen in Figure 10 is 25.0 mm

What is the actual diameter of the lumen of this blood vessel?

(1)

☒ **A** 3.1×10^{-2} m

☒ **B** 3.1×10^{-3} m

☒ **C** 2.0×10^{-2} m

☒ **D** 2.0×10^{-3} m

(ii) Which blood vessel delivers deoxygenated blood to the heart?

(1)

☒ **A** aorta

☒ **B** pulmonary artery

☒ **C** pulmonary vein

☒ **D** vena cava

(iii) Capillary walls are much thinner than the wall of the blood vessel in Figure 10.

The lumen of a capillary is also much smaller.

Explain how each of these features of the capillary helps it to function efficiently.

(2)

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(Total for question = 4 marks)

Q5.

Exercise causes changes in the circulation of the blood.

In an investigation, the change in blood flow to different parts of the body during exercise was measured.

All the volunteers used in the study were healthy females of the same age.

Figure 9 shows the results of this investigation.

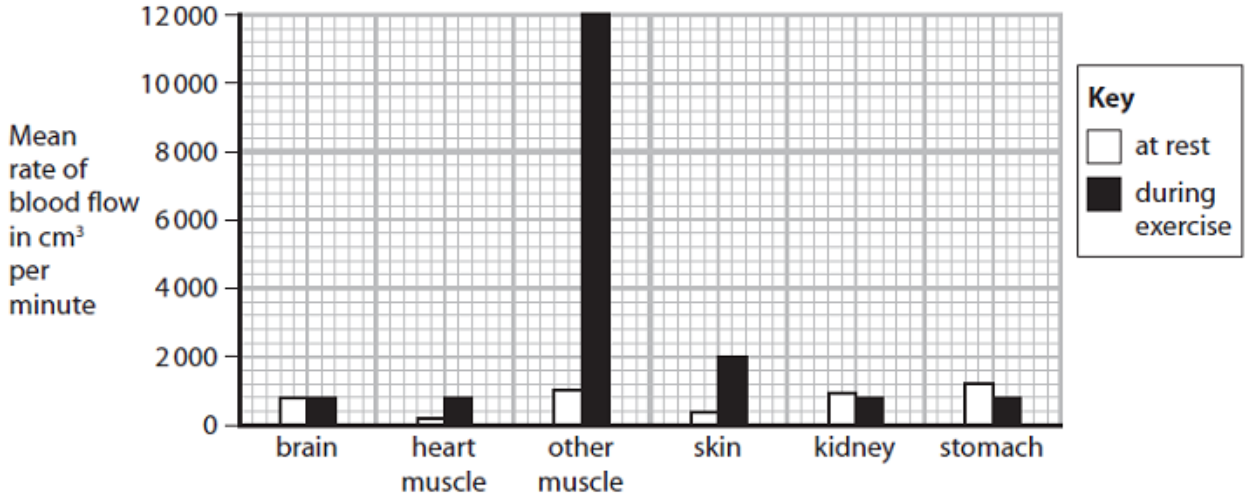


Figure 9

(i) During exercise, the blood flow to the stomach changes.

Calculate the percentage change in blood flow to the stomach in response to exercise.

Give your answer to the nearest whole number

(3)

..... %

(ii) Suggest **two** other variables that should be controlled in this investigation.

(2)

1 .....

2 .....

*(iii) Explain the changes in blood flow, shown in Figure 9, that are caused by exercise.

(6)

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(Total for question = 11 marks)

Q6.

(i) A patient visits his doctor because he is putting on weight but does not think he is increasing

his calorie intake.

The patient has a height of 1.9m and a body mass of 120kg.

What is his BMI?

(1)

☒ **A** 0.0083

☒ **B** 33.2

☒ **C** 0.016

☒ **D** 66.4

The doctor diagnosed this person with an underactive thyroid gland.

* (ii) Explain why an underactive thyroid could cause this patient to have an increased body mass.

(6)

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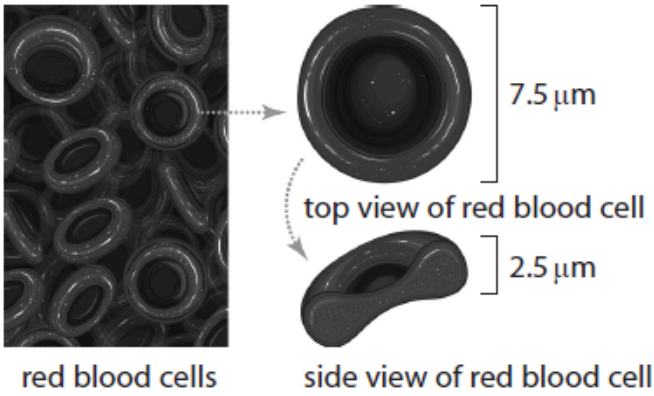
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(Total for question = 7 marks)

Q7.

Figure 6 shows the structure and actual size of red blood cells (erythrocytes).



(Source: © N.Vinoth Narasingam/Shutterstock)

Figure 6

(i) Calculate the image size of the top view of this red blood cell if this cell is magnified 400×.

Give your answer in mm.

(2)

..... mm

(ii) Explain how the shape of a red blood cell is related to its function.

(3)

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(iii) State the role of haemoglobin inside the red blood cell.

(1)

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(Total for question = 6 marks)

Q8.

Figure 8 shows the heart rate of person A and person B.

Person A does not do any regular exercise.

