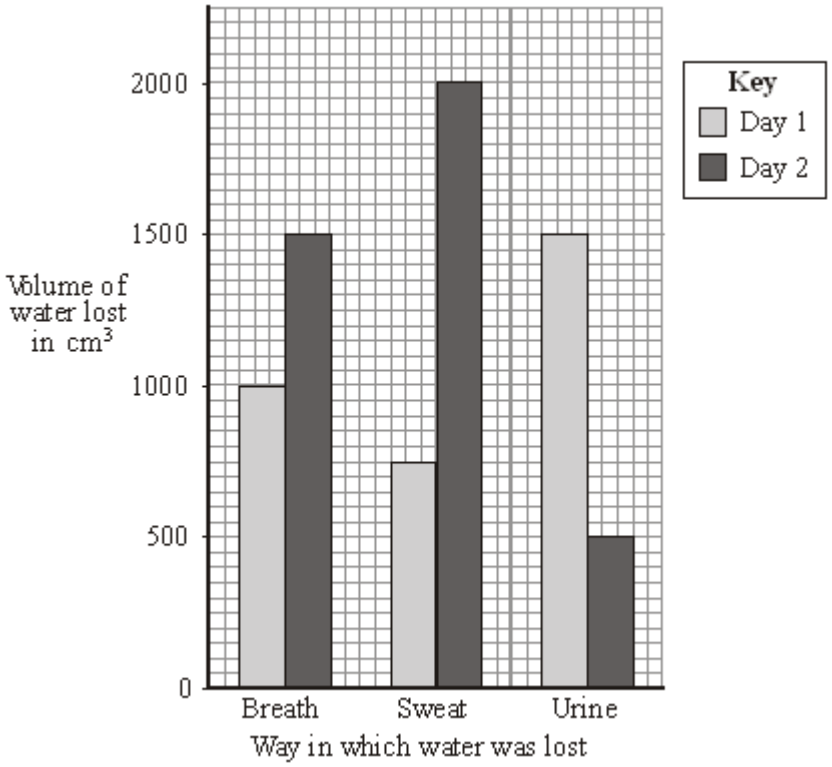
RESPIRATION (2nd PART)

Q1.

The bar chart shows the amount of water lost from the body of a student on two different days.

The student ate the same amount of food and drank the same amount of liquid on the two days. The temperature of the surroundings was similar on the two days.



(a) The total volume of water lost on day 1 was 3250 cm^3.

How much water was lost on day 2? Show all your working.

_____

_____ cm^3

(2)

(b) The student did much more exercise on one of the days than on the other.

On which day did he do more exercise? Day _____

Give **two** reasons for your answer.

1. _____

_____

2. _____

_____

(2)

(c) (i) Which **one** of these is a chemical reaction that produces water in the body?

Put a tick (✓) in the box next to your choice.

Breathing	☐
Osmosis	☐
Respiration	☐
Sweating	☐

(1)

(ii) How does sweating help the body?

_____

_____

(1)

(iii) If the body loses more water than it gains, it becomes dehydrated.
The concentration of the solution surrounding the body cells increases.
This causes the cells to lose water.

By which process do cells lose water?

Put a tick (✓) in the box next to your choice.

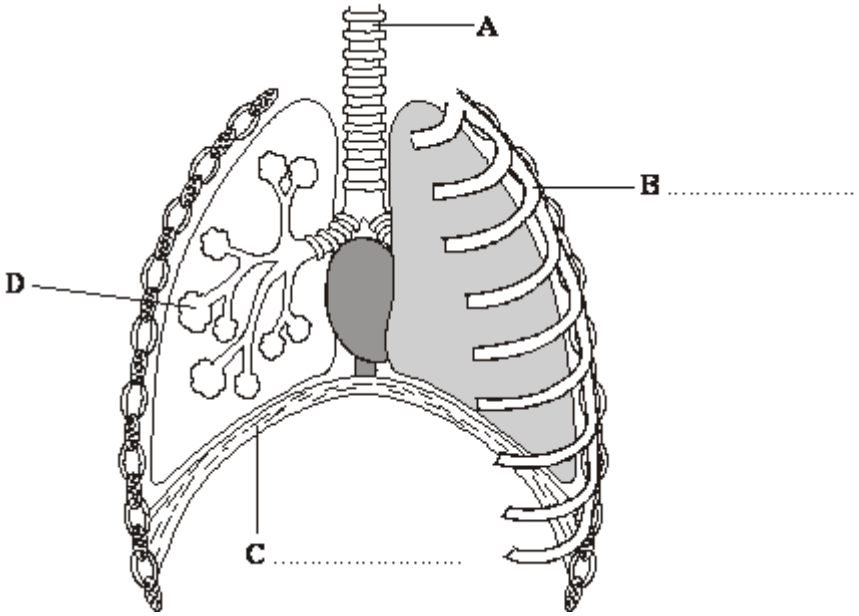
Breathing	☐
Osmosis	☐
Respiration	☐
Sweating	☐

(1)

(Total 7 marks)

Q2.

The diagram shows the human breathing system.



(a) On the diagram, label structures **B** and **C**.

Choose your answers from the list in the box.

alveoli	**diaphragm**	**rib**	**trachea**

(2)

(b) (i) Which letter, **A**, **B**, **C** or **D**, shows the site of gas exchange? _____

(1)

(ii) Which **one** of the following gases has a higher concentration in exhaled air than in inhaled air?

Draw a circle around **one** answer.

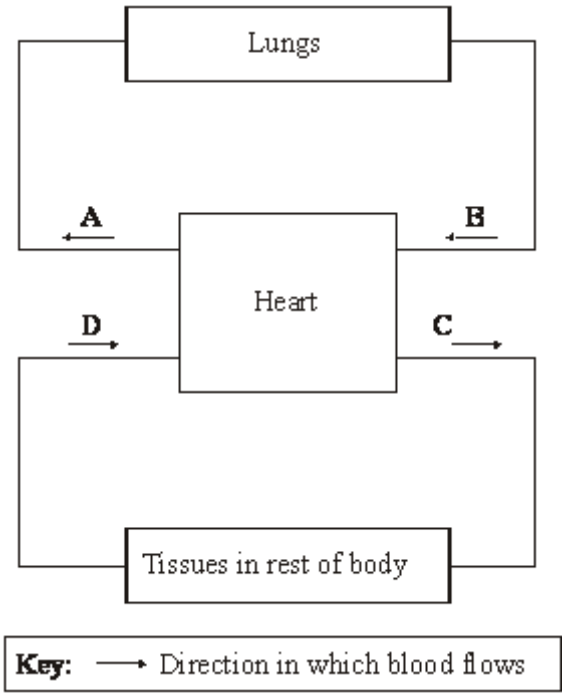
carbon dioxide **nitrogen** **oxygen**

(1)

(Total 4 marks)

Q3.

The diagram represents the human blood circulation system.



(a) **A**, **B**, **C** and **D** are blood vessels.

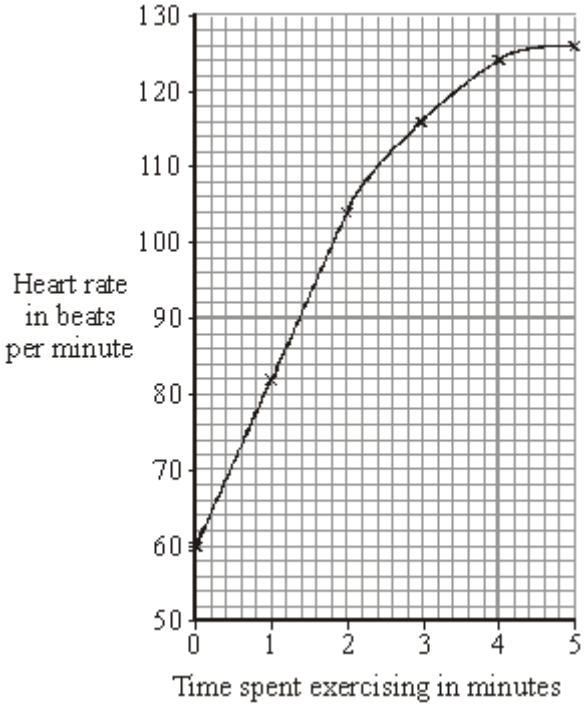
(i) Give the letter of **one** blood vessel that is an artery. _____

(1)

(ii) Give the letter of **one** blood vessel that is a vein. _____

(1)

(b) A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise. The results are shown in the graph.



(i) What was the student's heart rate before the exercise began?

_____ per minute

(1)

(ii) How long was it before the student's heart rate reached 124 beats per minute?

_____ minutes

(1)

(c) Which of the following parts of the blood carries most oxygen?

Draw a circle around **one** answer.

plasma **red blood cells** **white blood cells**

(1)

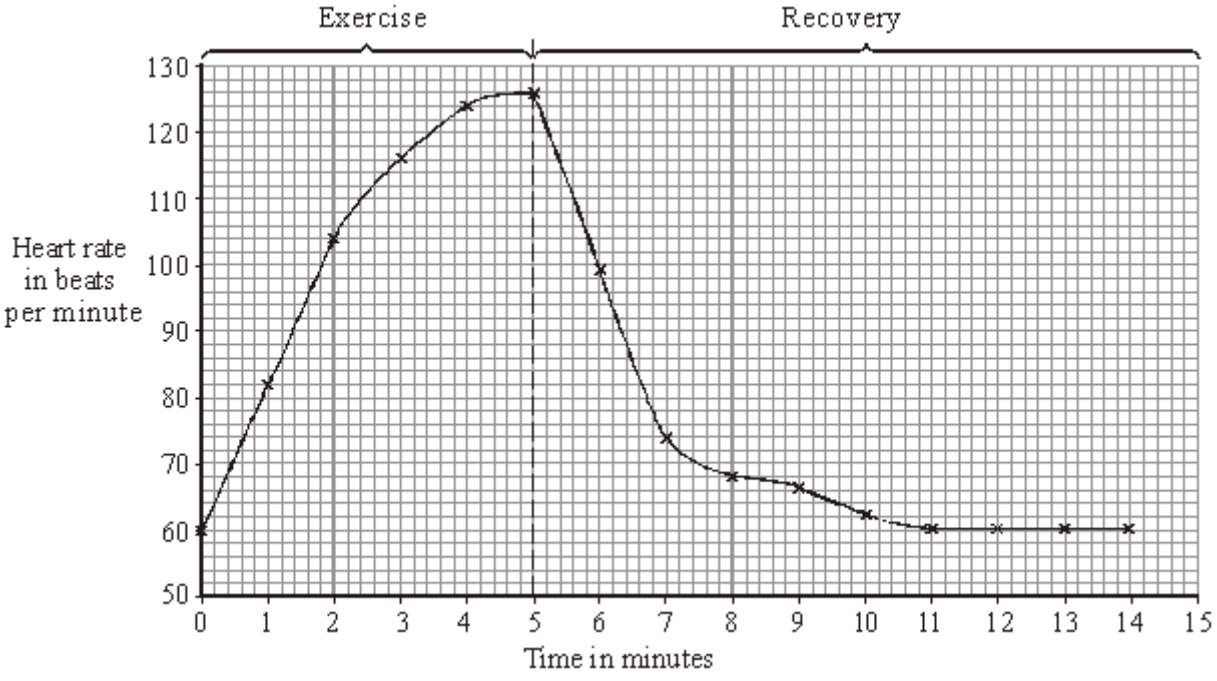
(Total 5 marks)

-

Q4.

A student pedalled an exercise cycle at constant speed for 5 minutes. The student's heart rate was recorded at one-minute intervals during the exercise and also during recovery.

The results are shown in the graph.



(a) Describe, in as much detail as you can, the changes in heart rate between 0 and 14 minutes.

_____

_____

_____

_____

(3)

(b) How do arteries supplying the leg muscles alter the rate of blood flow through them during exercise?

(1)

(c) Explain how an increase in heart rate helped the student during exercise.

(4)

(Total 8 marks)

Q5.

The table shows the amounts of energy used in running and in walking at different speeds by people of different body masses.

Activity	Energy used in kilojoules per hour			
	34 kg person	**50 kg person**	**70 kg person**	**90 kg person**
Running, 9 km per hour	1530	1850	2770	3700
Running, 11 km per hour	2140	2560	3860	5120
Running, 16 km per hour	2980	3570	5380	7140
Walking, 3 km per hour	530	670	1010	1340
Walking, 5 km per hour	740	880	1340	1760
Walking, 7 km per hour	1030	1240	1850	2480

(a) Describe **two** patterns you can see in the data.

1. _____

_____

2. _____

_____

(2)

(b) Our breathing rate is much higher when running than when walking.

Explain the advantage of this to the body.

