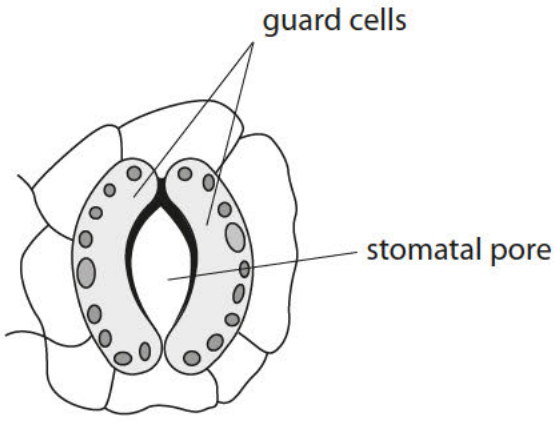
1 Stomata are pores found mainly on the underside of leaves.



(a) Explain the role of the stomata in

(i) transport in plants

(2)

(ii) gas exchange in plants

(2)

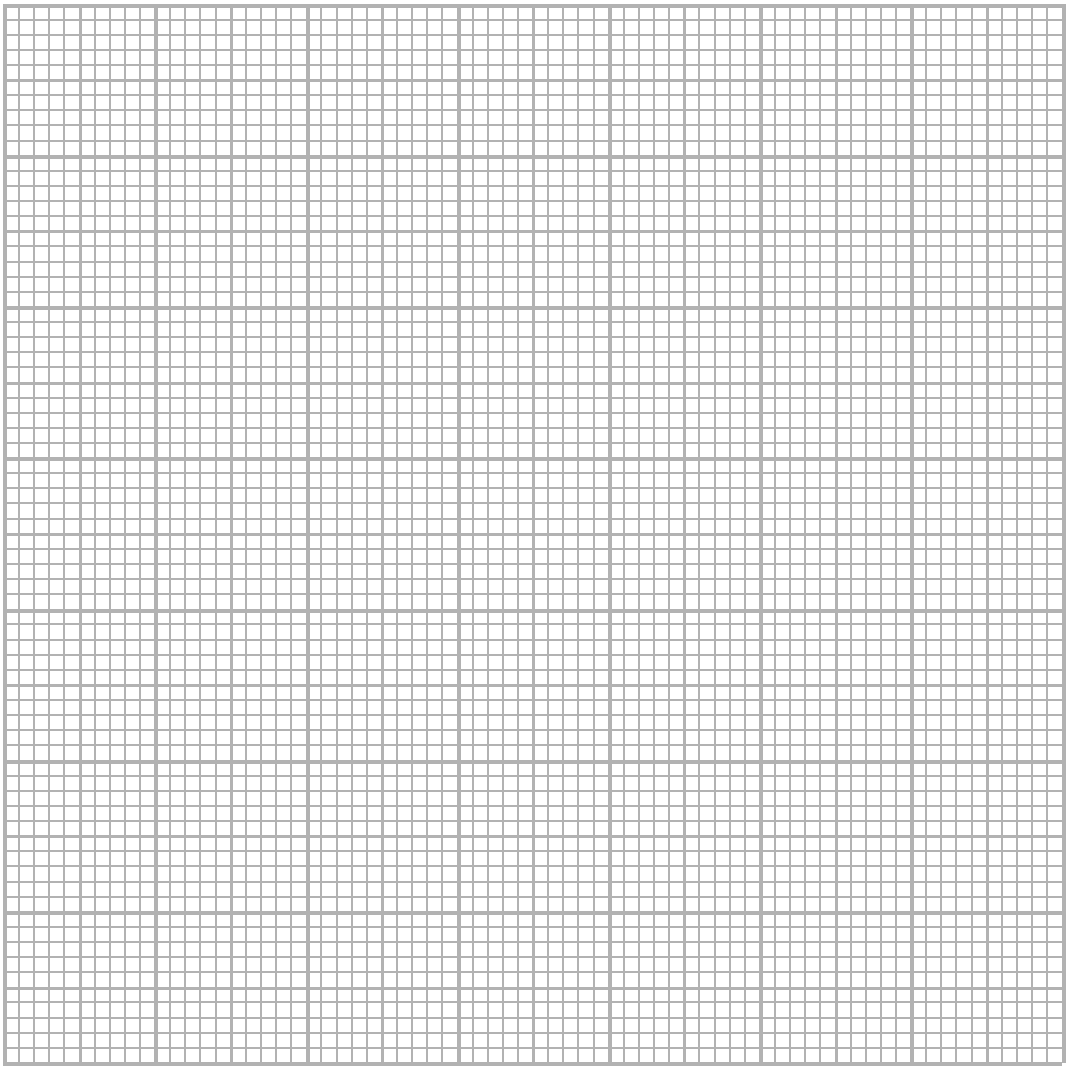
(b) An experiment is carried out to examine the effect of the size of stomatal pores on the rate of transpiration.