Person B has been running regularly for one year.

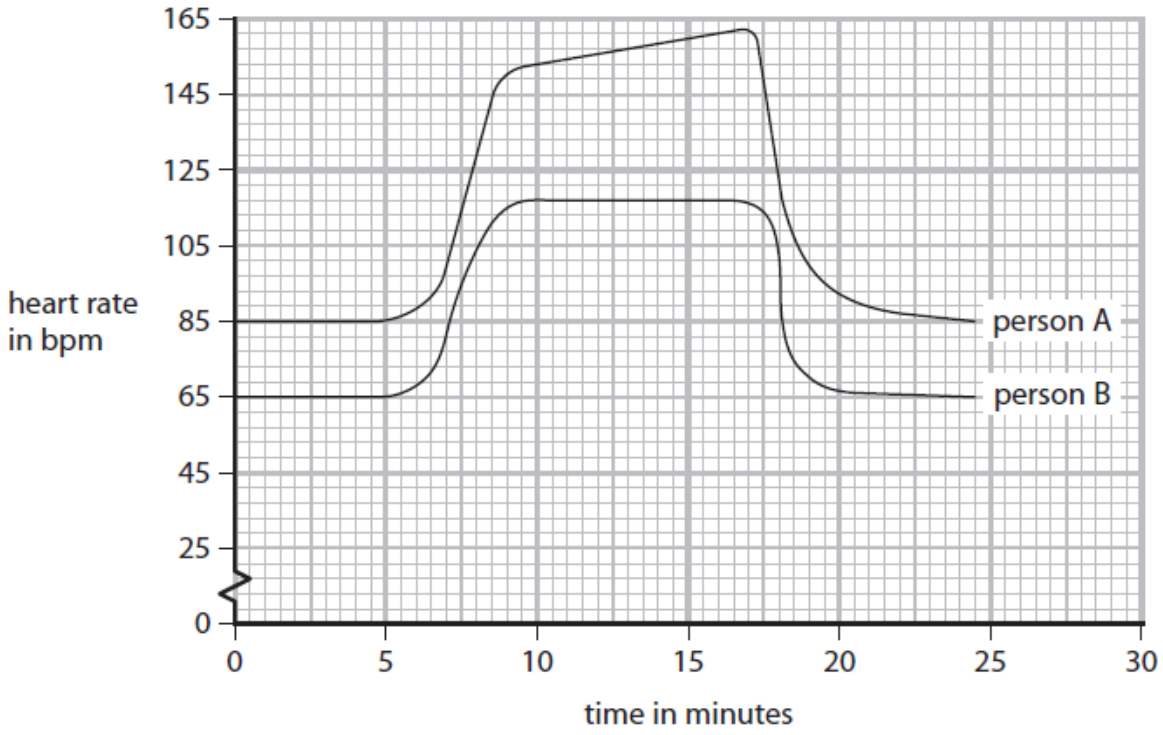


Figure 8

The stroke volume for person B before exercising was 61 ml per beat.

Calculate the cardiac output for person B before exercising.

Give your answer in litres per minute.

(3)

..... litres per minute

(Total for question = 3 marks)

Q9.

A person has a cardiac output of 4.9 litres per minute. The stroke volume of each heart beat is 70 ml.

Calculate the heart rate.

(2)

..... beats per minute

(Total for question = 2 marks)

Q10.

Figure 4 shows equipment used to investigate the rate of respiration in maggots.

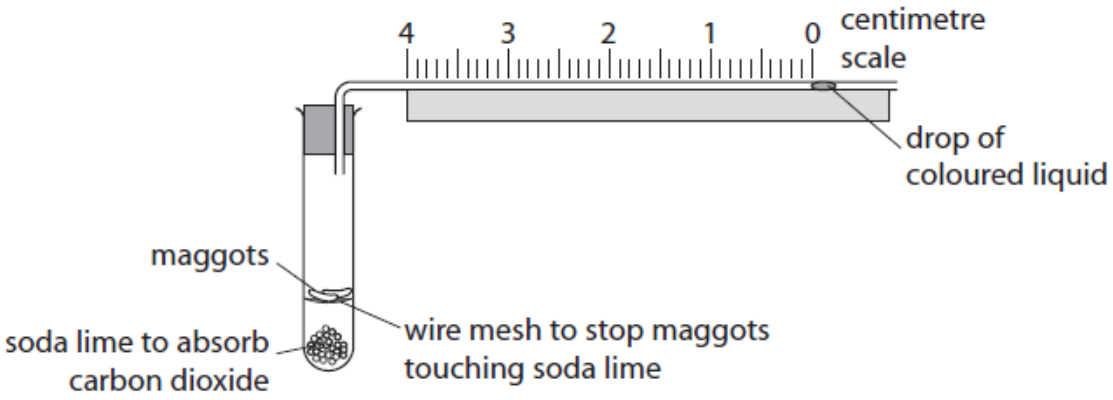


Figure 4

As the maggots respire, the drop of coloured liquid moves towards the test tube.

Figure 5 shows the position of the drop of coloured liquid after ten minutes.

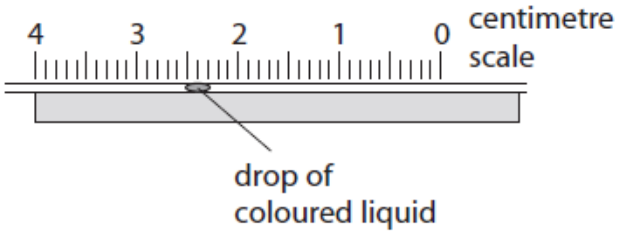


Figure 5

(i) Use information from Figures 4 and 5 to calculate the mean rate of respiration of the maggots in mm per minute.