_____

_____

_____

_____

_____

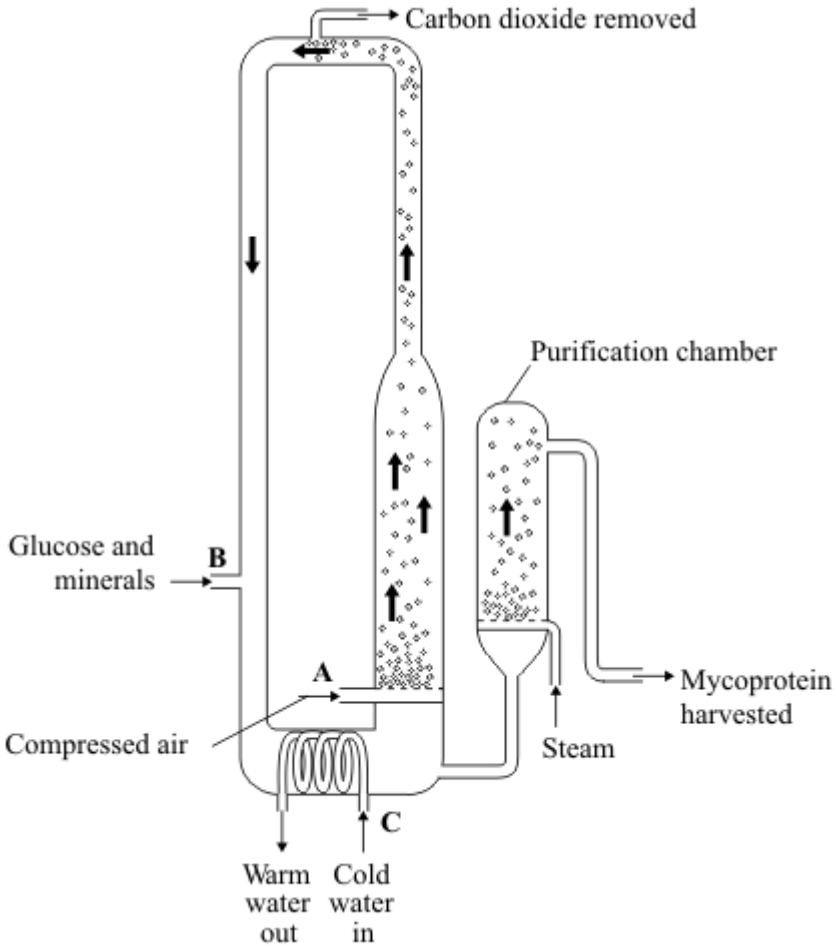
_____

(3)

(Total 5 marks)

Q6.

The diagram shows a fermenter. This fermenter is used for growing the fungus *Fusarium* which is used to make mycoprotein.



(a) Bubbles of air enter the fermenter at **A.**

Give **two** functions of the air bubbles.

1. _____

_____

2. _____

_____

(2)

(b) Glucose is added to the fermenter at **B.**

Explain why glucose is added.

_____

_____

(1)

(c) The fermenter is prevented from overheating by the cold water flowing in through the heat exchanger coils at **C.**

Explain what causes the fermenter to heat up.

_____

_____

(1)

(d) It is important to prevent microorganisms other than *Fusarium* from growing in the fermenter.

(i) Why is this important?

_____

_____

(1)

(ii) Suggest **two** ways in which contamination of the fermenter by microorganisms could be prevented.

1. _____

_____

2. _____

_____

(2)

(e) Human cells cannot make some of the amino acids which we need. We must obtain these amino acids from our diet.

The table shows the amounts of four of these amino acids present in mycoprotein, in beef and in wheat.

Name of amino acid	**Amount of amino acid per 100 g in mg**			**Daily amount needed by a 70 kg human in mg**
	Mycoprotein	**Beef**	**Wheat**	
Lysine	910	1600	300	840
Methionine	230	500	220	910
Phenylalanine	540	760	680	980
Threonine	610	840	370	490

A diet book states that mycoprotein is the best source of amino acids for the human diet.

Evaluate this statement.

Remember to include a conclusion in your evaluation.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 11 marks)

Q7.

A runner might drink a special 'sports drink' at intervals during a marathon race. The table shows the substances present in a sports drink.

Substance	Percentage
Water	
Sugar	5.0
Ions	0.2

(a) Complete the table to show the percentage of water in the sports drink.

(1)

(b) The runner sweats and also breathes heavily during the race.

(i) Why does the runner need to sweat?

_____

(1)

(ii) Which **two** substances in the table are lost from the body in sweat?

_____

(1)

(iii) Which substance in the table is lost from the body during breathing?

_____

(1)

(c) How does the sugar in the sports drink help the athlete during the marathon?

_____

_____

(2)

(Total 6 marks)

Q8.

Complete the table by writing the correct process next to its description.

Choose your answers from the list in the box

breathing	**diffusion**	**digestion**	**osmosis**	**respiration**

Description	Process
Moving air in and out of the lungs	
The movement of particles of a substance from high to low concentration	
The release of energy from glucose	

(Total 3 marks)

Q9.

Paula is training for a marathon. When she runs, her heart beats faster than it does when she is resting.

Complete the sentences, using words from the box.

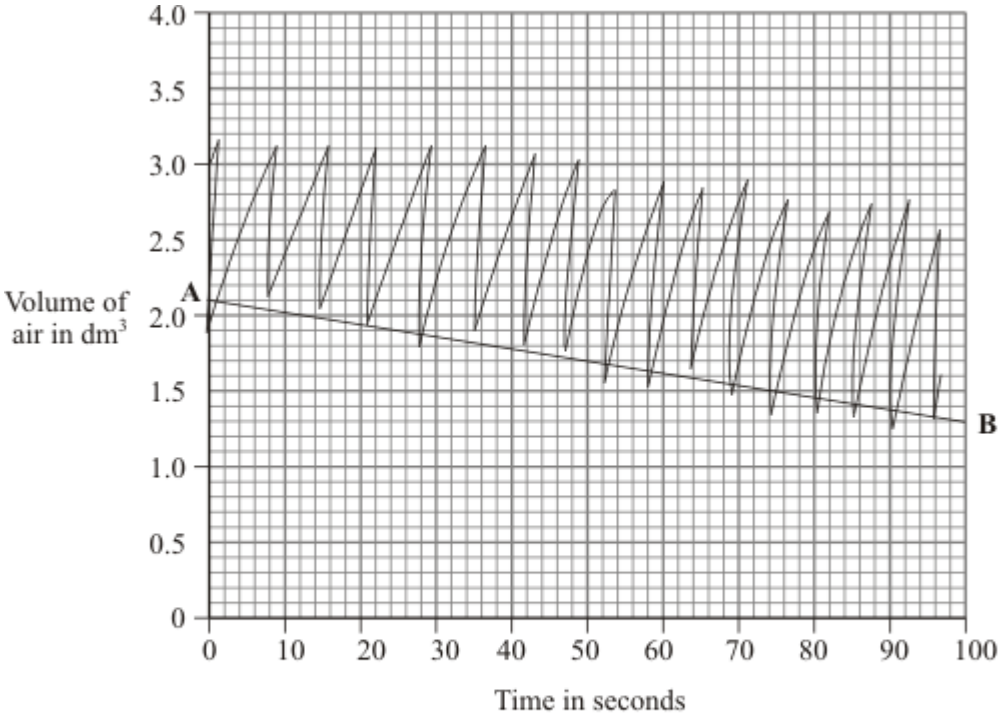
blood	**breathe**	**carbon dioxide**	**glucose**
heat	**nitrogen**	**oxygen**	**respire**

When she is running, Paula's muscle activity increases. To do this, her muscle cells _____ at a faster rate to give her more energy. Her muscles need to be supplied with _____ and _____ more quickly. Her heart beats faster to increase the flow of _____ which carries the products _____ and _____ away from her muscles.

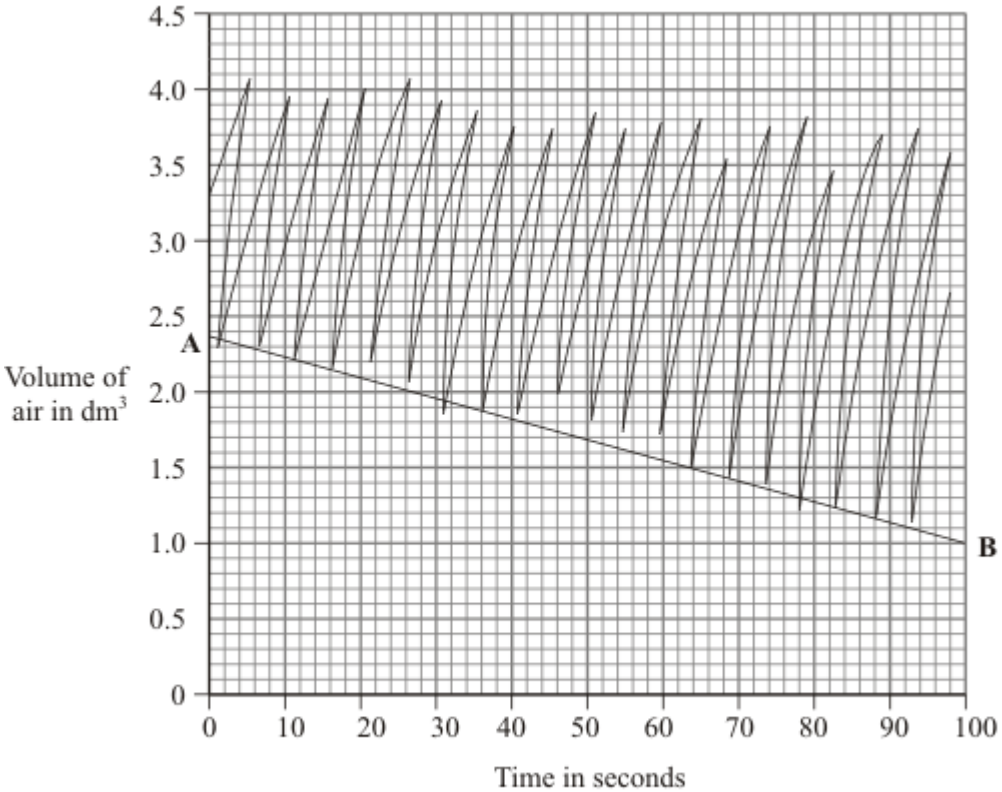
(Total 6 marks)

Q10.

A student's breathing was monitored before and after vigorous exercise. The student breathed in and out through a special apparatus. The graphs show the changes in the volume of air inside the apparatus. Each time the student breathed in, the line on the graph dropped. Each time the student breathed out, the line went up.



Before exercise



After exercise

(a) How many times did the student breathe in per minute:

before exercise; _____

after exercise? _____

(1)

(b) On each graph, the line **A** – **B** shows how much oxygen was used. The rate of oxygen use before exercise was 0.5 dm^3 per minute. Calculate the rate of oxygen use after exercise.

Rate of oxygen use after exercise = _____ dm^3 per minute

(2)

(c) The breathing rate and the amount of oxygen used were still higher after exercise, even though the student sat down to rest. Why were they still higher?

(4)

(Total 7 marks)

Q11.

Regular exercise is important, as it helps to maintain an efficient supply of blood to the muscles, the heart and the lungs. This is helped by an increase in the heart rate during exercise.

Explain why it is necessary for the heart rate to increase during exercise.

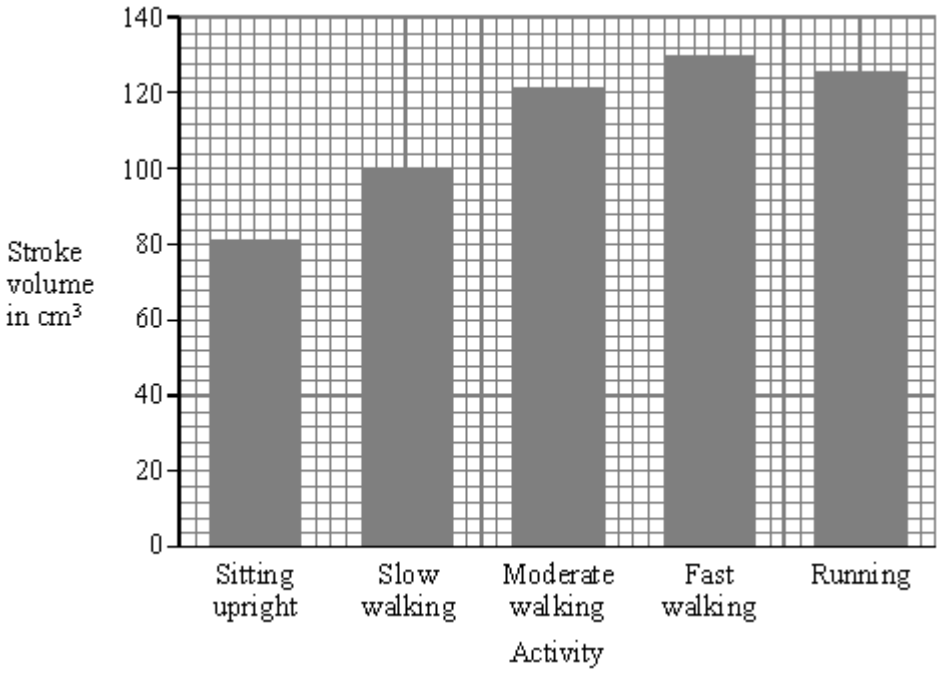
(Total 4 marks)

Q12.

A person did five different activities in turn. These activities needed increasing amounts of energy. For each activity two measurements were made. These were the rate of contraction of the left ventricle and its stroke volume (the volume of blood pumped at each beat). From these measurements the cardiac volume was calculated.

Some of these results are shown in the table and the bar chart.

Activity	Rate of contraction of left ventricle in beats per minute	Cardiac output in cm^3 per minute
Sitting upright	68	5 500
Slow walking		8 000
Moderate walking	98	12 000
Fast walking	130	17 500
Running	150	19 000



(a) (i) Describe how a person can count the rate of beating of the left ventricle.

_____

_____

(1)

(ii) Calculate the rate of ventricle contraction in beats per minute when the person was walking slowly. Show clearly how you work out your final answer.

_____

_____

_____

_____

Rate of ventricle contraction _____ beats per minute.

