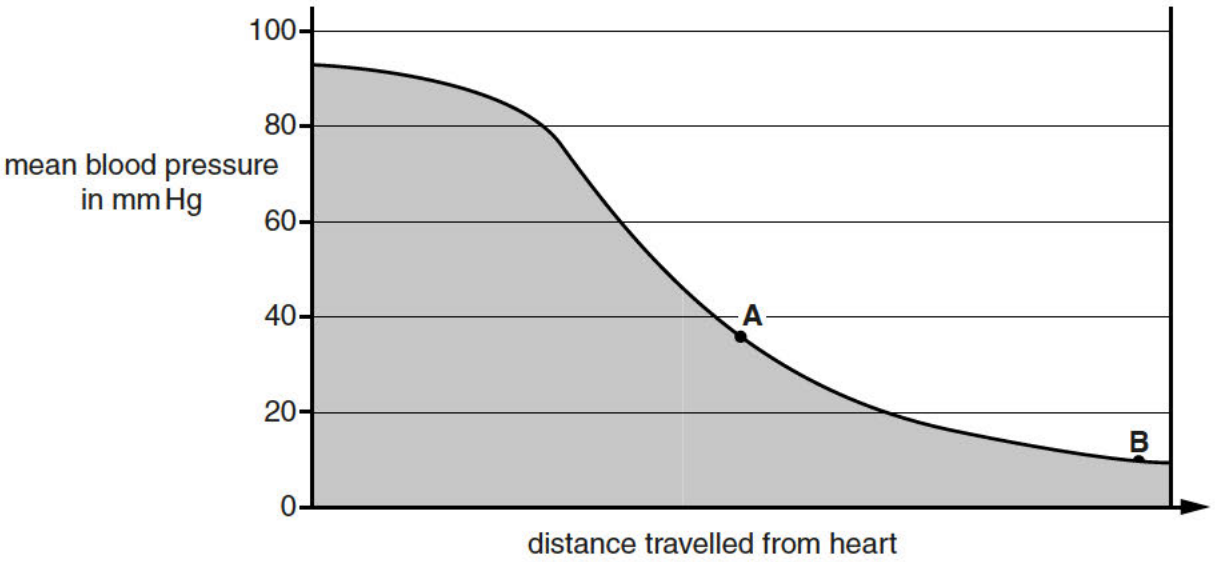
1 This question is about circulation.

(a) Look at the graph.

It shows the changes in pressure as blood leaves the heart and passes through blood vessels.



(i) Blood leaving the heart has a pressure of 93 mm Hg.

The blood pressure drops by 84 mm Hg.

Calculate the percentage drop in blood pressure.

percentage drop in blood pressure .....% **[1]**

(ii) Use the graph to name the type of blood vessels at point **A** and point **B**.

blood vessel at point **A** .....

blood vessel at point **B** ..... **[2]**

(b) The valves inside someone's heart can become damaged.

How can damaged heart valves affect a person's circulatory system?

.....

.....

..... **[2]**

[Total: 5]

2 Look at the table about people in five different countries.

It shows their mean blood cholesterol and mean BMI (body mass index).

Country	Mean blood cholesterol in mmol per litre		Mean BMI in kg per m^2	
	Females	**Males**	**Females**	**Males**
China	5.5	5.7	23.4	24.6
Cyprus	5.8	6.1	26.7	25.5
Ethiopia	4.3	4.6	19.9	20.7
India	5.3	5.2	21.4	22.0
Uruguay	6.1	6.2	27.2	27.3

(a) Does the information in the table show any overall differences between males and females?

Use the data to explain your answer.

.....

.....

.....

..... **[2]**

(b) The information in the table was collected from people aged 15 years and over.

BMI is calculated using a person's mass and height.

BMI is **not** included in the table for children younger than 15 years.

Suggest why.