(2)

..... mm per minute

(ii) Describe a control for this investigation.

(2)

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(Total for question = 4 marks)

Q11.

A human body has 5 dm^3 of blood.

At rest 20% of the blood travels to the muscles.

During exercise 60% of the blood travels to the muscles.

(i) Calculate the volume of blood travelling to the muscles during exercise.

(2)

..... dm^3

(ii) Explain **one** reason why there is an increase in blood flow to muscles during exercise.

(2)

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(Total for question = 4 marks)

Q12.

Figure 3 shows a peak flow meter.

A peak flow meter is used to measure the rate at which air is blown out of the lungs.



© Creative Commons License

Figure 3

To use a peak flow meter a person takes a deep breath and exhales the air as hard and as fast as possible into the peak flow meter.

People with asthma can have a reduced peak flow.

A student investigated the peak flow of five people with asthma and five people without asthma.

All the people were male and the same age.

The mean peak flow for people without asthma was 630 dm^3 per minute.

The mean peak flow for people with asthma was 480 dm^3 per minute.

Use the mean peak flow values to calculate the percentage decrease in peak flow for the people with asthma.

(2)

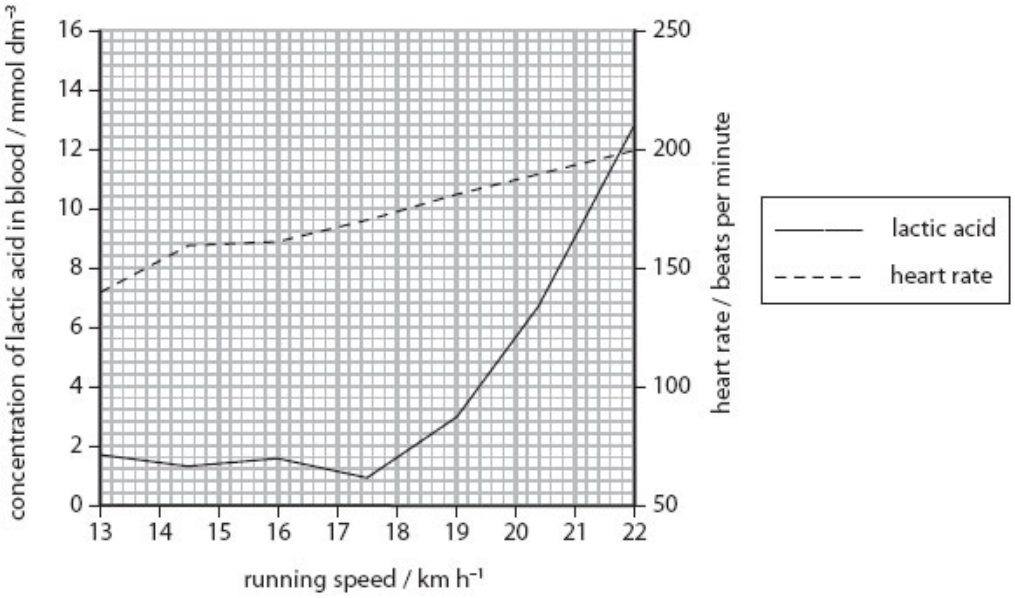
..... %

(Total for question = 2 marks)

Q13.

In an investigation, a person ran at different speeds.

The graph shows the concentration of lactic acid in the blood and the heart rate of this person while running.



(i) When the running speed is 22 km h^{-1}, the stroke volume of the runner is 0.18 dm^3.

Calculate the cardiac output of the runner using the equation.

cardiac output = stroke volume × heart rate

(2)

answer = ... dm^3 per minute

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

When the heart rate is at its maximum the concentration of lactic acid in the blood is

(1)

☒ **A** 11.2 mmol dm^{-3}

☒ **B** 12.8 mmol dm^{-3}

☒ **C** 200.0 mmol dm^{-3}

☒ **D** 210.0 mmol dm^{-3}

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

The graph shows that

☒ **A** as the heart rate increases the concentration of lactic acid increases

☒ **B** as the concentration of lactic acid increases the heart rate decreases

☒ **C** the concentration of lactic acid increases as running speed increases

☒ **D** the concentration of lactic acid is not dependent on heart rate

(iv) Explain why the concentration of lactic acid changes at running speeds greater than 18 km h^{-1}.

(3)

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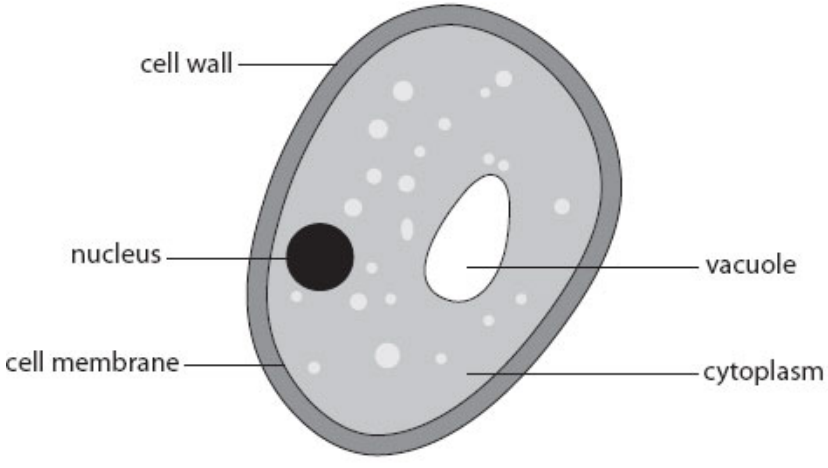
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Q14.