(2)

(iii) The pattern of results for stroke volume shows an anomalous result when the person is running. In what way is it anomalous?

_____

_____

(1)

(iv) There was a change in cardiac output when the person's movement changed from fast walking to running. How did the heart produce this change?

_____

_____

(1)

(b) Over a period of time, regular exercise can strengthen the heart muscle. This change in the heart muscle enables a person to run for longer before lactic acid build up occurs. Explain the reason for this.

_____

_____

_____

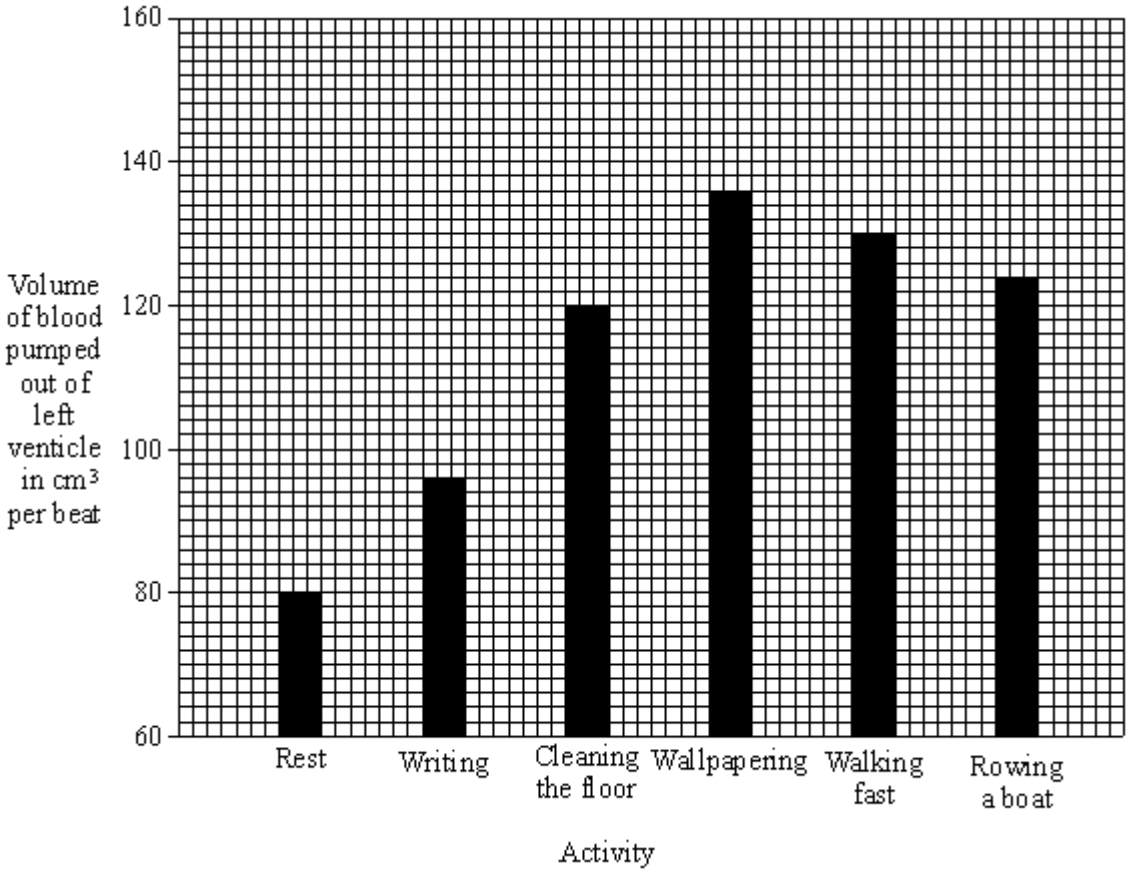
_____

(2)

(Total 7 marks)

Q13.

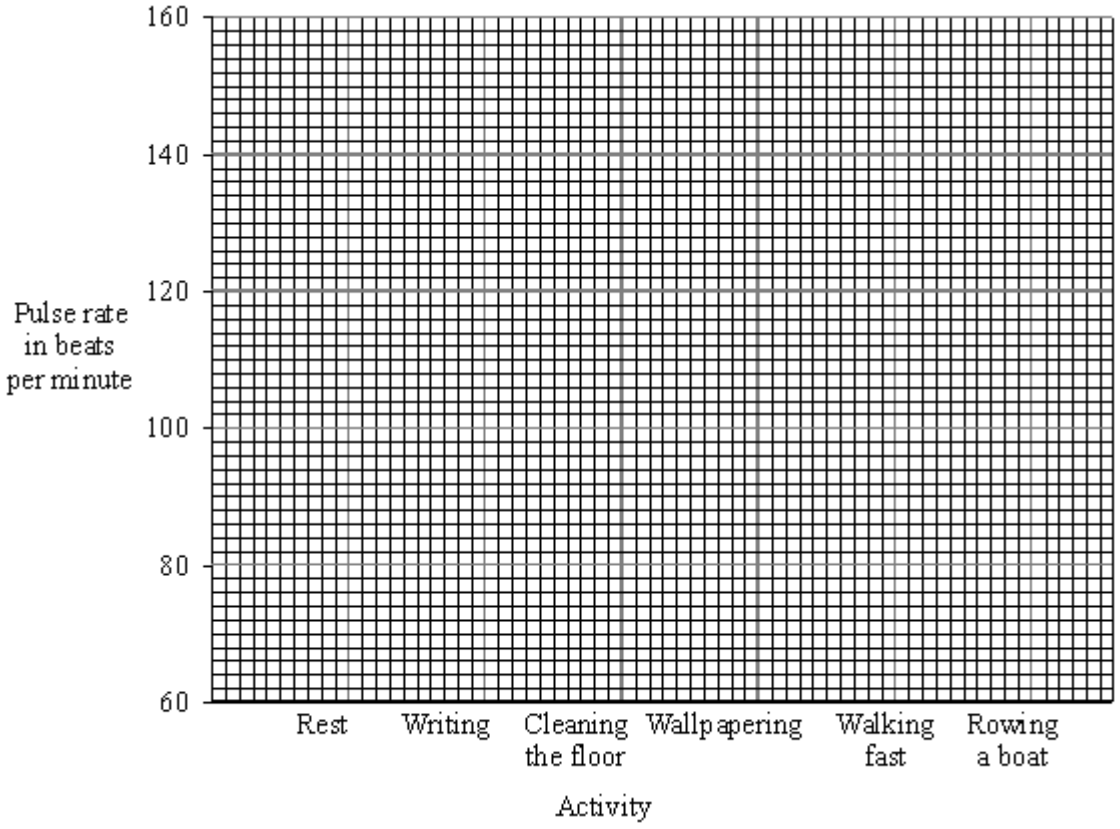
(a) The volume of blood pumped out of the left ventricle at each beat was measured for a person during six different activities. These activities showed an increasing energy demand, with rest requiring the least energy and rowing a boat the most. The results of these measurements are shown on the bar chart.



(i) The pulse rate was also measured for the person during the same activities. The table shows the results that were obtained.

Activity	Pulse rate in beats per minute
Rest	70
Writing	85
Cleaning the floor	100
Wallpapering	120
Walking fast	132
Rowing a boat	153

On the graph paper below draw a bar chart of the results obtained for the measurements of the pulse rate.



(2)

(ii) Undertaking activities with increasing energy demand has an effect on the volume of blood pumped from the left ventricle (per beat) and on the pulse rate. What do the bar charts show these effects to be? Use only information shown in the bar charts in your answer.

_____

_____

_____

(2)

(b) The pulse rate changed when the activity changed. Explain the reason for this.

_____

_____

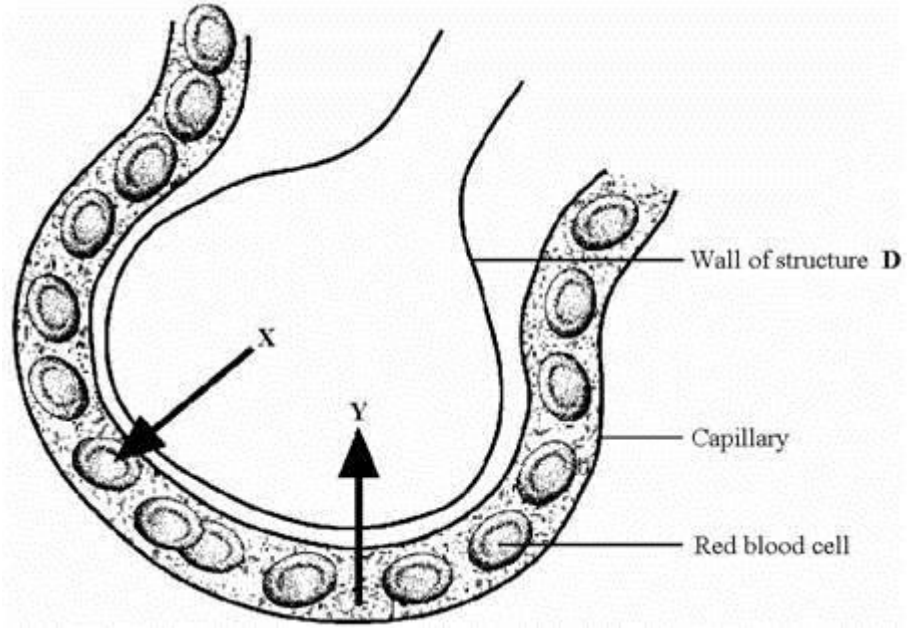
_____

(2)

(Total 6 marks)

Q14.

The diagram shows an enlargement of structure **D**.



The arrows show the direction of the gases exchanged in this structure. Name gas **X** and gas **Y**.

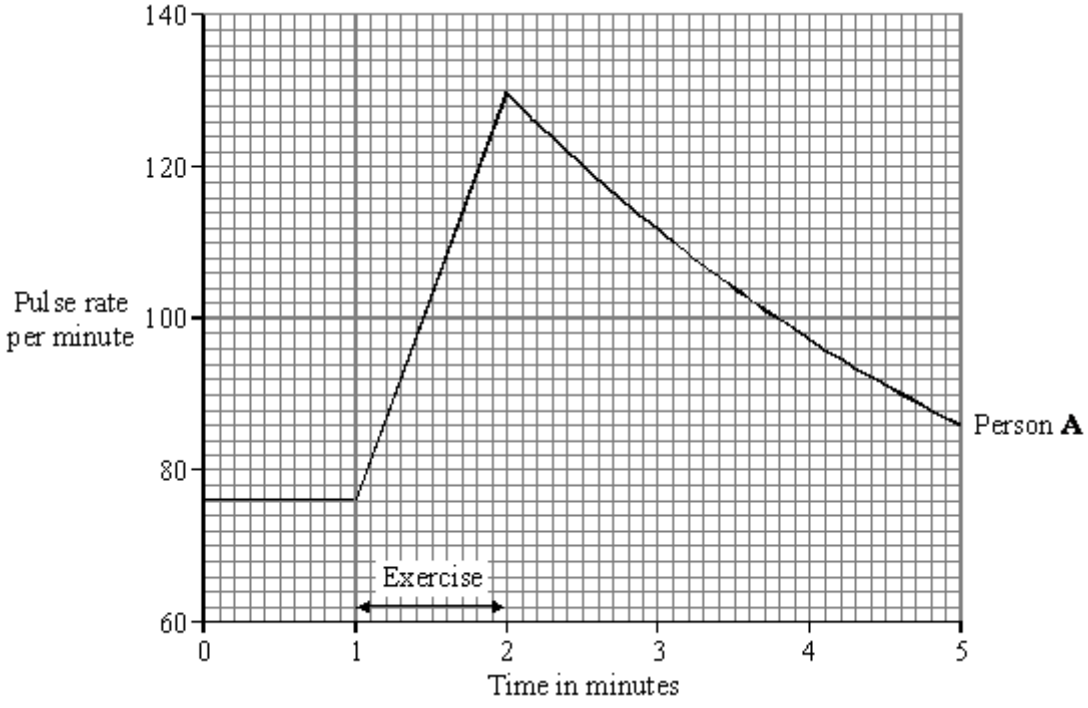
X _____

Y _____

(Total 2 marks)

Q15.

Person A and **Person B** measured their pulse rates over a period of five minutes. For one minute of this time they exercised by stepping on and off a box. At other times they sat still. The graph shows the results for **Person A**.



(i) What does the graph tell you about the changes in the pulse rate of **Person A** within the five minute period?

_____

_____

_____

_____

_____

(3)

(ii) What was the pulse rate of **Person A** at the end of the five minute period?

_____

(1)

(iii) The table shows the results obtained for **Person B**.

Time in minutes	**Pulse rate per minute**
0	68
1	68
2	110
3	96
4	80
5	68

Plot these results on the graph.

(2)

(Total 6 marks)

Q16.

(a) During respiration, sugar is oxidised to release energy. Complete the equation for respiration.