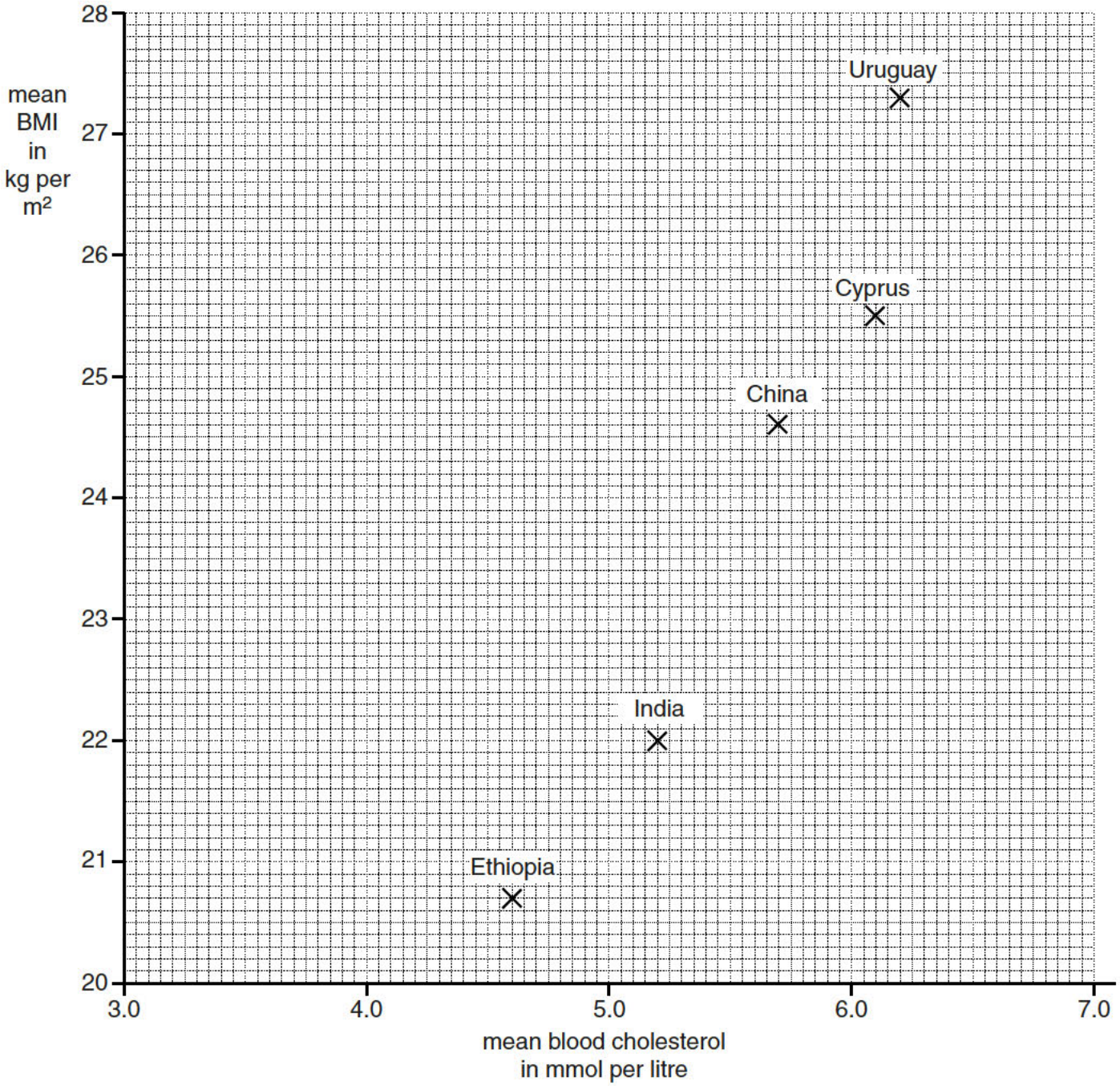
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..... **[2]**

(c) Rakesh wants to see if there is a link between blood cholesterol levels and BMI.

He uses the data about males to plot a graph.



Rakesh concludes that his graph shows that the higher the blood cholesterol level, the higher the BMI.

Rakesh finds information about five other countries.

Country	Mean blood cholesterol in mmol per litre	Mean BMI in kg per m^2
	Males	**Males**
Cameroon	3.2	24.5
Greece	4.7	28.0
Netherlands	4.7	25.2
Nigeria	3.6	22.6
United Kingdom	5.0	27.0

(i) **Add** this data to Rakesh's graph.

Use crosses (✕) to plot the points. **[2]**

(ii) What does the graph **now** show about a link between blood cholesterol levels and BMI?

Explain your answer.

.....

.....

.....

..... **[2]**

(d) Rakesh compares blood cholesterol in two countries, Cyprus and India, Cyprus is a small country and India is a large country.

He does a calculation using some of the data from the table.

	Mean blood cholesterol in mmol per litre	
	Females	**Males**
Cyprus	5.8	6.1
India	5.3	5.2
Average mean of the figures from the two countries	5.55	5.65

Rakesh concludes that in the two countries put together, males have higher blood cholesterol levels than females.

Explain why Rakesh's conclusion is **not** valid.