Yeasts are microorganisms that are used in the brewing and baking industries.

The diagram shows a yeast cell.



(a) (i) State **two** ways in which the structure of this yeast cell differs from the structure of a

bacterial cell.

(2)

1 .....

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2 .....

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(ii) Plant cells can produce glucose.

Suggest why yeast cells cannot produce glucose.

(1)

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(b) The table shows the number of different components found in the blood of a healthy person and the blood of two other people.

	number of components per dm^3 of blood		
component of blood	healthy person	person A	person B
red blood cells	5×10^{12}	6×10^{12}	3×10^{12}
white blood cells	7×10^{9}	5×10^{10}	8×10^{10}
platelets	3×10^{11}	3×10^{11}	3×10^{11}

(i) Calculate the difference in the number of white blood cells per dm3 of blood between the healthy person and person A.

(2)

answer = ...

(ii) Describe the functions of white blood cells.

(2)

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(iii) Person B has a low number of red blood cells compared to the healthy person.

Suggest an effect this may have on person B.

(1)

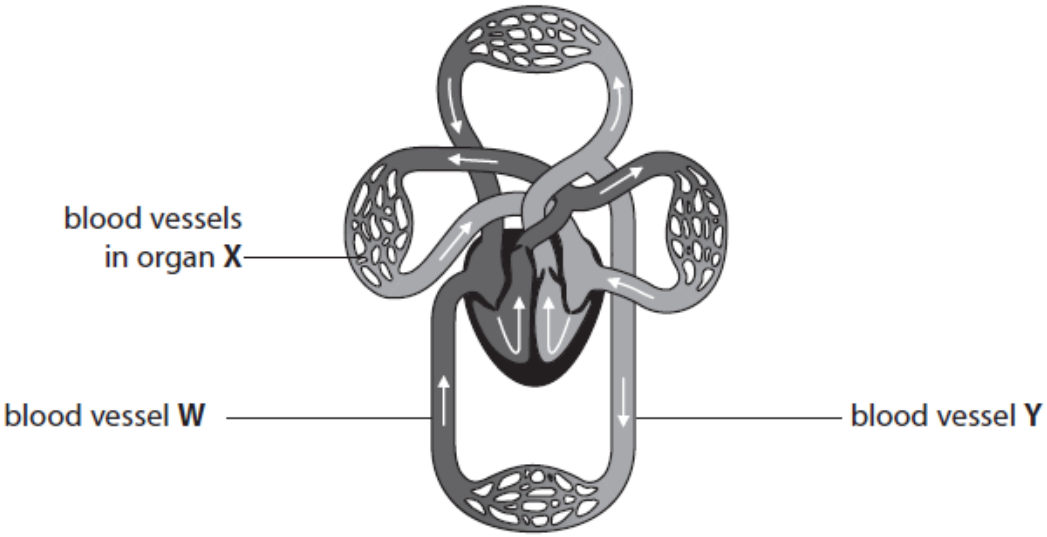
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(Total for Question = 8 marks)

Q15.

The diagram shows the human circulatory system.



(i) Name organ **X**.

(1)

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(ii) Explain how the heart causes blood to move to organ **X**.

(2)

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(iii) Which row shows the names of blood vessels **W** and **Y**?

Place a cross (☒) in the box next to your answer.

(1)

	blood vessel W	blood vessel Y
☒ **A**	pulmonary vein	aorta
☒ **B**	vena cava	pulmonary artery
☒ **C**	pulmonary artery	vena cava
☒ **D**	vena cava	aorta

(iv) Describe how the blood in vessel **W** is different from the blood in vessel **Y**.

(2)

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Q16.

A woman had unexplained weight loss and fatigue.
She had blood tests to investigate the cause of these symptoms.

Figure 6 shows the results.

blood test	woman's result	normal range
TSH level	5.6 mU/l	0.4 to 4.9 mU/l
thyroxine level	27.5 pmol/l	9.0 to 21.0 pmol/l
red blood cell count	5.2×10^6 cells/μl	4.2 to 5.4×10^6 cells/μl
glucose level	82.0 mg/dl	72.0 to 99.0 mg/dl

Figure 6

Comment on the results of these blood tests and the possible causes of the woman's weight loss and fatigue.

(4)

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(Total for question = 4 marks)

Q17.

Figure 5 shows the stroke volume at different heart rates of a person who has trained for a marathon and of a person who has not trained for a marathon.