Sugar + _____ = _____ + _____ + energy

(3)

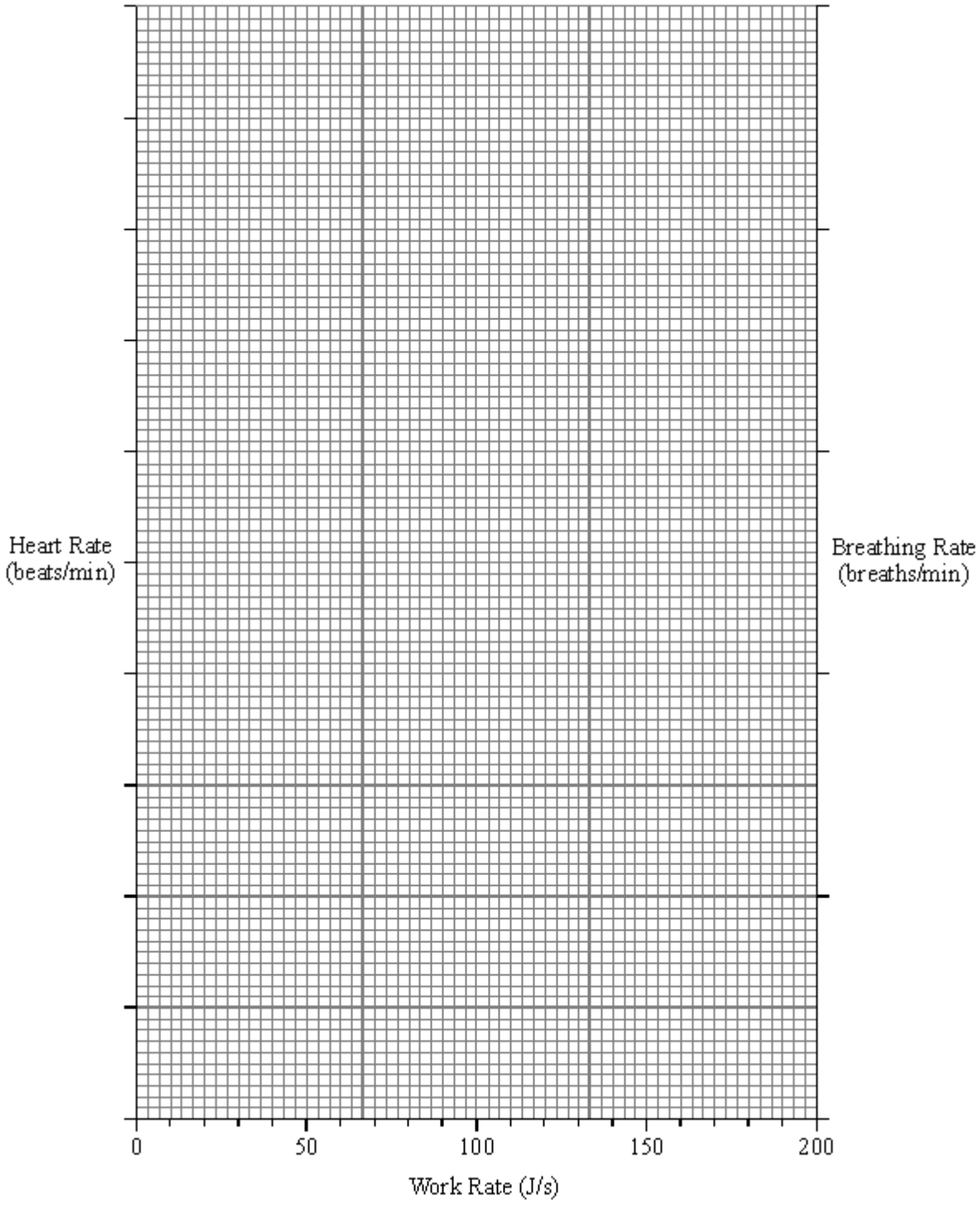
(b) The photograph below shows an athlete using an exercise machine. The machine can be adjusted to vary the rate at which the athlete is required to work.

The athlete's heart rate and breathing rate were measured at different work rates.

The table below shows the results which were obtained.

WORK RATE (J/s)	HEART RATE (beats/min.)	BREATHING RATE (breaths/min.)
0	86	9.6
60	106	10.0
80	112	10.4
100	122	10.4
120	135	11.4
140	143	14.5
160	156	15.8
200	174	30.5

Plot the data on the graph paper below.



(3)

(c) Explain, as fully as you can, the advantages to the body in the change in breathing and heart rates.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(d) This increase in the rate of heart-beat is a response to a stimulus. For this response suggest:

(i) the stimulus; _____

(ii) the co-ordinator; _____

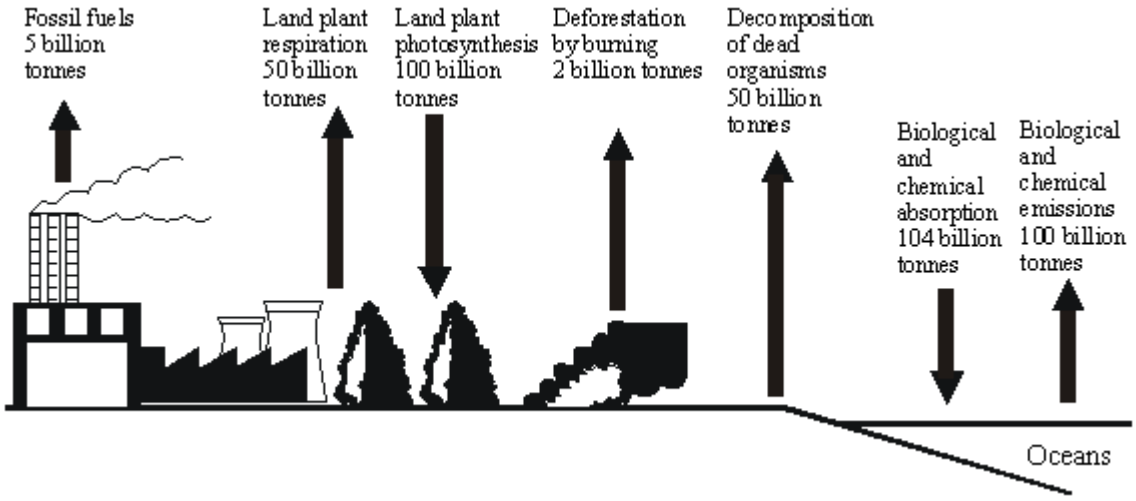
(iii) the effector. _____

(3)

(Total 15 marks)

Q17.

The diagram below shows the mass of carbon involved each year in some of the processes in the carbon cycle.



(a) Complete the equation for plant respiration.

	+	oxygen	→	carbon dioxide	+		+	energy

(2)

(b) (i) Calculate the mass of carbon removed from the atmosphere each year. *(Show your working.)*

Answer _____ billion tonnes

(1)

(ii) Calculate the percentage of this total which is removed by the photosynthesis of land plants. (*Show your working*.)

Answer _____ %

(2)

(iii) Calculate the net gain of carbon by the atmosphere in one year. *(Show your working.)*

Answer _____ billion tonnes

(2)

(Total 7 marks)

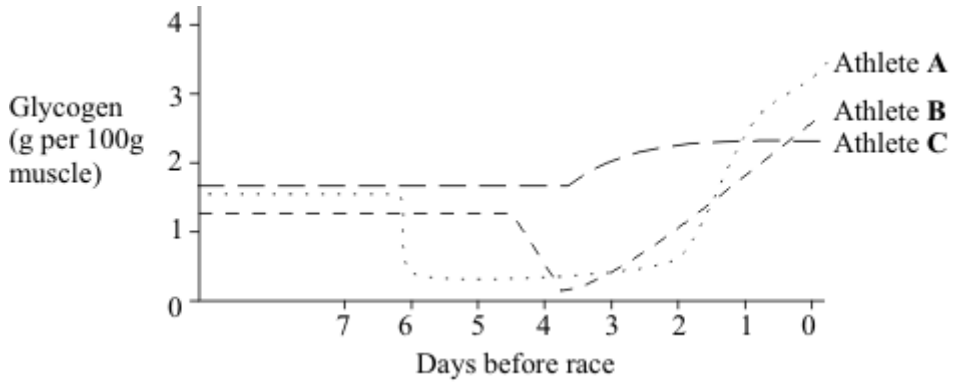
Q18.

Marathon runners are recommended to have a high carbohydrate diet prior to a race. Three athletes tried out three dietary regimes prior to a marathon race.

These three dietry regimes were as follows.

Athlete A	Up to 7 days before the race	-	Normal mixed diet
	7 days before the race	-	Prolonged extreme physical activity
	6-3 days before the race	-	Protein and fat diet; no carbohydrate
	2 and 1 days before the race	-	Large carbohydrate intake
Athlete B	Up to 5 days before race	-	Normal mixed diet
	5 days before the race	-	Prolonged extreme physical activity
	4-1 days before the race	-	Large carbohydrate intake
Athlete C	Up to 4 days before the race	-	Normal mixed diet
	4-1 days before the race	-	Large carbohydrate intake

The graph below shows the effect of each of these dietary regimes on glycogen levels in the athletes' muscles



(a) (i) What is the immediate effect of extreme physical activity on the glycogen content of muscles?

_____

_____

(1)

(ii) Describe how this effect occurs.

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(b) (i) Evaluate the three regimes as preparation for a marathon race.

_____

_____

_____

_____

_____

_____

(3)

(ii) Suggest a possible explanation for the different effects of the three regimes.

_____

_____

_____

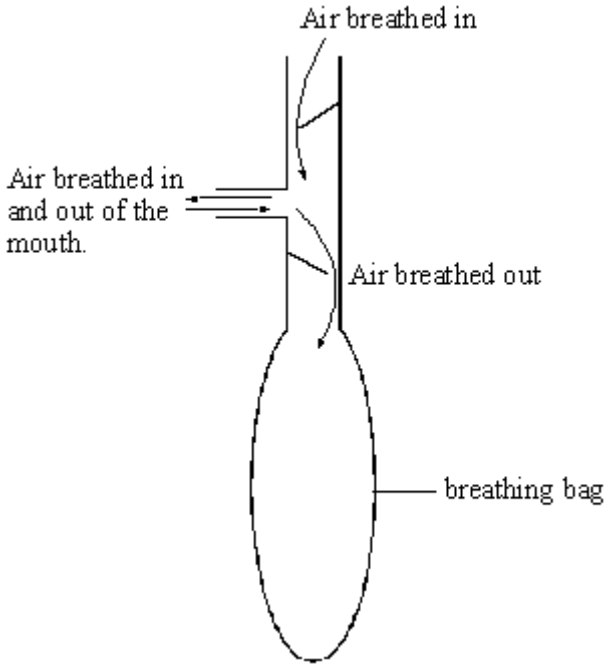
_____

(2)

(Total 9 marks)

Q19.

A student breathed out into an empty breathing bag five times.



After breathing out five times the volume of air in the bag was measured. The volume was 3000 cm^3.

(a) Complete the following sentences.

The air the student breathed in would contain more _____ than the air the student breathed out.

The air the student breathed out would contain more _____ than the air the student breathed in.

(2)

(b) The student then did some exercise for two minutes. The volume breathed out in five breaths was again measured. This time there was 9000 cm^3 of air in the bag.

What does this tell you about the effect of exercise on breathing?

_____

_____

(1)

(c) (i) Name the chemical process that releases energy when it takes place in the cells of the body.

_____

(1)

(ii) Name the substances produced by this process.

_____ and _____

(2)

(iii) Explain as fully as you can why this process has to take place more rapidly during exercise.

_____

_____

_____

_____

(2)

(Total 8 marks)

Q20.

(a) Explain, as fully as you can, why respiration has to take place more rapidly during exercise.

_____

_____

_____

(2)

(b) During exercise the process of respiration produces excess heat. Explain how the body prevents this heat from causing a rise in the core (deep) body temperature.

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 6 marks)

Q21.

In an investigation four groups of athletes were studied. The maximum rate of oxygen consumption for each athlete was measured and the mean for each group was calculated. The athletes then ran 10 mile races and the mean of the best times was calculated for

each group. The results are shown in the table below.

GROUP OF ATHLETES	MAXIMUM RATE OF OXYGEN CONSUMPTION (cm^3 per kg per min)	BEST TIME IN 10 MILE RACE (minutes)
A	78.6	48.9
B	67.5	55.1
C	63.0	58.7
D	57.4	64.6

(i) What is the relationship between maximum rate of oxygen consumption and time for a 10 mile race?

_____

_____

(1)

(ii) Suggest an explanation for this relationship.

_____

_____

_____

_____

_____

_____

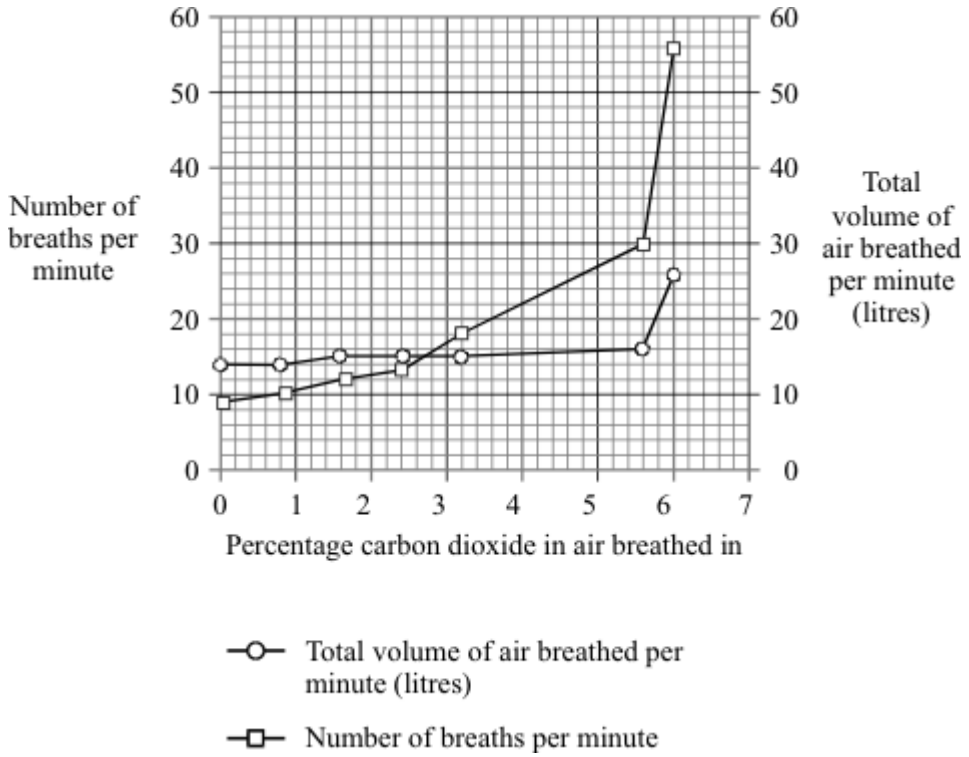
(3)

(Total 4 marks)

Q22.