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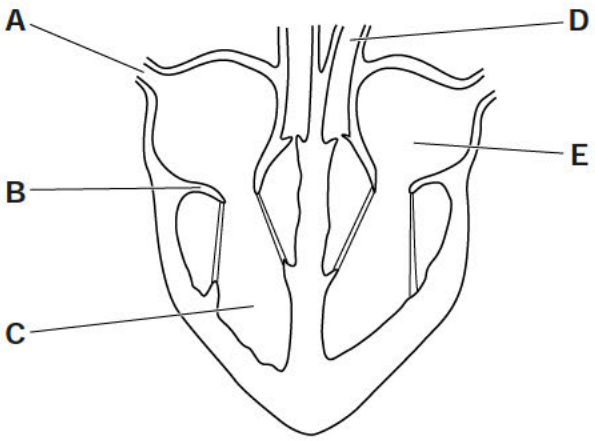
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..... **[2]**

[Total: 10]

3 Look at the diagram of a human heart.



(a) Write the letter **A** to **E** next to the correct name of each part of the heart.

name of part	letter
aorta	
left atrium	
right ventricle	
tricuspid valve	
vena cava	

[2]

(b) Blood contains cells.

One type of cell is a red blood cell.

(i) Red blood cells are adapted for their job by being very small.

Explain why this helps them do their job.

..... **[1]**

(ii) Haemoglobin is found in red blood cells.

Haemoglobin is a protein made in the cytoplasm.

Red blood cells start off life with a nucleus.

The gene for haemoglobin is only found in the nucleus.

Explain how it is possible that haemoglobin can be made in the cytoplasm.

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..... [2]

(iii) Haemoglobin is important in transporting oxygen.

Describe how haemoglobin transports oxygen from the lungs to the body cells.

.....

.....

..... [2]

(c) Blood also contains white blood cells.

White blood cells and red blood cells are made in the bone marrow.

Why can cells in the bone marrow produce both red and white blood cells?

.....

.....

..... [2]

[Total: 9]

4 (a) Look at the table about some different animals.

It shows the mean (average) mass, heart rate and life span.

It also shows the mean (average) number of heart beats in a life time, in billions.

(1 billion = 1 thousand million.)

Animal	Mass in g	Heart rate per minute	Life span in years	Life time heart beats in billions
hamster	60	450	3	0.7
chicken	1500	275	15	2.2
cat	2000	150	15	1.2
pig	150000	70	25	0.9
horse	1200000	44	40	0.9
whale	120000000	20	80	0.8

(i) Look at the information in the table.

What patterns can you see between mass, heart rate and life span?

.....

.....

.....

..... **[2]**

(ii) The 'heart beat hypothesis' states that:

'every animal has a similar number of heart beats in its life time'.

Discuss whether or not the information in the table supports the 'heart beat hypothesis'.

.....

.....

.....

..... **[2]**

(iii) This table shows data for humans.

Animals	Mass in g	Heart rate per minute	Life span in years	Life time heart beats in billions
human	90 000	60	70	2.2

Do humans fit the patterns shown by the other animals?

Explain your answer.

.....

.....

.....

..... **[2]**

(b) Scientists have made a four-year study of over 31 000 heart disease patients from around the world.

The scientists compared patients with high rates (greater than 78 beats per minute) with patients with low heart rates (58 or fewer beats per minute).

They found that the patients with high heart rates had:

- a 39% greater chance of having a heart attack
- a 77% greater chance of dying from a heart attack.

(i) This study will be important for doctors.

Explain why.

.....

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.....

..... **[2]**

(ii) Describe any limitations in the data.

.....

.....

.....

..... **[2]**

5 Malaria is a disease caused by a protozoan called

Plasmodium. *Plasmodium* is transmitted by mosquitoes.



mosquito

(a) Describe how mosquitoes transmit *Plasmodium* between humans.

.....

.....

..... **[2]**

(b) One way of preventing the spread of malaria is by draining swamps.

Explain why draining swamps can help.

.....

..... **[1]**

(c) In the past, some people thought that malaria was caused by harmful gas from swamps.

To protect themselves from malaria, these people put nets around their beds to try to keep out the harmful gas.

Using nets around beds reinforced the **incorrect** idea that malaria is caused by harmful gas.

Explain why.

.....

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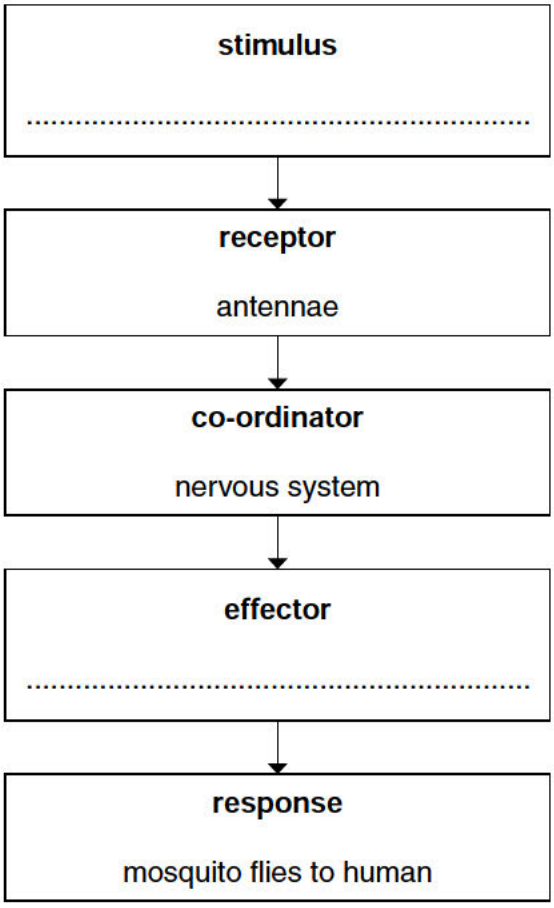
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..... **[2]**