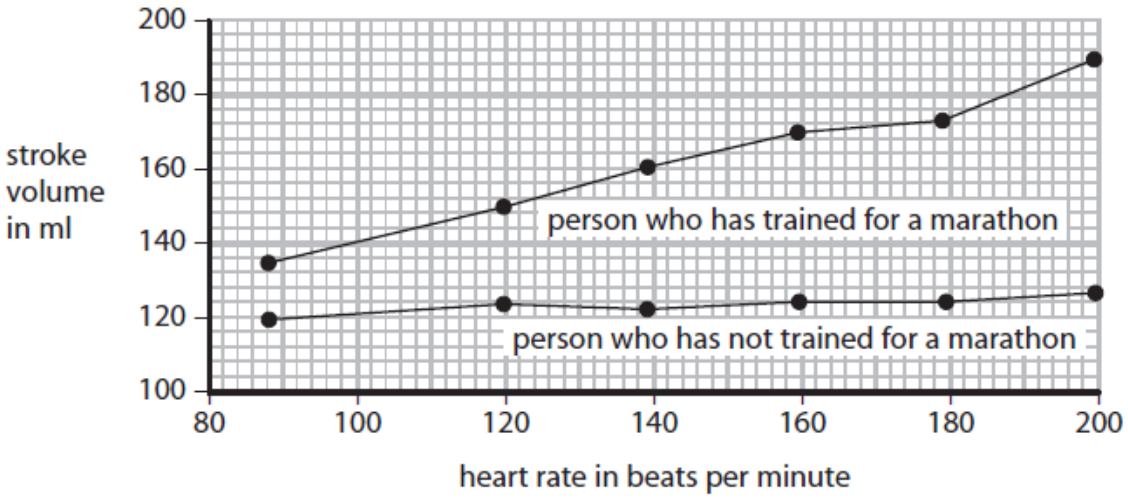


Figure 5

(i) Compare the effect of heart rate on stroke volume of the person who has trained for a marathon with the person who has not trained for a marathon.

(2)

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(ii) Calculate the cardiac output for the person who has trained for a marathon when the heart rate is 160 beats per minute.

Give the units in your answer.

(3)

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(Total for question = 5 marks)

Q18.

Figure 8 shows the heart rate of person A and person B.

Person A does not do any regular exercise.

Person B has been running regularly for one year.

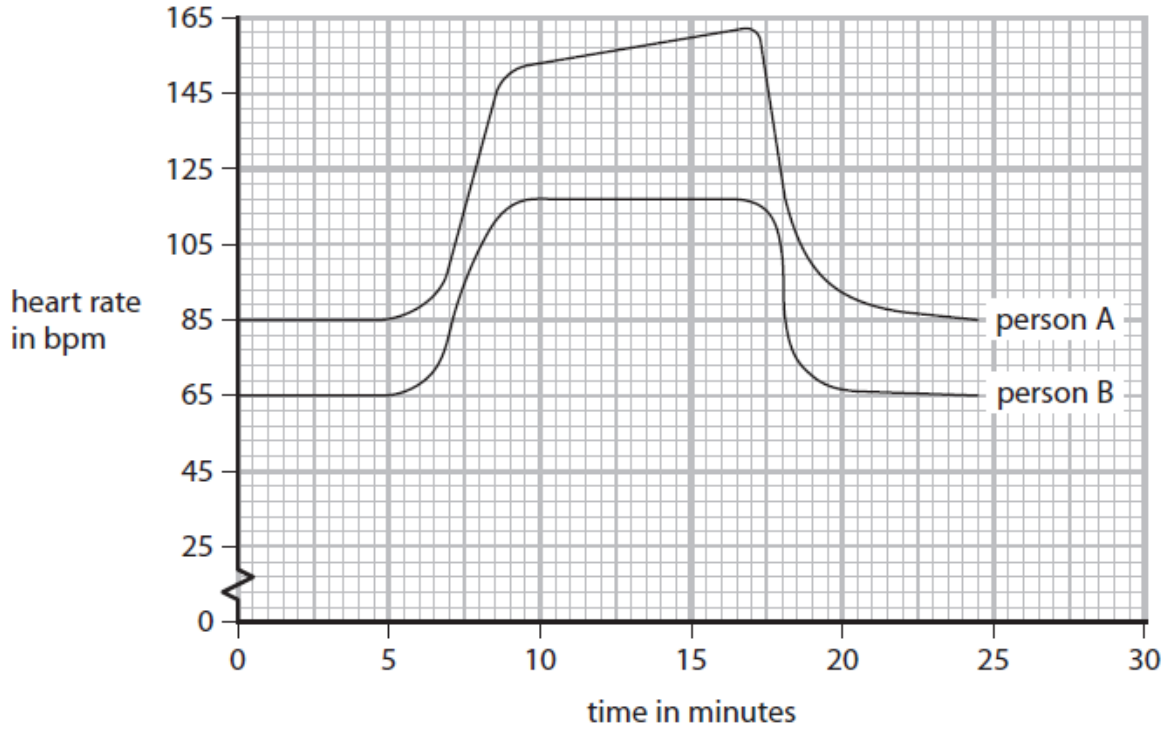


Figure 8

Both people rested for the first 6 minutes, then did the same high intensity exercise for the next 12 minutes, then rested.

Compare the heart rates of person A with the heart rates of person B.

(4)

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(Total for question = 4 marks)

Q19.

Figure 10 shows the estimated blood flow through some parts of the body when a person is at rest and during exercise.

part of the body	estimated rate of blood flow in cm^3 per minute	
	at rest	during exercise
brain	750	748
heart muscle	350	1 150
digestive system	2 500	1 200
other muscles	1 200	14 500
all other organs (except lungs)	1 423	1 420

Figure 10

Compare the rate of blood flow through the body when this person is at rest and during exercise.

(3)

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(Total for question = 3 marks)

Q20.

* Blood from the body enters the heart through the vena cava.

Describe how this blood flows through the heart and lungs to leave the heart through the aorta.

Include references to the chambers of the heart and the relevant valves in your answer.