The graph shows the effect of increasing the carbon dioxide content of the inhaled air on:

- the number of breaths per minute;
- the total volume of air breathed per minute.



(i) Describe the effect of increasing the percentage of carbon dioxide in the inhaled air on the total volume of air breathed.

_____

_____

_____

_____

(2)

(ii) Suggest why the total volume of inhaled air is **not** directly proportional to the number of breaths per minute.

_____

_____

_____

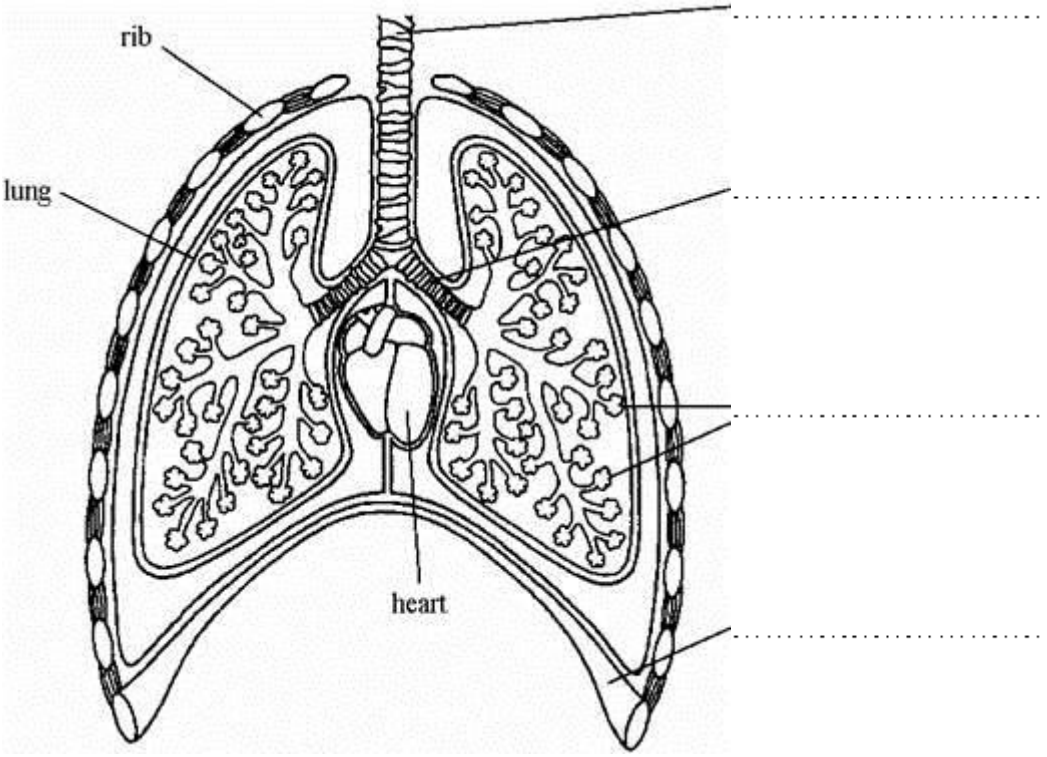
_____

(2)

(Total 4 marks)

Q23.

The diagram shows part of the breathing system in a human.



(a) Use words from the list to label the parts on the drawing.

alveoli **bronchiole** **bronchus** **diaphragm** **trachea (windpipe)**

(4)

(b) Where in the lungs does oxygen enter the blood?

_____

(1)

(c) Which process in cells produces carbon dioxide?

_____

(1)

(Total 6 marks)

Q24.

Read the passage.

Glutton up a gum tree

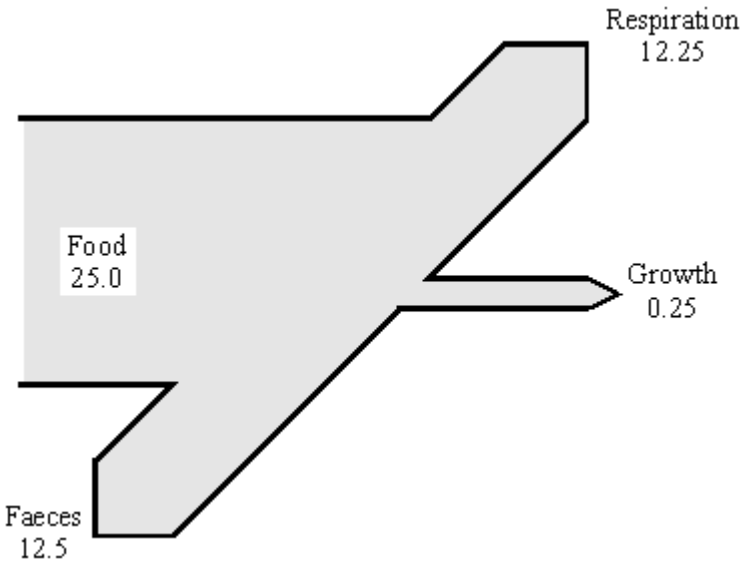
Along the banks of the Cygnet River on Kangaroo Island, the branches of the dying gum trees stretch out like accusing fingers. They have no leaves. Birds search in vain for nectar-bearing flowers.

The scene, repeated mile upon mile, is an ecological nightmare. But, for once, the culprit is not human. Instead, it is one of the most appealing mammals on the planet – the koala. If the trees are to survive and provide a food source for the wildlife such as koalas that depend on

them, more than 2000 koalas must die. If they are not removed the island's entire koala population will vanish.

Illegal killing has already started. Worried about soil erosion on the island, some farmers have gone for their guns. Why not catch 2000 koalas and take them to the mainland? "Almost impossible," says farmer Andrew Kelly. "Four rangers tried to catch some and in two days they got just six, and these fought, bit and scratched like fury."

The diagram shows the flow of energy through a koala.
The numbers show units of energy.



(i) Calculate the percentage of the food intake which is converted into new tissues for growth. Show your working.

_____ %

(2)

(ii) Give **three** different ways in which the koala uses the energy released in respiration.

1. _____

_____

2. _____

_____

3. _____

_____

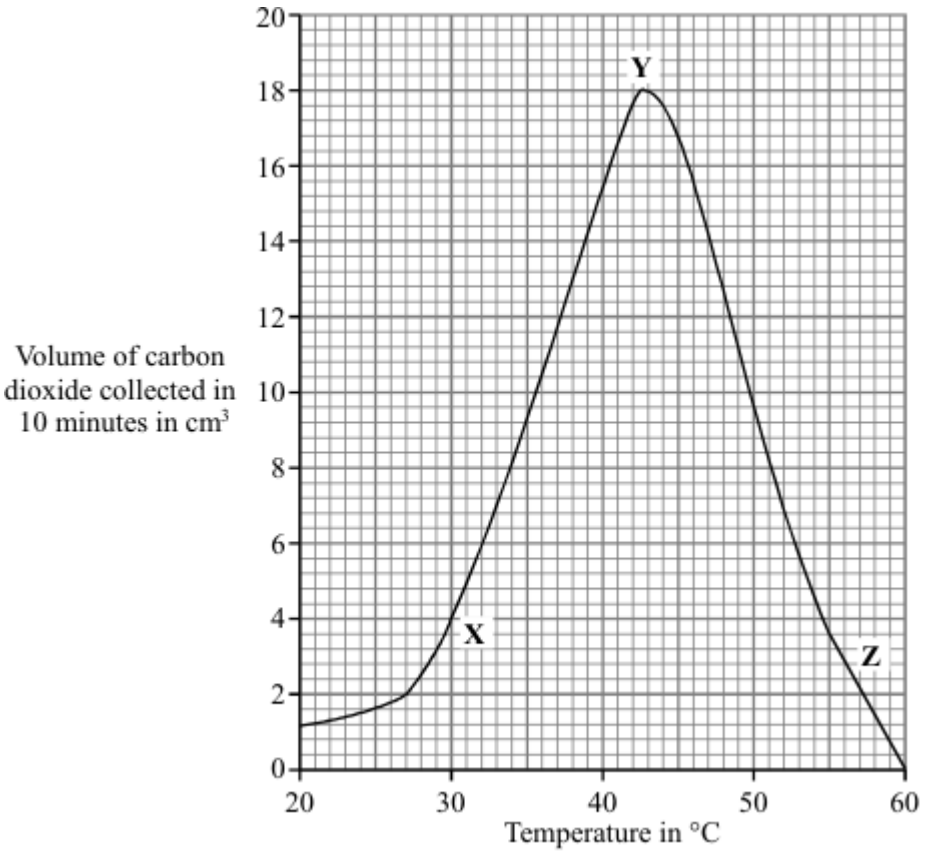
(3)

(Total 5 marks)

Q25.

Fermentation of sugar by yeast produces carbon dioxide.

The graph shows the effect of temperature on the production of carbon dioxide by fermentation.



(a) By how much did the volume of carbon dioxide collected change when the temperature was raised from 30°C to 40°C?

_____ cm^3

(1)

(b) Complete the sentences to explain the shape of the curve between **X** and **Y**.

Raising the temperature _____ the speed of the reacting particles.

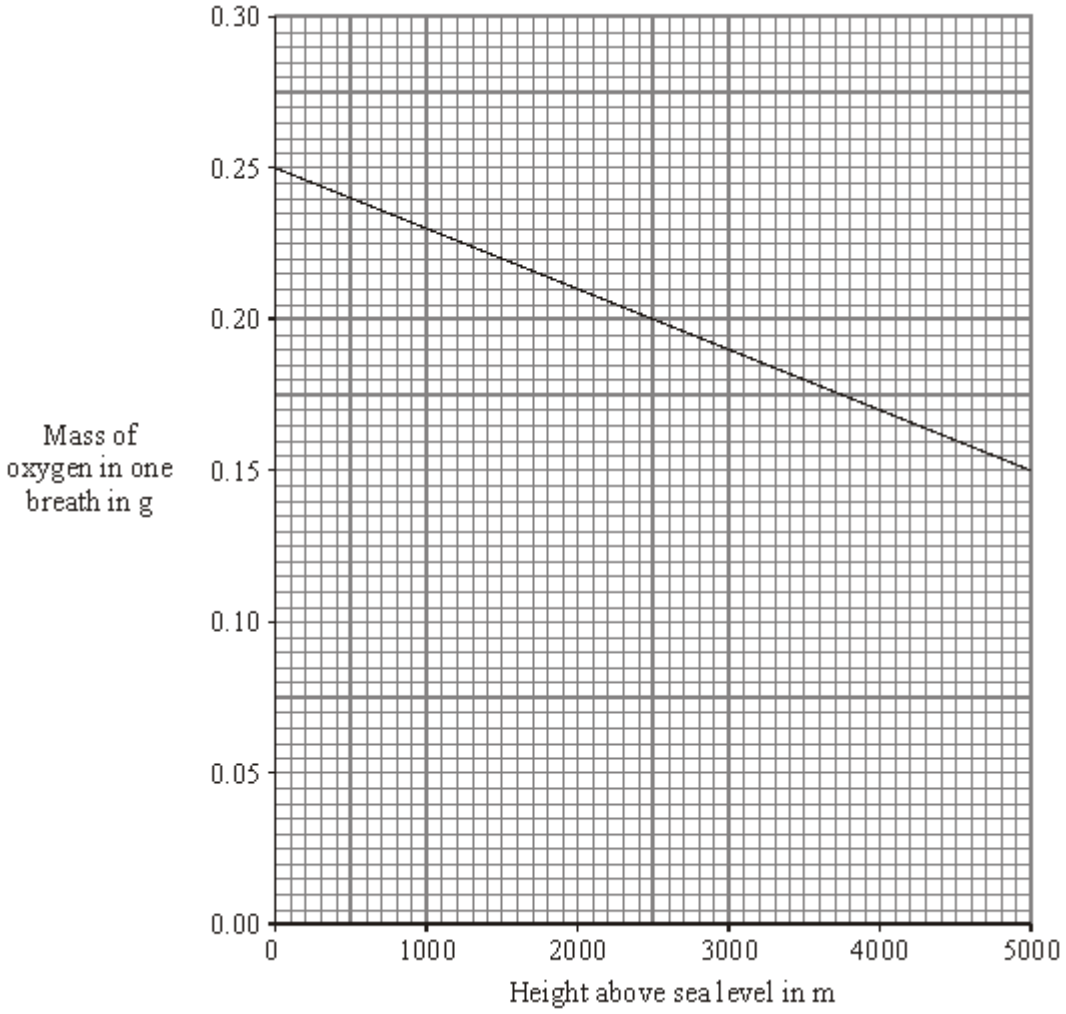
These particles collide more _____ and more _____ .

