Chapter 9

Transport in animals

01. 0610_s17_qp_41 Q: 4

Fig. 4.1 shows part of the circulatory system of a fish.

The arrows show the direction of blood flow.

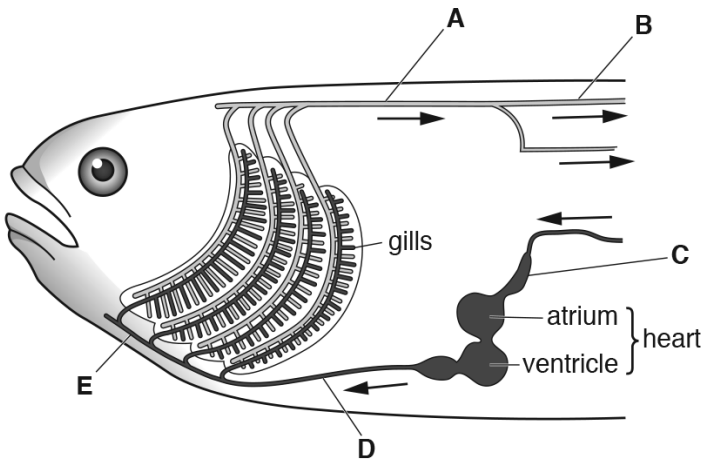

Fig. 4.1

(a) The circulatory system of fish is described as a single circulation.

State what is meant by a *single circulation.*

.....

.....[1]

(b) State the letter of the blood vessel in Fig. 4.1 that contains blood at the highest pressure.

..... [1]

(c) The gills are the site of gas exchange.

State **two** features of gas exchange surfaces.

1.....

.....

2.....

.....

[2]

[Total: 4]

Fig. 1.1 shows a vertical section through a human heart and the major blood vessels.

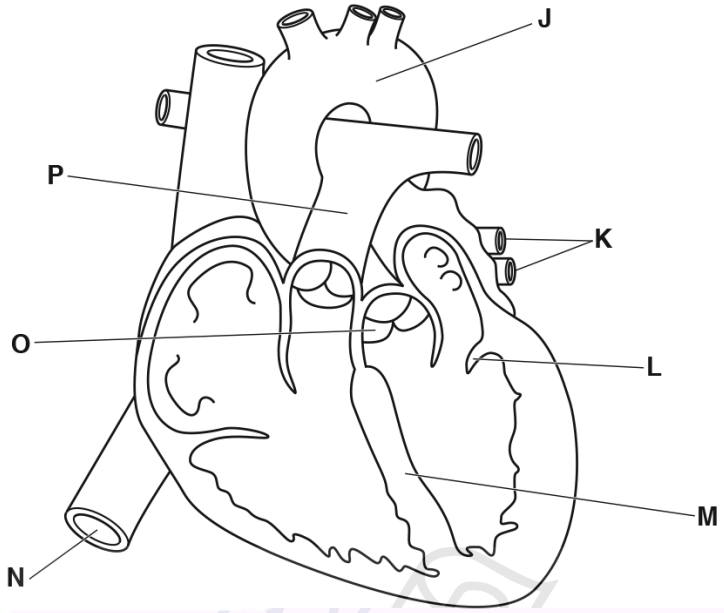

Fig. 1.1

(a) (i) State the names of the structures labelled **L**, **M** and **O** as shown in Fig. 1.1.

L .....

M .....

O .....

[3]

(ii) Identify a letter on Fig. 1.1 that represents a blood vessel that has:

blood with the highest concentration of carbon dioxide .....

blood with the highest concentration of oxygen .....

the highest pressure .....

[3]

(b) (i) Describe how blood is moved by the heart from blood vessel **K** to blood vessel **J**.

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.....[5]

(ii) Explain why the wall of the left ventricle is thicker than the wall of the right ventricle.

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.....[2]

[Total: 13]

03. 0610_s17_qp_41 Q: 1

Fat is a necessary component of the human diet.

(a) State **three** ways in which the human body uses fat.