(6)

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(Total for question = 6 marks)

Q21.

Figure 3 shows a diagram of the circulatory system of a fish.

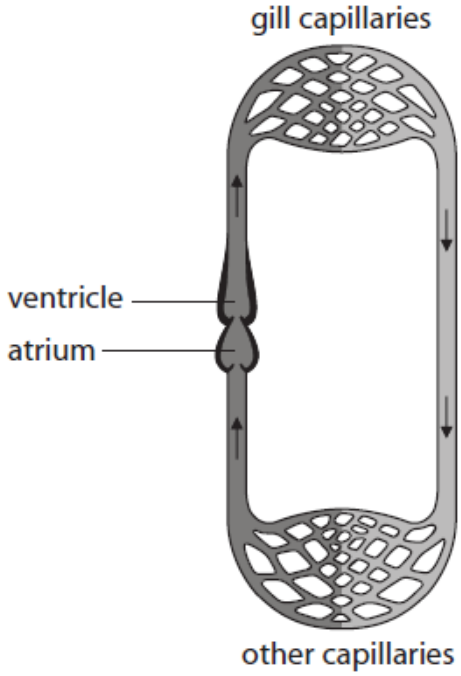


Figure 3

Compare the differences between the structure of the circulatory system of a fish and the human circulatory system.

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(Total for question = 4 marks)

Q22.

(i) Explain how chewing food helps digestion.

(2)

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(ii) In the small intestine, large fat droplets are broken into smaller droplets by a substance called bile.

Explain how the smaller fat droplets are then digested and enter the bloodstream.

(3)

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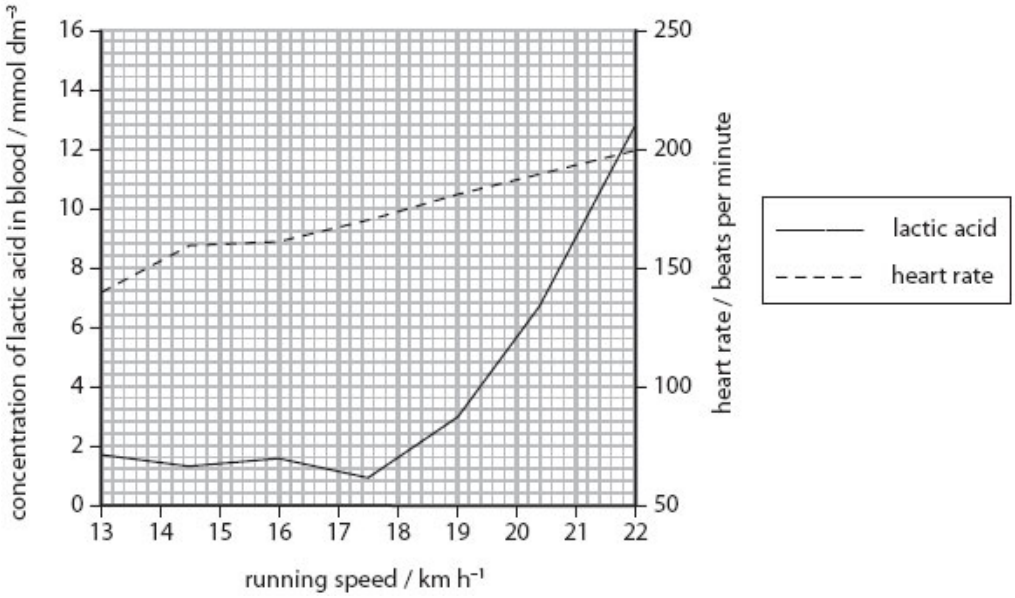
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(Total for question = 5 marks)

Q23.

In an investigation, a person ran at different speeds.

(a) The graph shows the concentration of lactic acid in the blood and the heart rate of this person while running.



(i) When the running speed is 22 km h^{-1}, the stroke volume of the runner is 0.18 dm^3.

Calculate the cardiac output of the runner using the equation.

cardiac output = stroke volume × heart rate

(2)

answer = ... dm^3 per minute

(ii) Complete the sentence by putting a cross (☒) in the box next to your answer.

When the heart rate is at its maximum the concentration of lactic acid in the blood is

(1)

☒ **A** 11.2 mmol dm^{-3}

☒ **B** 12.8 mmol dm^{-3}

☒ **C** 200.0 mmol dm^{-3}

☒ **D** 210.0 mmol dm^{-3}

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

(1)

The graph shows that

☒ **A** as the heart rate increases the concentration of lactic acid increases

☒ **B** as the concentration of lactic acid increases the heart rate decreases

☒ **C** the concentration of lactic acid increases as running speed increases

☒ **D** the concentration of lactic acid is not dependent on heart rate

(iv) Explain why the concentration of lactic acid changes at running speeds greater than 18 km h^{-1}.

(3)

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(b) After running the person rested.

Explain why the concentration of lactic acid in the blood changes whilst resting.

(3)

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(Total for Question is 10 marks)

Q24.

