

- 1** (a) A food contains protein. Describe, in as much detail as you can, what happens to this protein after the food is swallowed.

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**(4)**

- (b) The table shows the activity of lipase on fat in three different conditions.

CONDITION	UNITS OF LIPASE ACTIVITY PER MINUTE
Lipase + acid solution	3.3
Lipase + weak alkaline solution	15.3
Lipase + bile	14.5

Explain, as fully as you can, the results shown in the table.

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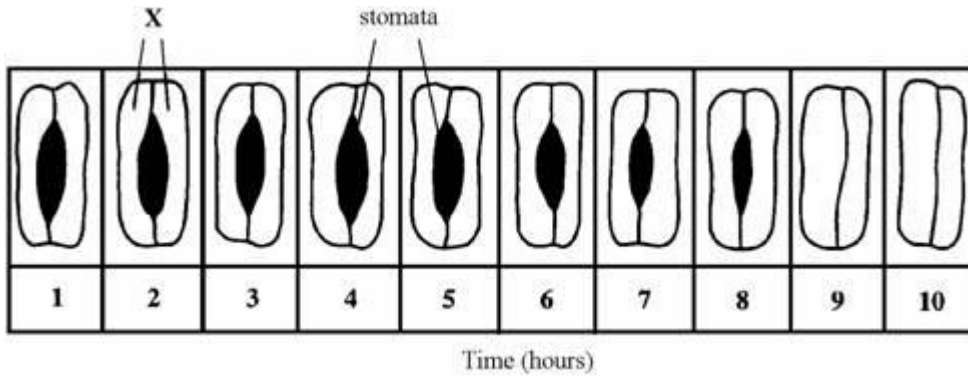
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**(3)**

**(Total 7 marks)**

2

A potted plant was left in a hot, brightly lit room for ten hours. The plant was not watered during this period. The drawings show how the mean width of stomata changed over the ten hour period.



(a) Why do plants need stomata?

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(1)

(b) Name the cells labelled **X** on the drawing.

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(1)

(c) The width of the stomata changed over the ten hour period. Explain the advantage to the plant of this change.

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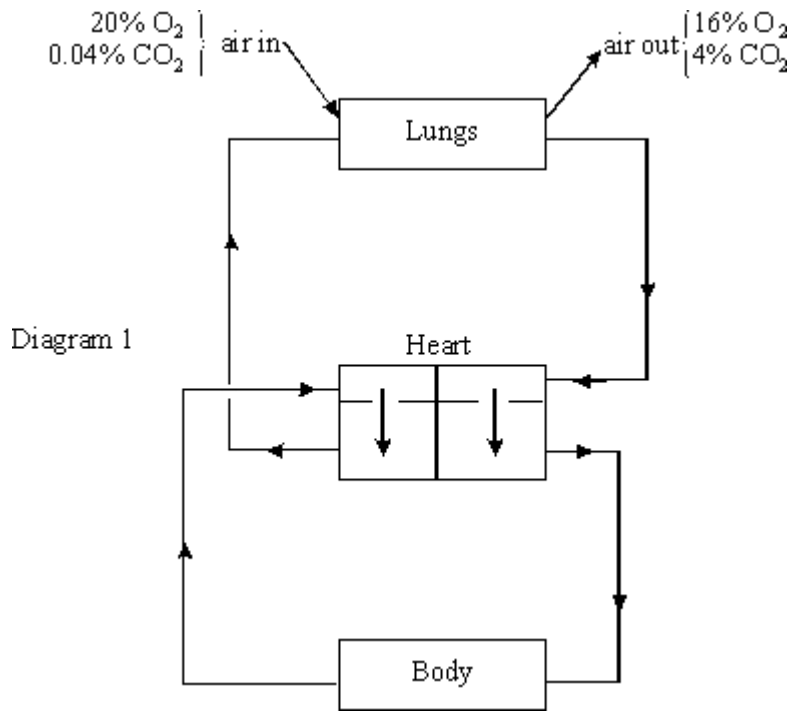
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(2)

(Total 4 marks)

3

Diagram 1 shows the main features of human blood circulation.