(3)

(Total 4 marks)

Q26.

(a) The graph shows how the mass of oxygen you breathe in changes as you climb up a mountain.



Describe, in as much detail as you can, how the mass of oxygen in one breath changes as you climb from sea level to 3000 m.

_____

_____

_____

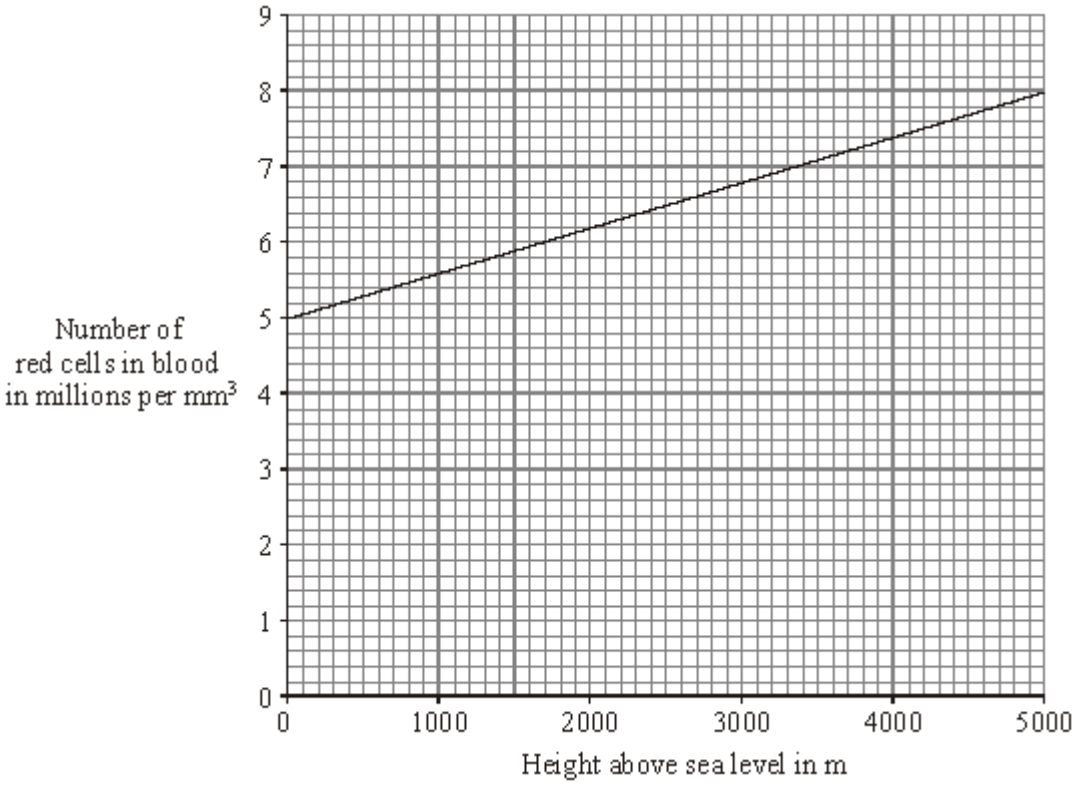
_____

_____

_____

(3)

(b) People who live high up in mountainous areas have more red blood cells than people who live at sea level. The graph below shows how the number of red blood cells changes with height above sea level.



(i) How many more red blood cells does a person living at 3000 m above sea level have than someone living at sea level? Show clearly how you work out your answer.

_____

_____

Increase in number of red blood cells = _____ millions per m^3

(2)

(ii) What is the advantage of having more red blood cells?

_____

_____

(1)

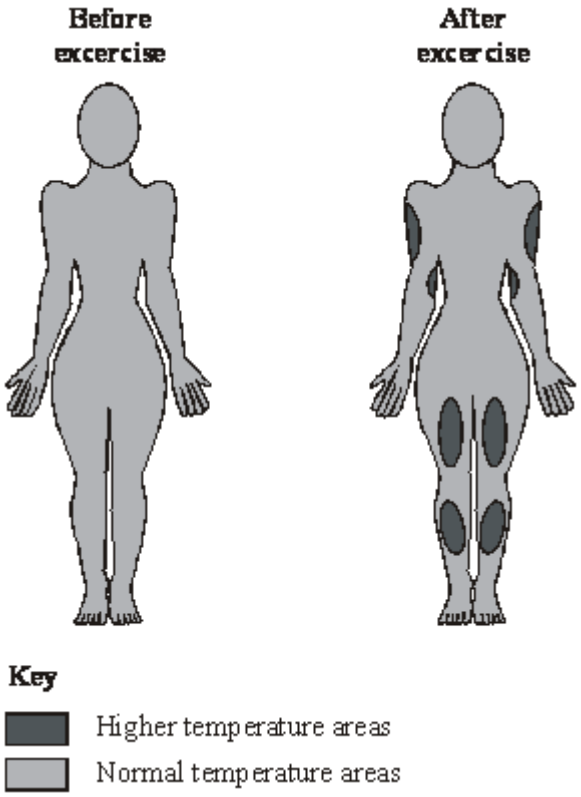
(Total 6 marks)

Q27.

The temperature at the surface of the skin can be measured by using a technique called thermography.

In this technique, areas with higher temperature appear as a different colour on the thermographs.

The drawings below show the results of an investigation in which thermographs were taken from a person before and after exercise.

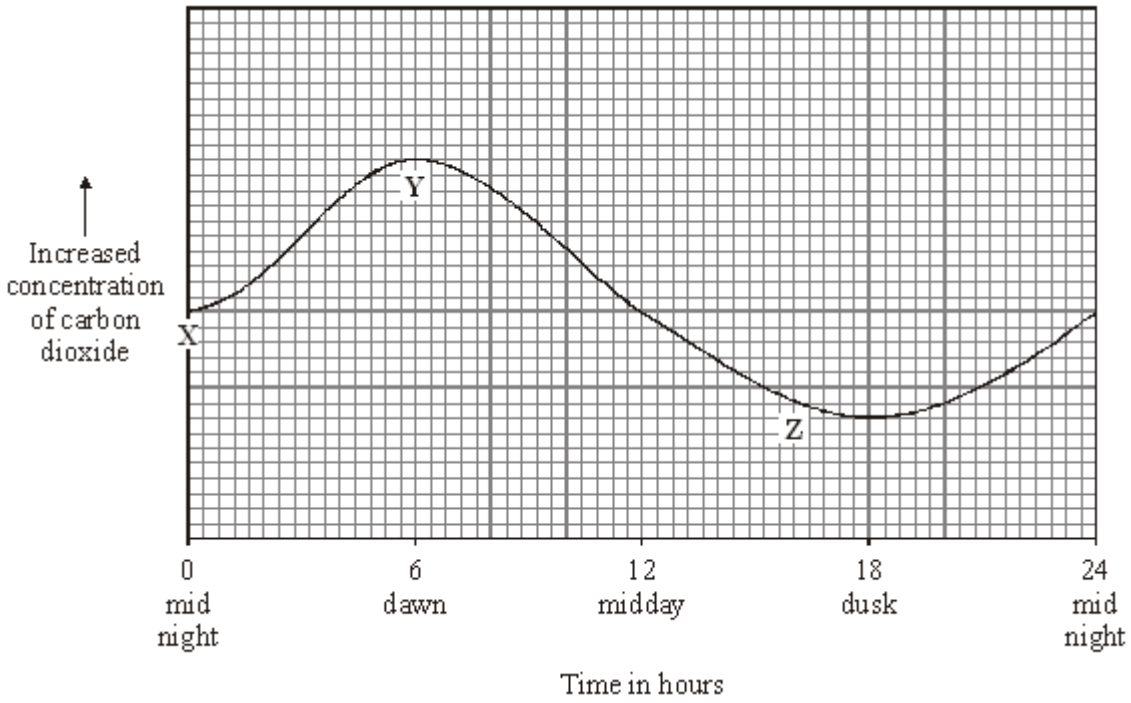


Describe and explain, as fully as you can, the effects of exercise on skin temperature.

(Total 3 marks)

Q28.

The graph shows the concentration of carbon dioxide in the air in a greenhouse full of tomato plants, measured over a period of 24 hours.



(a) Explain why the concentration of carbon dioxide in the air in the greenhouse increased between **X** and **Y**.

_____

_____

_____

_____

(2)

(b) Explain why the concentration of carbon dioxide in the air in the greenhouse decreased between **Y** and **Z**.

_____

_____

_____

_____

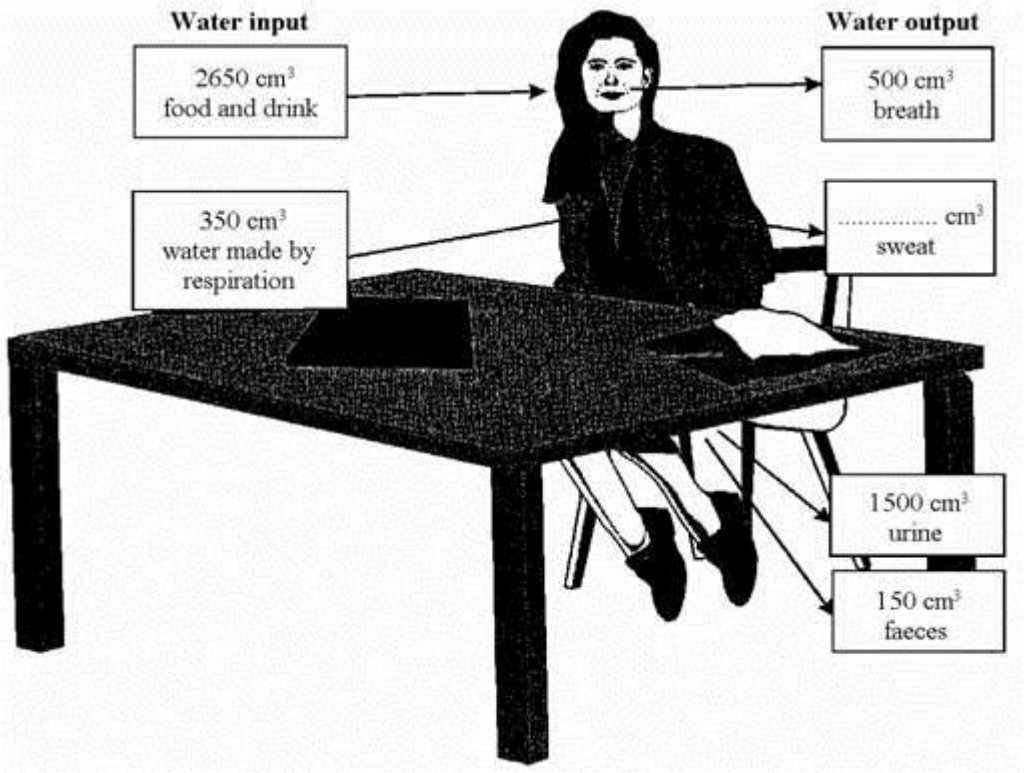
(2)

(Total 4 marks)

Q29.

The diagram shows a water balance for a girl who spends most of the day working at a desk. It is not complete.

(a) Complete the diagram by writing in the volume of sweat produced.



(1)

(b) The next day she spent much of the day training, doing many different types of exercise.

State how **each** of the following would change and why it would be different from the previous day.

(i) The amount of water given off as sweat.

_____

_____

_____

(2)

(ii) The amount of water breathed out.

_____

_____

_____

(2)

(iii) The amount of urine passed, if she had the same water intake as on the previous day.

_____

_____

_____

(2)

(c) Which organ controls the amount of water in the body?

_____

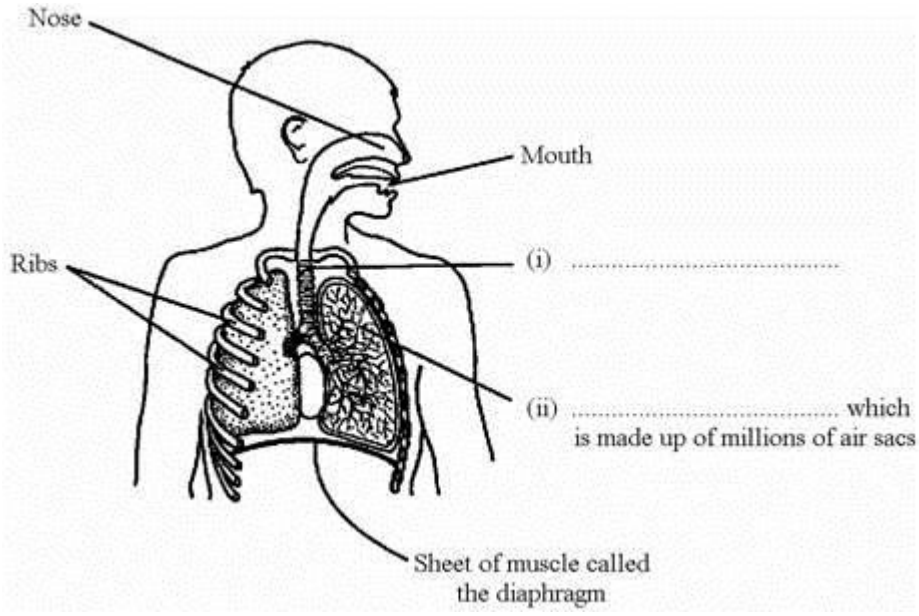
(1)

(Total 8 marks)

Q30.

The diagram shows the human breathing system.

(a) Complete the labels (i) and (ii).



(2)

(b) Complete the following sentence.