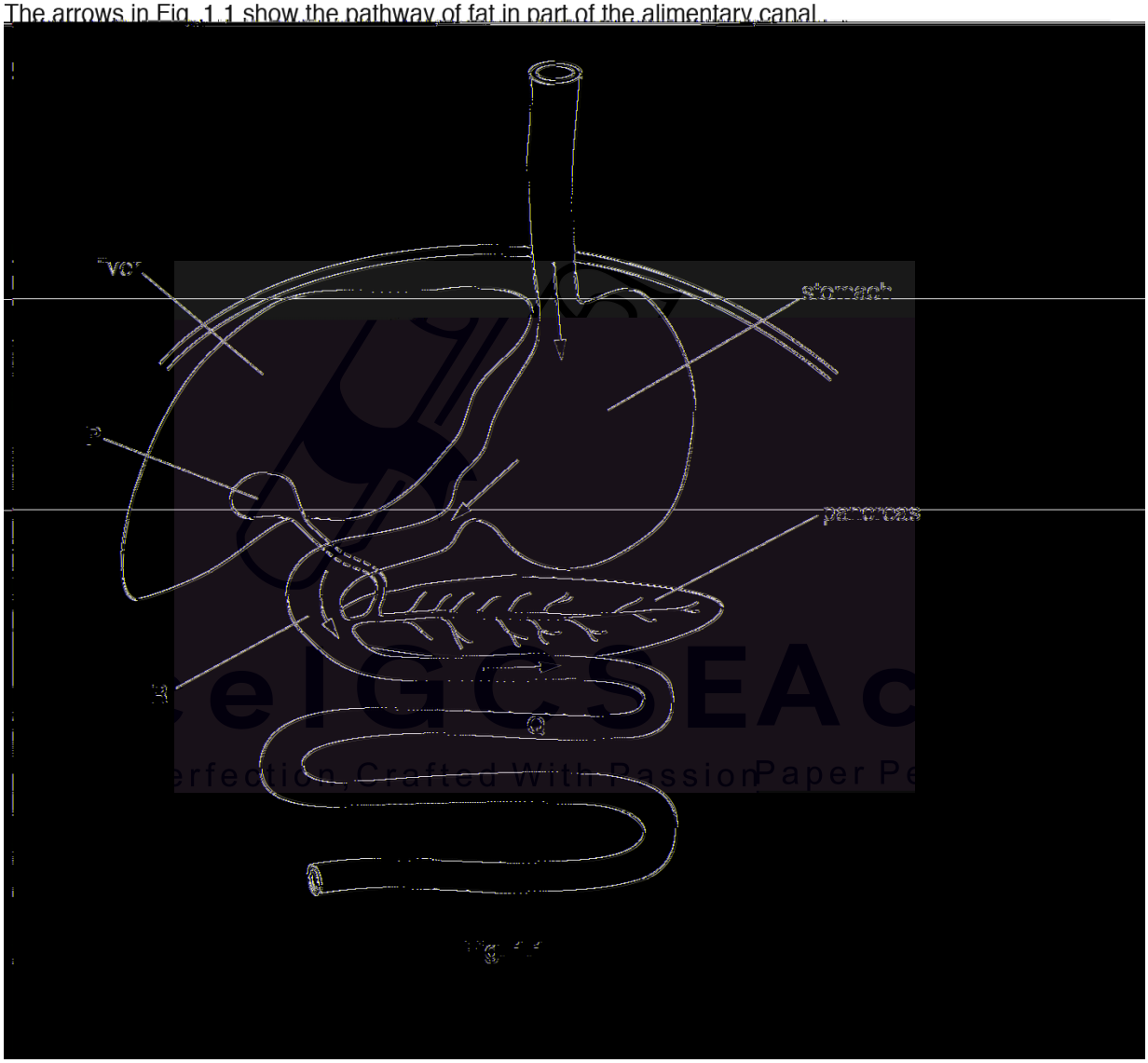
1.....

2.....

3.....

[3]

The arrows in Fig. 1.1 show the pathway of fat in part of the alimentary canal.



(b) State the name of

(i) the enzyme secreted by the pancreas that digests fat

.....[1]

(ii) the products of chemical digestion of fat

.....[1]

(iii) the liquid that is produced by the liver and stored by organ **P** in Fig. 1.1

.....[1]

(iv) organ **P** in Fig. 1.1.

.....[1]

(c) Explain what happens to ingested fat at **R** in Fig. 1.1 **before** chemical digestion occurs.

.....

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.....

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.....[2]

(d) Explain how the products of fat digestion are transported from **Q** to the rest of the body.

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.....[3]

One possible effect of too much fat in the diet is coronary heart disease.

(e) Describe how too much fat in the diet may cause coronary heart disease.

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.....[3]

(f) Describe **and** explain how coronary heart disease can be treated.

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.....[6]

[Total: 21]

04. 0610_w17_qp_43 Q: 2

A group of students investigated the effect of exercise on their heart rates.

They measured their heart rates:

- before exercise
- immediately after running 1 km
- one minute after running 1 km

Before doing the investigation they wrote a hypothesis.

(a) (i) Write a hypothesis for this investigation.

.....

.....

.....

.....[2]

(ii) The students measured their pulse as an indicator of heart rate.

Describe how the students could measure their pulse.

.....

.....

.....

.....[2]

(b) In another investigation, a doctor tested some of her patients to determine the effect of exercise on coronary heart disease.

Coronary heart disease is caused by a blockage in the coronary artery.

Describe the effect on the heart of a blockage in the coronary artery.

.....

.....

.....

.....

.....[2]

(c) The doctor divided her coronary heart disease patients randomly into two equal groups.

Each group was given different instructions:

- group **A** – patients were given a daily exercise plan
- group **B** – patients were told to make their own exercise plan.