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

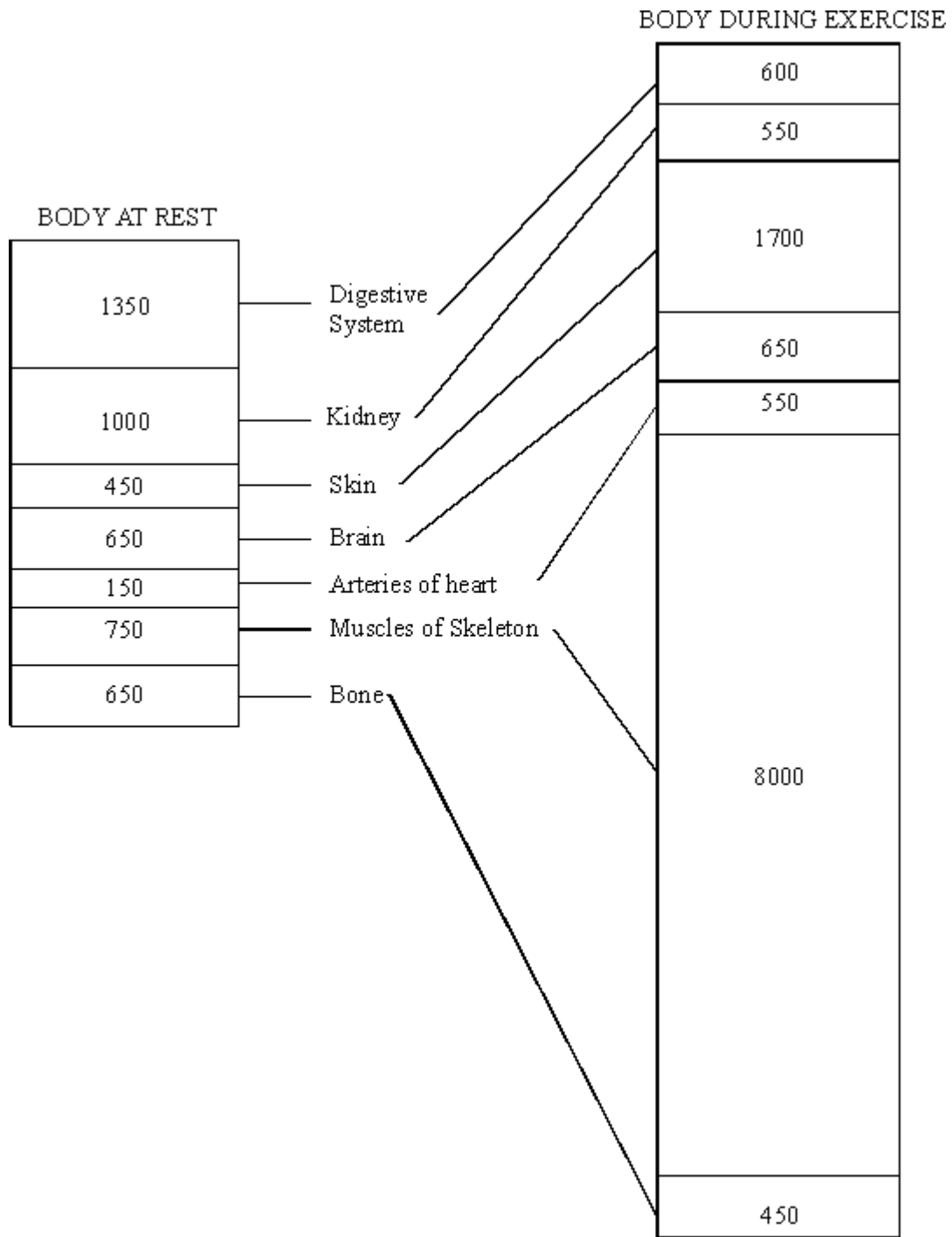
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(2)

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



Rate of supply of blood to parts of the body (cm<sup>3</sup>/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
<b>Kidney</b>		

(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.)

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(3)

(Total 9 marks)

**4** Describe the roles of the liver and the pancreas in the digestion of fats.

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(Total 5 marks)

**5** As they go higher up a mountain, mountaineers take less oxygen into their bodies with each breath, as shown in the table below.

HEIGHT	MILLIGRAMS OF OXYGEN TAKEN INTO <b>LUNGS</b> WITH EACH NORMAL BREATH	MILLIGRAMS OF OXYGEN INTO <b>BLOOD</b> WITH EACH NORMAL BREATH	
		AT FIRST	AFTER STAYING AT 4500 METRES FOR TWO WEEKS
sea-level	300	60	90
1500 metres	250	50	
3000 metres	200	40	
4500 metres	150	30	45

(a) (i) How does the amount of oxygen taken into the blood with each breath vary with the amount of oxygen breathed into the lungs with each breath?

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(2)

(ii) Use the idea of diffusion to explain why the amount of oxygen taken into the blood varies in this way.

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(1)

(b) (i) How does staying at an altitude of 4500 metres for two weeks affect the mountaineers?

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(2)

(ii) Suggest an explanation for this.

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\_\_\_\_\_

(1)

(iii) Add the two missing figures to the right-hand column of the table.