When we breathe out, the mixture of gases which leaves the air sacs contains

more _____ and **less** _____ than the mixture of

gases which enters the air sacs.

(2)

(Total 4 marks)

Q31.

(i) What is the name of the process which takes place in living cells in your body and which releases energy from oxygen and glucose?

_____

(1)

(ii) Name the **two** products of the process in part (i).

_____ and _____

(1)

(Total 2 marks)

Q32.

(a) (i) Complete the word equation for the process of aerobic respiration.

Glucose + _____ → carbon dioxide + water

(1)

(ii) Which organ removes carbon dioxide from your body?

_____

(1)

(b) Use names from the box to complete the **two** spaces in the passage.

carbon dioxide	lactic acid	nitrogen	oxygen	water

Anaerobic respiration can occur when an athlete does vigorous exercise.

This is because there is not enough _____ in the body.

The product of anaerobic respiration is _____ .

(2)

(Total 4 marks)

Q33.

Oxygen from our lungs is carried, by our blood, to cells in our body where aerobic respiration takes place.

(i) Complete the **two** spaces to balance the chemical reaction for aerobic respiration.

$$C_6H_{12}O_6 + 6O_2 \rightarrow \_\_\_\_ CO_2 + \_\_\_\_ H_2O$$

(1)

(ii) Name the substance with the formula $C_6H_{12}O_6$.

_____

(1)

(iii) Name the structures in the cytoplasm of our cells where aerobic respiration takes place.

_____

(1)

(Total 3 marks)

Q34.

A young athlete trains and this makes her heart work harder. The table shows part of her training record.

Time measured in weeks from the start of training	0	8	16	24	32	40
Resting pulse rate measured in pulses per minute	75	69	66	63	61	60

(i) Give **two** changes to her heart resulting from this training.

1. _____

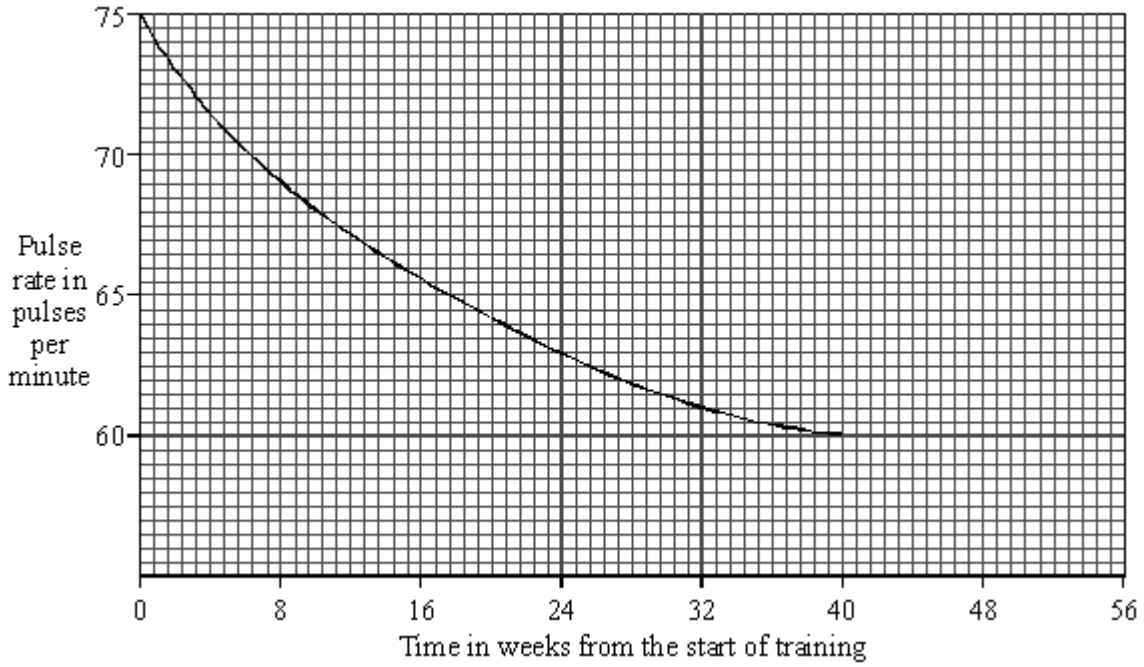
_____

2. _____

_____

(2)

(ii) The graph shows a smooth curve drawn to match the data from her training record.



Use the graph:

(A) to estimate her resting pulse rate, in pulses per minute, after 18 weeks of training;

_____

(1)

(B) to predict her resting pulse rate, in pulses per minute, if she continues her training until the end of the year.

_____

(1)

(Total 4 marks)

Q35.

(a) The air you breathe in and the air you breathe out are different.

Use the names of gases from this box to complete the **three** spaces.

argon	carbon dioxide	nitrogen	oxygen	water vapour

Compared to the air you breathe in, the air you breathe out contains:

- **more** _____

- **more** _____
- **less** _____

(3)

(b) The process of aerobic respiration takes place in your cells.

(i) Complete the space in the word equation for this process.

_____ + oxygen → carbon dioxide + water

(1)

(ii) Complete the space to give the main energy transfer which takes place in this process.

chemical energy → _____ energy

(1)

(iii) What is the name of the organ where oxygen from the air passes to your blood?

_____

(1)

(c) The athlete is taking part in vigorous exercise.

Complete the **two** spaces in the passage.

The cells in our muscles respire anaerobically during vigorous exercise. This results in _____ debt and the production of _____ acid.

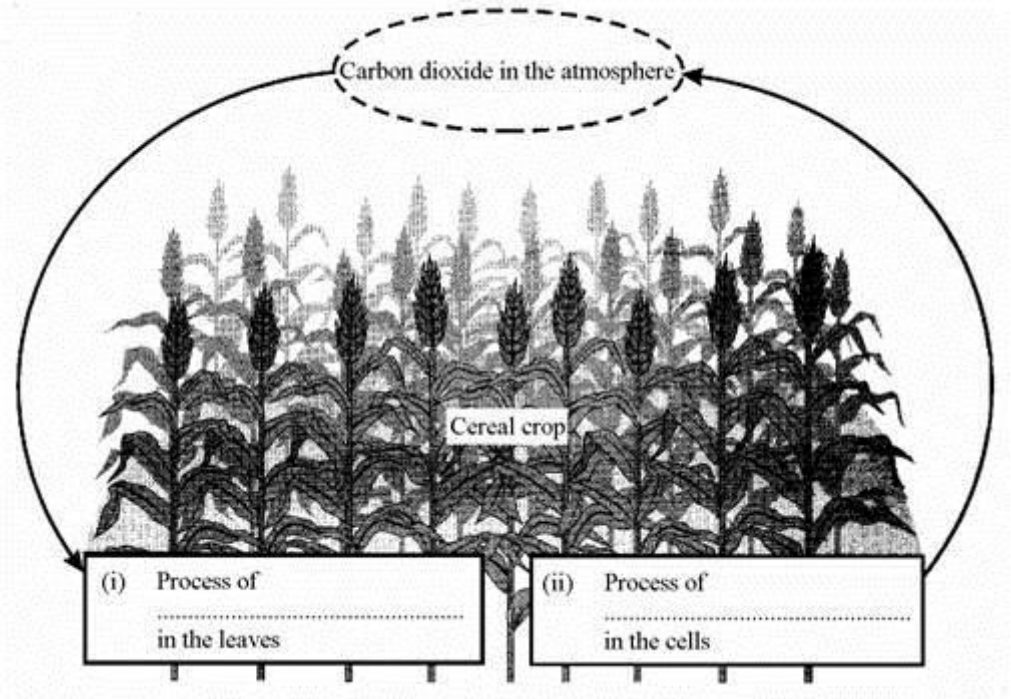
(2)

(Total 8 marks)

Q36.

(a) The diagram shows a cereal crop.

Complete spaces (i) and (ii).



(2)

(iii) What sort of weather may cause the cereal crop to wilt?

_____

(1)

(b) Describe the process of transpiration in plants.

_____

_____

_____

_____

_____

_____

(3)

(Total 6 marks)

Q37.

The man uses energy as he walks along. Energy is released in the cells in his body.

(i) What name is given to this process which occurs in his cells?

Circle the correct name.

circulation **reproduction** **respiration** **transpiration**

(1)

(ii) What gas is brought to his cells by the blood?

_____

(1)

(iii) What gas is released by his cells and carried away by the blood?

_____

(1)

(Total 3 marks)

Q38.

(a) Respiration is a process which takes place in living cells. What is the purpose of *respiration*?

_____

_____

(1)

(b) (i) Balance the equation for the process of respiration when oxygen is available.

$C_6H_{12}O_6$ + O_2 → CO_2 + H_2O

(1)

(ii) What is the name of the substance in the equation with the formula $C_6H_{12}O_6$?

_____

(1)

(c) Oxygen is absorbed through the alveoli in the lungs.

(i) How are the alveoli adapted for this function?

_____

_____

_____

(2)

(ii) Name the gas which is excreted through the alveoli.

_____

(1)

(d) (i) What is the name of the process of respiration when oxygen is **not** available?

_____

(1)

(ii) Describe the process of respiration which takes place in human beings when oxygen is **not** available and give an effect.

_____

_____

_____

_____

_____

_____

(3)

(Total 10 marks)

Q39.

Plants need chemical energy for respiration and for active transport.

(i) Write a balanced chemical equation which represents the process of respiration in plants.

_____

(2)

(ii) Describe the process of active transport in the root hair cells of plants.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3)

(Total 5 marks)

Q40.

The table shows the percentage of some gases in the air a boy breathed in and out.

Gases	Air breathed in	Air breathed out
carbon dioxide	0.04%	4.0%
oxigen	20.0%	16.0%
water vapour	1.0%	6.0%

(a) What happens in the lungs to change the levels of oxygen and carbon dioxide in this way?

Oxygen _____

_____

Carbon dioxide _____

(4)

(b) Compare the percentage of water vapour in the air breathed out with the percentage in air breathed in.

(2)

(Total 6 marks)

Q41.

Diagram 1 shows the main features of human blood circulation.

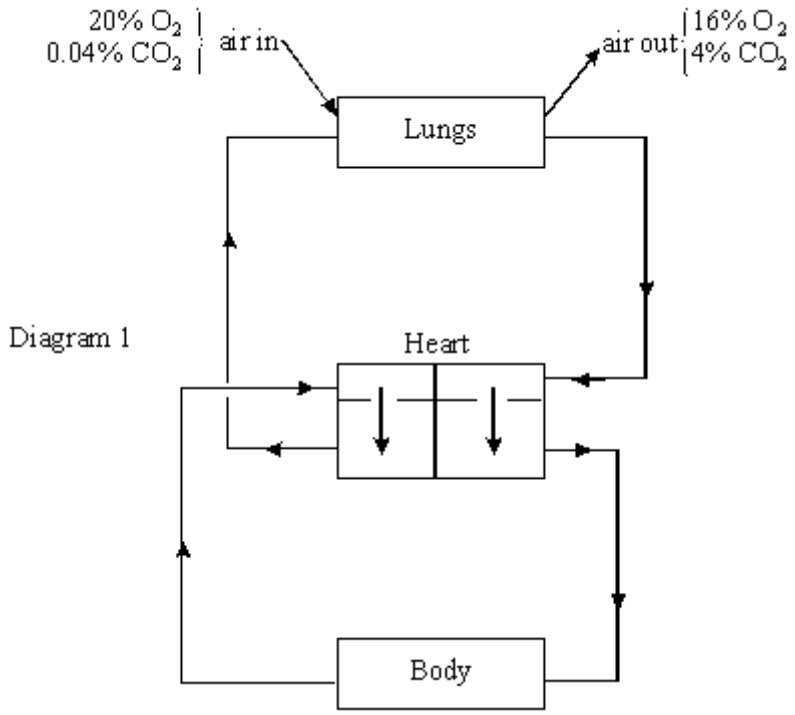
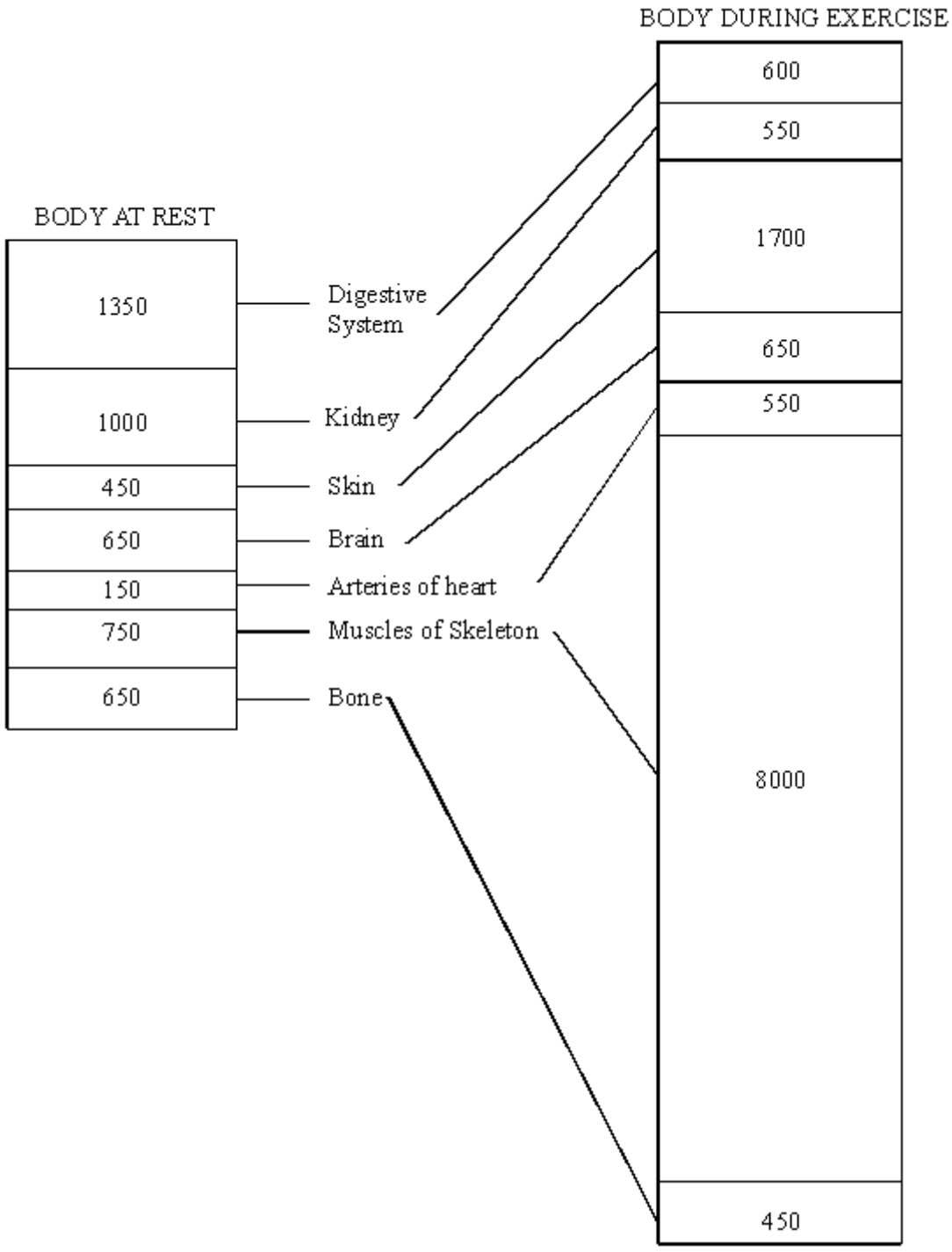