The data were collected in still air and in moving air.

Size of stomatal pore in μm	rate of transpiration in mg / m^2 / s	
	still air	moving air
0	0	0
4	22	38
8	46	140
12	48	165
16	50	210
20	50	248
24	50	264

(i) Plot a graph to show the effect of stomatal pore size on transpiration rate in still and moving air.
Use a ruler to join your points with straight lines.

(6)



(ii) Use the graph to compare the effect of increasing stomatal pore size on transpiration rate in still and moving air.

(2)

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(iii) Explain the effect that moving air has on transpiration rate.

(3)

(Total for Question = 15 marks)

2 (a) An experiment was carried out to look at the effect of exercise on heart rate.

The experimental results were collected from a group of children, both boys and girls.

The children's heart rate was measured three times.

- at rest
- just before exercise (in anticipation of exercise)
- immediately after carrying out one minute of exercise

	Heart rate in beats per minute		
	at rest	**just before exercise**	**after exercise**
Henry	72	76	87
Megan	116	120	175
Laura	79	84	96
David	97	99	100
John	90	93	176
Michael	67	75	132
Sarah	115	116	176
Claire	82	83	141
Rosanna	95	98	113
Rachel	82	87	136
Hattie	77	82	96
Rosie	105	110	153
Alex	79	82	90
Katheryn	99	102	152
Rebecca	82	89	156
Siobhan	87	94	170
Mark	82	94	128
Thomas	98	76	172
Lougie	80	92	132
Richard	95	115	141
Average (mean)	**89**	**93**	

(i) Calculate the average (mean) for the student data after exercise.

Show your working.

(2)

average (mean) = ... beats per minute

(ii) Name the child with an anomalous result in the data for heart rate just before exercise.

(1)

.....

(iii) Suggest why the mean value of heart rate just before exercise is different to the mean value at rest.

(2)

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(iv) Name two variables that should be controlled in this experiment.

(2)

1 .....

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2 .....

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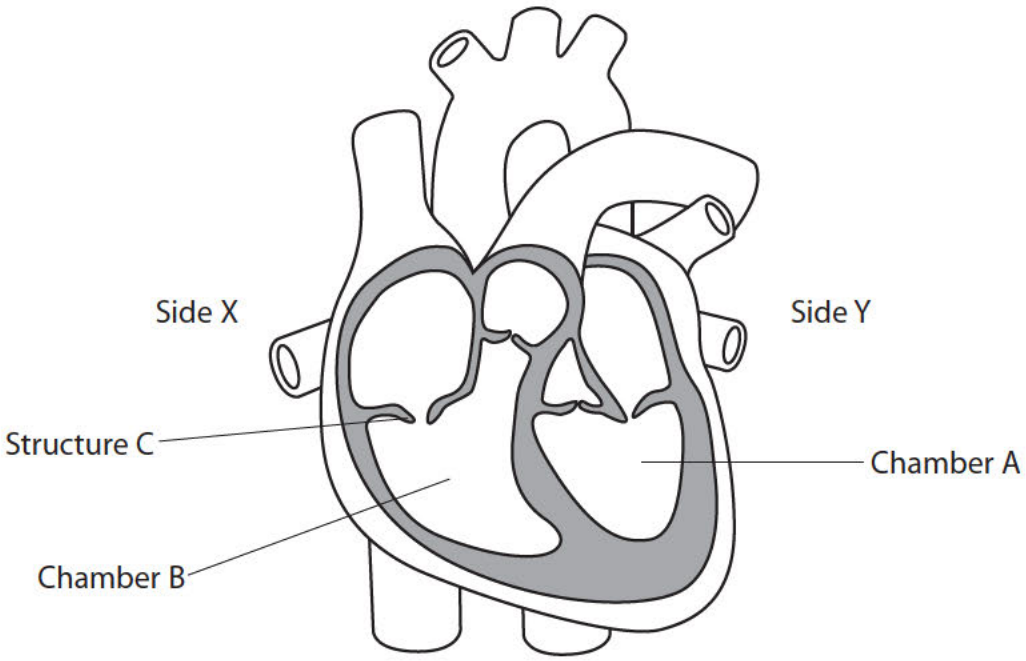
(b) Long distance runners and cyclists usually have a lower than average resting heart rate.

Suggest why a low heart rate has developed in these people.

(4)

(Total for Question = 11 marks)

3 The diagram shows the structure of the human heart.



(a) (i) Explain how you know that X is the right side of the heart.

(1)

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.....

(ii) Give the name of chamber A.

(1)

.....

(iii) On the diagram, label the pulmonary artery.

(1)

(iv) Explain the difference in the structure of the walls of chamber A and chamber B.

(2)

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(b) (i) Give the name of structure C.

(1)

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(ii) Describe the function of structure C.

(1)

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(c) Sometimes a baby is born with a hole between chambers A and B.

Suggest the effects that this condition may have on the baby.