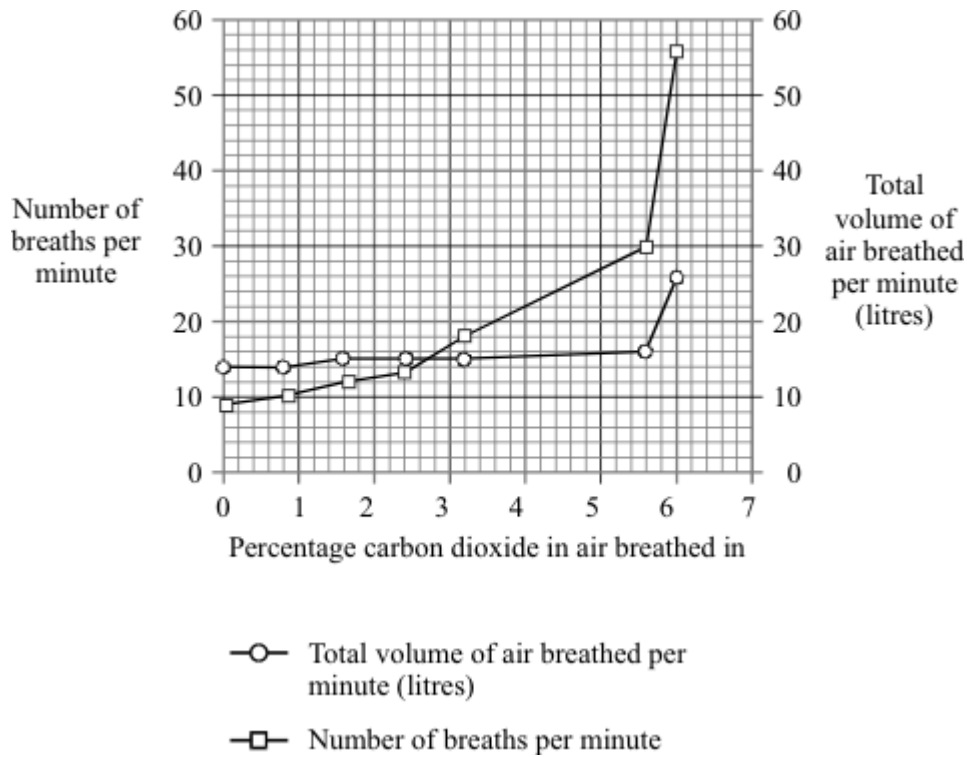
(2)

(Total 8 marks)

6

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.

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(2)

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

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(2)

(Total 4 marks)



## Mark schemes

- 1** (a) digested / broken down / made soluble by protease enzyme in stomach in small intestine / from stomach / from pancreas into amino acids  
amino acids / small molecules absorbed into blood  
*any four for 1 mark each*

4

- (b) *ideas that*  
lipase / enzyme works best in alkaline / neutral conditions  
acid denatures or inactivates enzyme / inhibits enzyme activity  
bile emulsifies fat / bile produces larger surface area of fats / bile alkaline  
for enzyme to work on / which increase activity of enzymes  
*any three for 1 mark each*

3

[7]

- 2** (a) allow carbon dioxide to enter / gaseous exchange (oxygen neutral) (transpiration neutral)  
*for one mark*

1

- (b) guard (cells)  
*for one mark*

1

- (c) stops / reduces the rate of water loss / transpiration (*reject* if dark initiated) stops / reduces wilting / description e.g. drooping / maintains turgor  
*for 1 mark each*

2

[4]

- 3** (a) *idea*  
O<sub>2</sub> increases  
CO<sub>2</sub> decreases  
*for 1 mark each*

2

- (b) (i) reduced unchanged increased  
digestive system brain skin  
bone muscles  
heart and arteries

*All (6) correct gains 4  
5 correct gains 3  
4 correct gains 2  
2/3 correct gains 1*

Correct wording not needed if unambiguous. No mark if organ repeated.

4

- (ii) more/higher/quicker/faster  
*gains 1 mark*

**but**

7500 more/from 5,000 to 12,500 more  
*gains 2 marks*

**but**

7500 cm<sup>3</sup>/min more  
*gains 3 marks*

or 2½ times more

3

[9]

- 4** pancreas produces lipase  
which breaks down / digests fats into fatty acids and glycerol  
liver produces bile / hydrogen carbonate  
which neutralises acids / makes alkaline  
provides optimum / best / most effective pH for lipase / enzyme action  
bile emulsifies fats / description  
increasing the surface area for lipase / enzyme to act on

*any five for 1 mark each*

*(digestion is in stomach / liver / pancreas – penalise only once)*

[5]

- 5** (a) (i) increasing one increases the other  
*gains 1 mark*

but

they increase in proportion/ 1/5 taken in at first / 3/10 taken in after 2 weeks  
*gains 2 marks*

2

- (ii) *idea that more/faster diffusion with higher concentration*  
*for 1 mark*

**or**

with more oxygen particles/molecules (in same space)

1

- (b) (i) can take more oxygen from (the same) air/changes from 30 to 45/increases by 15  
*gains 1 mark*

but

takes 50% more or 1.5 times as much  
*gains 2 marks*

**or**

increases by 15 mg breath

2

- (ii) more red blood cells develop  
or  
more haemoglobin in the blood  
(not just 'acclimatises')  
*for 1 mark*

1

- (iii) 75  
60  
*each for 1 mark*

2

[8]

6

- (i) increase in CO<sub>2</sub> concentration leads to increase in volume of air inhaled  
increase of % carbon dioxide has little effect over most of range / large  
increase when % carbon dioxide > 5.6 %  
*each for 1 mark*

2

- (ii) *idea that*  
depth of breathing changes at low % carbon dioxide, increase in % CO<sub>2</sub>  
results in volume of each breath increasing without increase / little increase  
in number of breaths  
*each for 1 mark*

2

[4]