Diagram 1

(a) What changes in the composition of **blood** occur in the lungs?

(2)

Diagram 2 shows how the circulation of blood changes between rest and exercise.



Rate of supply of blood to parts of the body (cm^3/min) when at rest and during exercise.

(b) (i) Use the information from Diagram 2 to complete the table below.

Parts of the body to be included:

Digestive System

Skin

Brain

Arteries of Heart

Muscles of Skeleton

Bone

HOW BLOOD SUPPLY CHANGES DURING EXERCISE		
reduced	unchanged	increased
Kidney		

(4)

(ii) What happens to the rate of supply of blood to the whole body with exercise?

(You should make full use of the information provided.)

_____

_____

_____

(3)

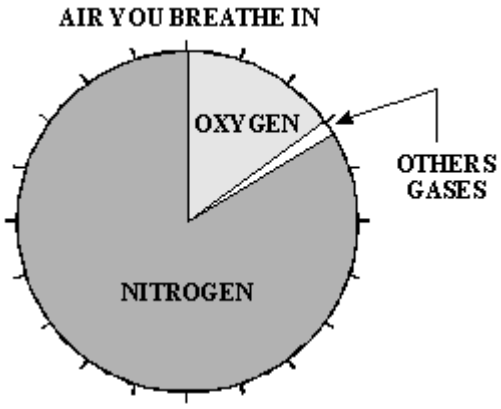
(Total 9 marks)

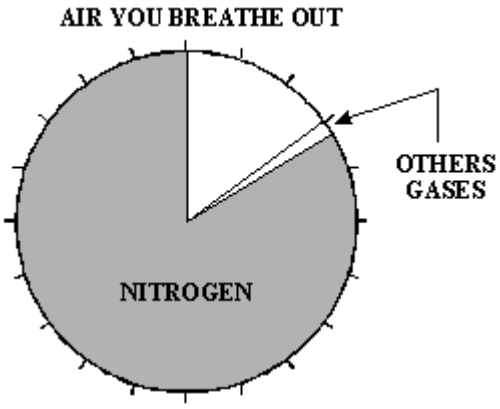
Q42.

(a) Breathed-out air is different from breathed-in air.

The two pie-charts show the percentages of different gases in each.

Complete the second pie-chart, using the information from the table.





This air contains less than 1% carbon dioxide. (Too little to show)

Gases in breathed–out air	
nitrogen	79%
oxygen	16%
carbon dioxide	4%
other gases	1%

(3)

(b) Use the information above to complete the following sentences.

The air you breathe out contains more _____ than the air you breathe in.

The air you breathe out contains less _____ than the air you breathe in.

(2)

(Total 5 marks)

Q43.

As they go higher up a mountain, mountaineers take less oxygen into their bodies with each breath.

This is shown in the table below.

	MILLIGRAMS OF OXYGEN TAKEN INTO **LUNGS** WITH EACH NORMAL BREATH	MILLIGRAMS OF OXYGEN TAKEN INTO **BLOOD** WITH EACH NORMAL BREATH
At bottom of	300	60

mountain		
At top of mountain	150	30

(a) At the top of the mountain, they only take half as much oxygen into their lungs with each breath as they did at the bottom.

How does this affect the amount of oxygen that gets into their blood with each breath?

_____

_____

(2)

(b) Why do the cells in the mountaineers' bodies need oxygen?

_____

_____

(1)

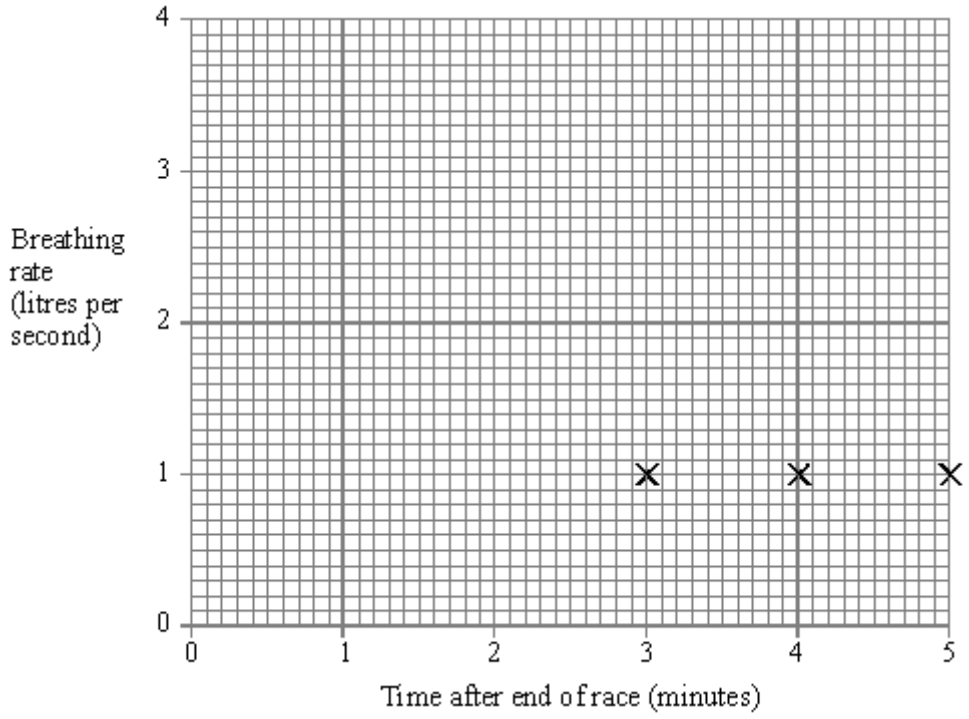
(Total 3 marks)

Q44.

(a) (i) The table shows an athlete's breathing rate after the end of a race.

The results can be put onto a graph.
Three of the points are already plotted.
Plot the other points shown in the table.
Then draw the graph.

Time after end of race (minutes)	Breathing rate (litres per second)
0	4
1	2
2	1
3	1
4	1
5	1



(4)

(ii) What is the athlete's breathing rate ½ (half) a minute after the end of the race?

_____

(2)

(b) One of the reasons for breathing is to get rid of carbon dioxide from your body. Choose words from the list to complete the sentences below about how your body does this.

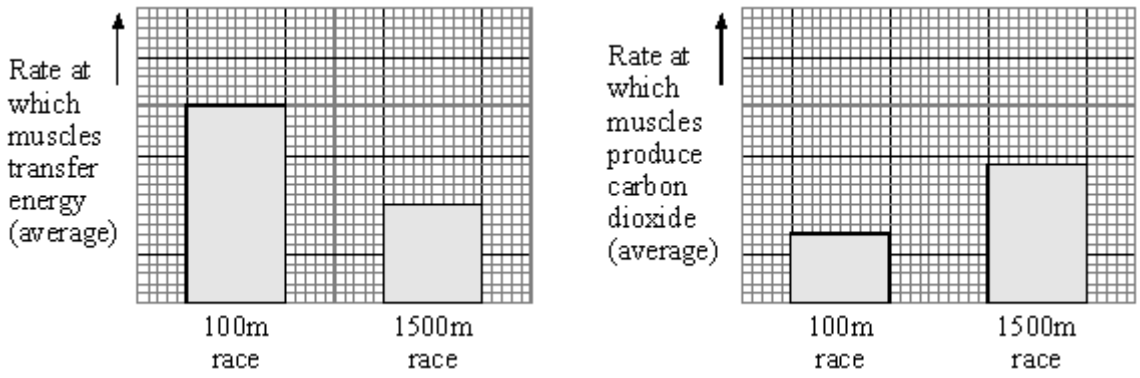
blood **heart** **kidneys** **lungs** **urine**

Carbon dioxide gets out of your body from your _____

The carbon dioxide is carried to this part of your body by your _____

(2)

(c) The bar charts show what happens in an athlete's muscles when running in two races of different distances.



(i) Compare what happens in the athlete's muscles when running in the two races.

_____

(3)

(ii) Use the information in the box to explain your answer to (i).

aerobic respiration	glucose + oxygen ⟶	carbon dioxide + water
anaerobic respiration	glucose ⟶	lactic acid

(2)

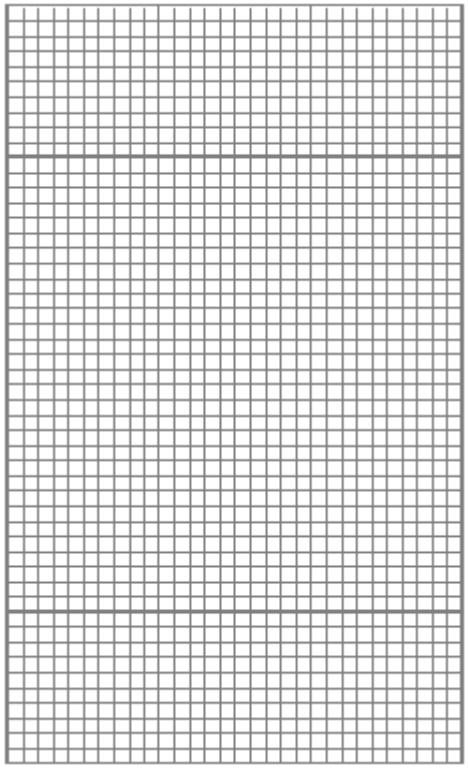
(Total 13 marks)

Q45.

(a) The table shows an athlete's breathing rate after the end of a race.

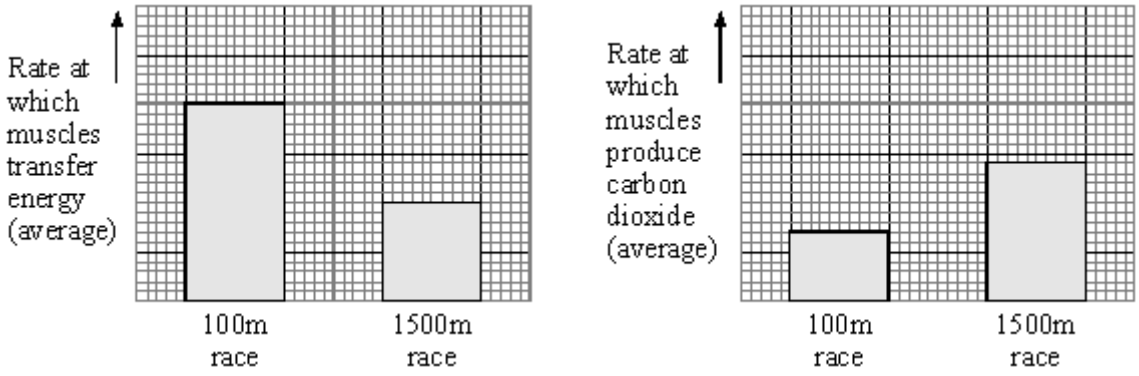
Use the information shown in the table to draw a line graph.

Time after end of race (minutes)	Breathing rate (litres per second)
0	4
1	2
2	1
3	1
4	1
5	1



(3)

(b) The bar charts show what happens in an athlete's muscles when running in two races of different distances.



(i) Compare what happens in the athlete's muscles when running in the two races.

_____

_____

(3)

(ii) Use the information in the box to explain your answer to (i).

aerobic respiration	glucose + oxygen ⟶	carbon dioxide + water
anaerobic respiration	glucose ⟶	lactic acid

_____

_____

(2)

(c) Explain why the athlete breathes at a faster rate than normal for two minutes after finishing a 100 metres race.

_____

_____

_____

(2)

(Total 10 marks)

0]