(d) Mosquitoes use their sense of smell to detect humans.

Mosquitoes detect the smell with receptors on their antennae.

Complete the flow chart to show how a mosquito detects, and responds to, the smell of a human.



[2]

(e) One of the symptoms of malaria is a fever.

In a fever, the body temperature may rise to over 40 °C.

(i) How does the body monitor the rise in body temperature?

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.....

..... **[2]**

(ii) One way to cool down is by vasodilation.

Explain how vasodilation cools a body.

.....

.....

..... **[2]**

[Total: 11]

6 Carl is an athlete.

He competes in the 200 m sprint.



(a) Muscle contraction during the sprint needs energy.

Aerobic respiration is a process that occurs in living cells.

Complete the symbol equation for aerobic respiration.

..... + ... → ..... + ...

[2]

(b) The circulatory system has parts that help transport substances around the body.

Arteries are part of the circulatory system.

How do arteries help transport substances around the body?

Put a tick (✓) in the box next to the correct statement.

arteries carry blood at low pressure away from the heart	☐
arteries carry blood at high pressure away from the heart	☐
arteries carry blood at low pressure and have valves to prevent backflow	☐
arteries carry blood at high pressure back to the heart	☐
arteries join veins to capillaries	☐

[1]

(c) (i) Look at the table of data.

It shows the maximum oxygen consumption for males of different fitness levels.

The males are aged between 13 and 29 years old.

maximum oxygen consumption in cm^3 per kg per minute						
age in years	fitness levels					
	very poor	poor	fair	good	excellent	superior
13–19	less than 35	35–38	39–45	46–50	51–55	more than 55
20–29	less than 33	33–35	36–42	43–46	47–52	more than 52

Carl is 25 years old.

He has a maximum oxygen consumption of 44 cm^3 per kg per minute.

Carl wants to improve his fitness level to excellent.

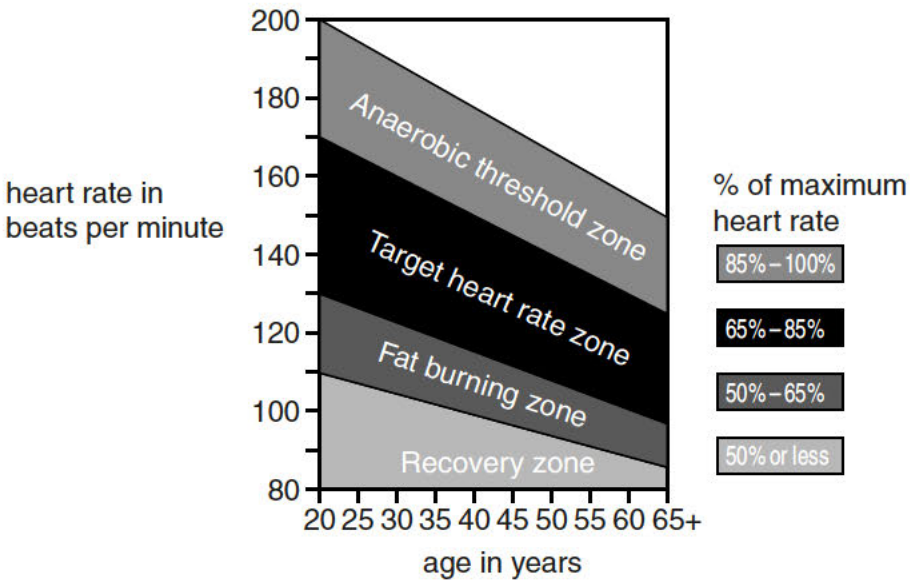
Look at the table.

Calculate Carl's maximum oxygen consumption as a percentage of the lowest excellent value.

answer .....% [1]

(ii) Carl needs to exercise to further improve his fitness level.

Look at the Exercise Target Zone Chart.



Carl's heart rate reaches 180 beats per minute during exercise.

Is Carl training efficiently? .....

Justify your answer.

.....

.....

.....

..... **[3]**

[Total: 7]