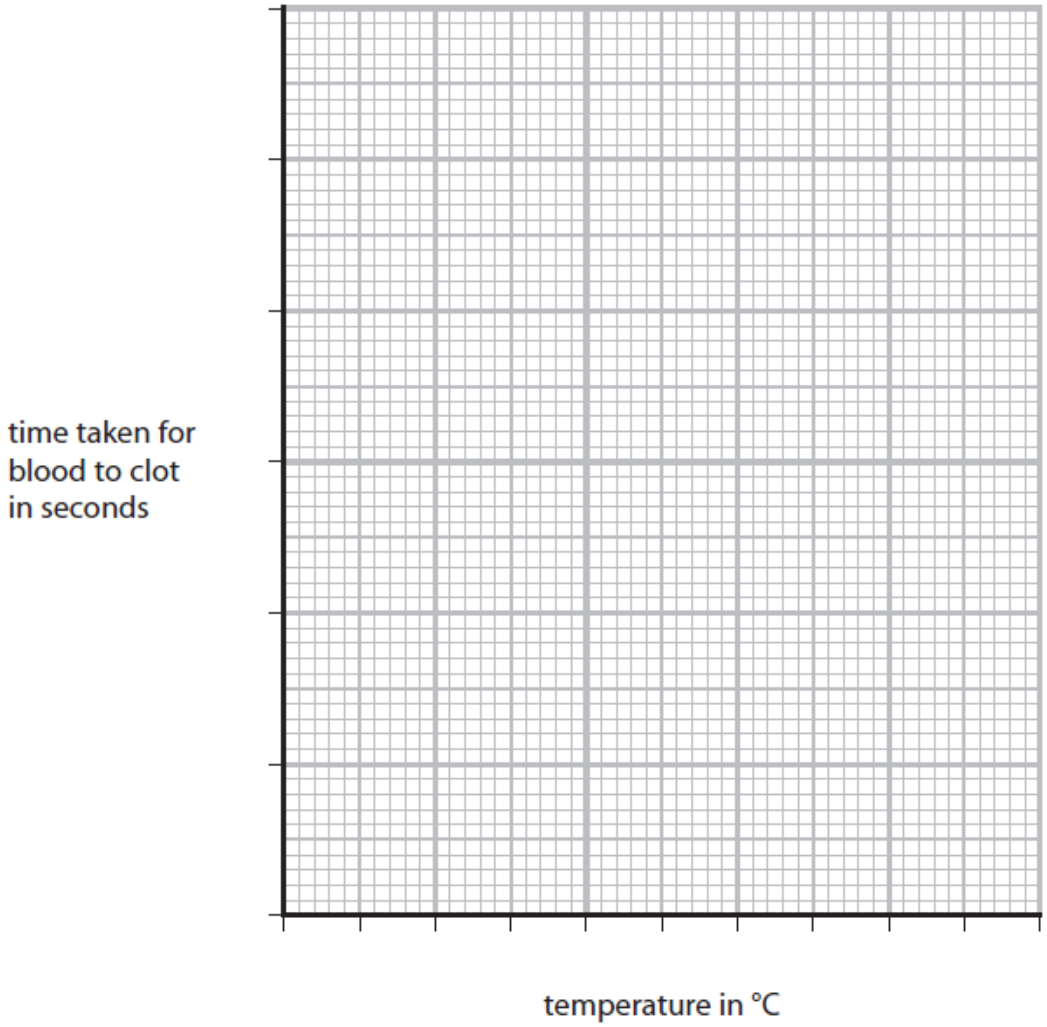
Figure 7 shows the time taken for blood to clot at different temperatures.

temperature in °C	time taken for blood to clot in seconds
5	90
15	70
25	55
35	40
45	110

Figure 7

(i) Draw a graph to show the data in Figure 7.

(3)



(ii) Give **two** safety precautions that should be used when handling blood samples.

(2)

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2 .....

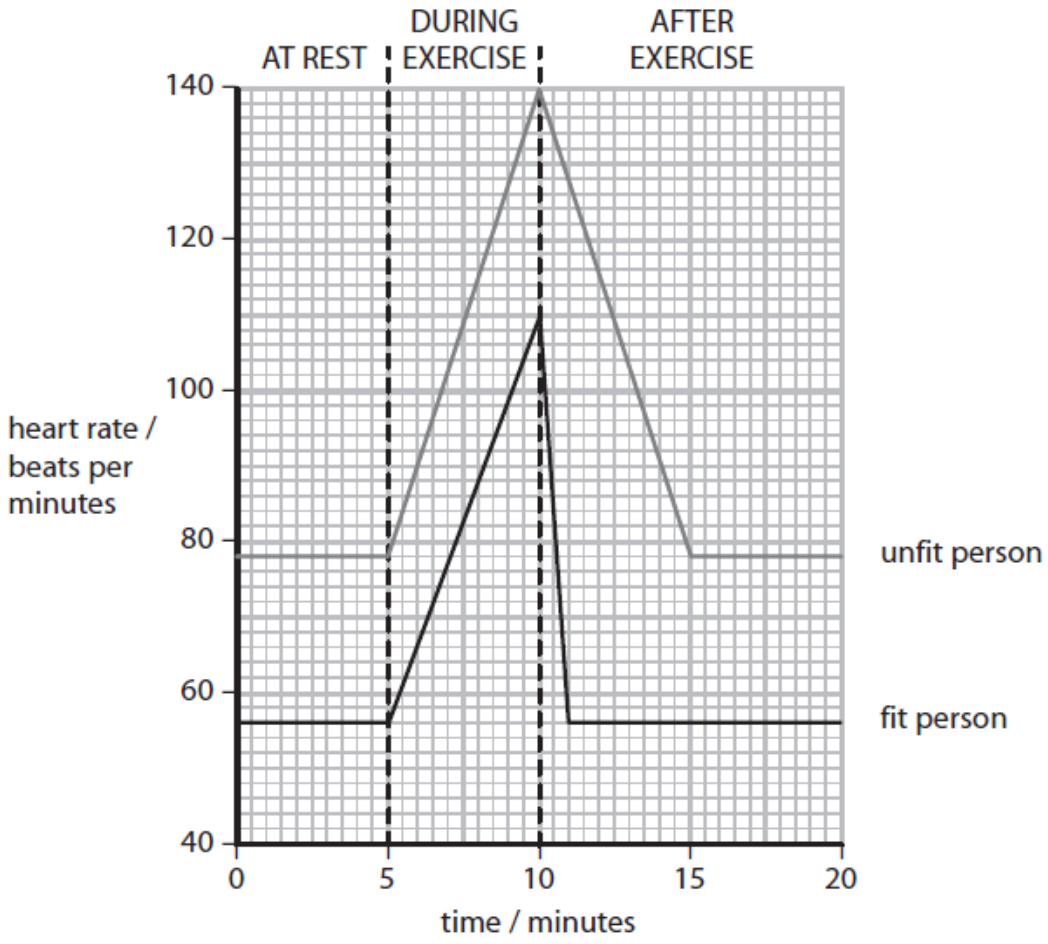
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(Total for question = 5 marks)