(3)

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(d) A student wants to investigate the effect of exercise on heart rate.

(i) Describe how the student could measure heart rate.

(2)

(ii) Explain how the student could ensure that the results obtained would allow a valid comparison to be made.

(2)

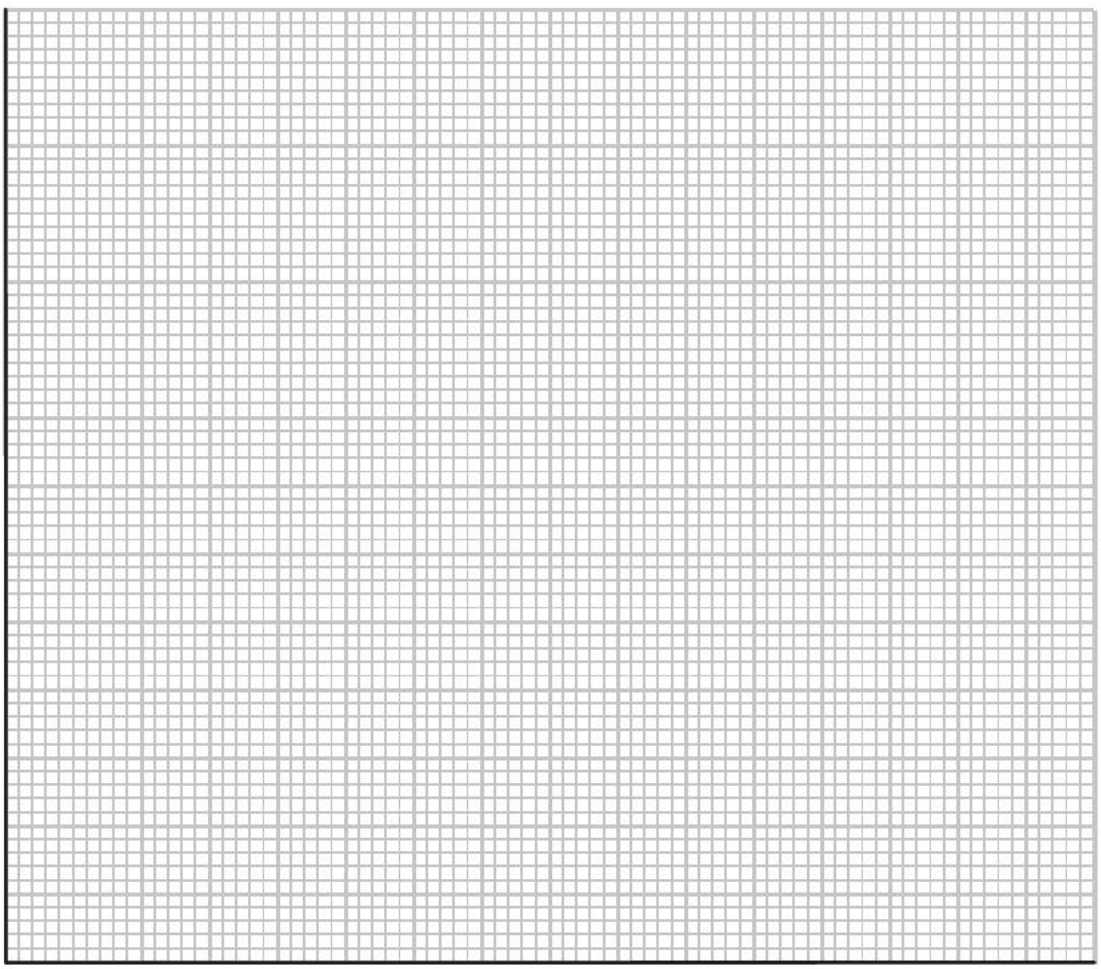
(Total for Question = 14 marks)

4 Scientists investigated the effect of altitude (height above sea level) on the mass of haemoglobin found in human blood. Blood samples were taken from humans living at different altitudes. The results are shown in the table.

Altitude in metres	Average mass of haemoglobin in grams per litre
0	121
500	121
1000	121
1500	125
2000	128
2500	133
3000	140

(a) (i) Plot a graph on the grid to show how the average mass of haemoglobin changes with altitude. Use a ruler to join the points with straight lines.

(5)



(ii) Use the graph to describe how altitude affects the mass of haemoglobin in human blood.

(2)

(iii) Suggest why a long distance athlete who trains at high altitude may have a better chance of winning than a long distance athlete who trains at sea level.

(3)

(b) Scientists obtain blood samples from an athlete's vein. To do this they use a sterile needle attached to a syringe.

(i) Suggest two reasons why scientists obtain blood samples from a vein rather than from an artery.

(2)

1 .....

2 .....

(ii) Suggest one reason why the scientists could **not** obtain a blood sample from a capillary.

(1)

.....

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(iii) Suggest why the needle used to obtain a blood sample needs to be sterile.

(2)

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(Total for Question = 15 marks)