Q25.

Exercise

The graph shows the heart rate of a fit person and of an unfit person at rest, during exercise and after exercise.



(a) (i) Compare the heart rate of the fit person with the heart rate of the unfit person from 5 to 15 minutes.

(3)

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(ii) Cardiac output = stroke volume × heart rate.

The stroke volume of the fit person at 10 minutes is 0.20 dm^3 per beat.

Calculate the cardiac output of the fit person at 10 minutes.

Use the graph to help you.

(2)

..... dm^3 per minute

(iii) The recovery period is the time it takes for the heart rate to return to its rate at rest after exercise.

Explain why the recovery period for the fit person was different from the recovery period for the unfit person.

(3)

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(b) Which of the following shows the direction that blood flows towards, through and from the heart?

Place a cross (☒) in the box next to your answer.

(1)

☒ **A** vena cava → ventricle → atrium → pulmonary vein

☒ **B** pulmonary artery → atrium → ventricle → aorta

☒ **C** aorta → ventricle → atrium → pulmonary vein

☒ **D** pulmonary vein → atrium → ventricle → aorta

(c) More carbon dioxide is produced by cells during exercise.

Name the part of the blood that transports most of the carbon dioxide to the lungs.

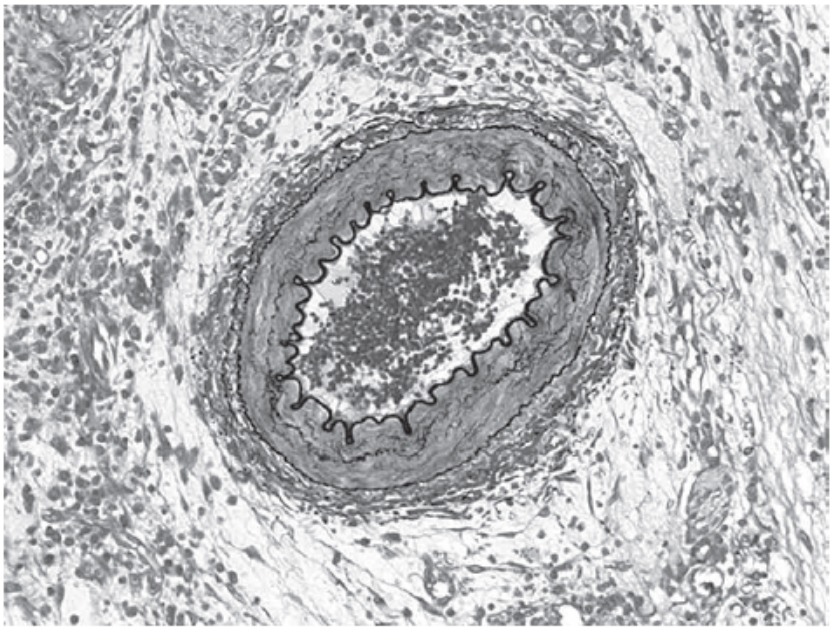
(1)

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(Total for question = 10 marks)

Q26.

Figure 2 shows a photomicrograph of a blood vessel.



(Source: Microscape/Science Photo Library)

Figure 2

Explain how the structure of this blood vessel is related to its function.

(2)

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(Total for question = 2 marks)

Q27.

Explain how **one** structure of a vein helps the blood return to the heart.

(2)

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(Total for question = 2 marks)

Q28.

Explain how the release of adrenalin can result in the improved performance of an athlete.

(4)

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(Total for question = 4 marks)

Q29.

Figure 10 shows the estimated blood flow through some parts of the body when a person is at rest and during exercise.

part of the body	estimated rate of blood flow in cm^3 per minute	
	at rest	during exercise
brain	750	748
heart muscle	350	1 150
digestive system	2 500	1 200
other muscles	1 200	14 500
all other organs (except lungs)	1 423	1 420

Figure 10

Explain why there is a change in the rate of blood flow through the digestive system during exercise.

(2)

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(Total for question = 2 marks)

Q30.

After high intensity exercise, the pH of muscles can decrease from pH 7.0 to pH 6.3.

Explain this change in pH.

(2)

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(Total for question = 2 marks)

Q2.