The doctor measured the heart rate (HR) of each patient immediately after doing exercise and again one minute later.

She calculated their heart rate recovery using this formula:

heart rate recovery = HR immediately after exercise – HR one minute after exercise.

She then calculated the average heart rate recovery for each of the two groups of patients.

The doctor repeated these measurements after three months and after six months.

The results are shown in Fig. 2.1.

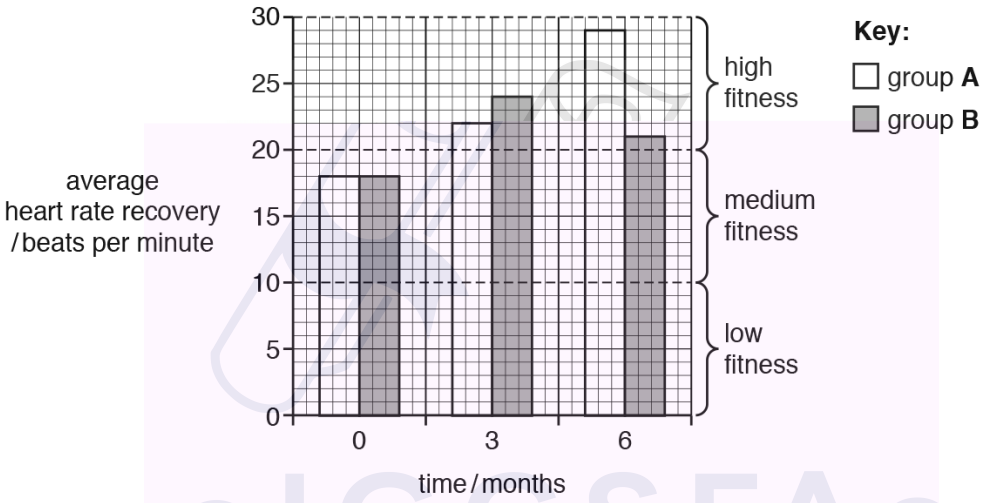

Fig. 2.1

Describe **and** explain the effect of exercise on the average heart rate recovery of the coronary heart disease patients in group **A** and group **B**.

Use data from Fig. 2.1 to support your answer.

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.....[6]

(d) Exercise may reduce the risk of coronary heart disease.

State **one other** possible way of reducing the risk of developing coronary heart disease.

.....[1]

[Total: 13]

05. 0610_s16_qp_41 Q: 1

(a) Fig. 1.1 shows the human heart and the main blood vessels. The functions of the parts of the heart and some of the blood vessels are given in Table 1.1.

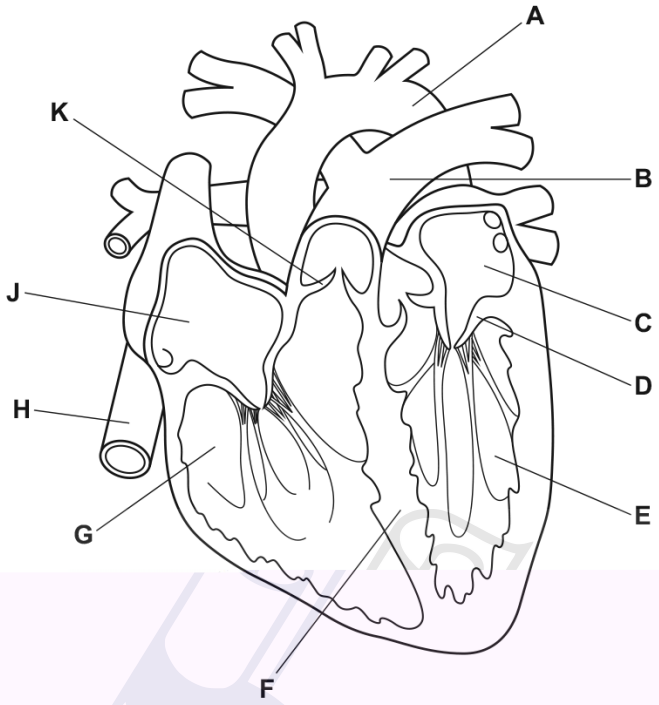

Fig. 1.1

Complete Table 1.1.

One row has been done for you.

Table 1.1

function	letter on Fig. 1.1	name
structure that separates oxygenated and deoxygenated blood		
structure that prevents backflow of blood from ventricle to atrium		
blood vessel that carries oxygenated blood	**A**	aorta
blood vessel that carries deoxygenated blood		
structure that prevents backflow of blood from pulmonary artery to right ventricle		
chamber of the heart that contains oxygenated blood		
chamber of the heart that contains deoxygenated blood		

[6]

(b) A group of students used a heart monitor to record the pulse rate of an athlete during a 5000 metre race. The recordings started just before the race began and ended just after it had finished, as shown in Fig. 1.2.

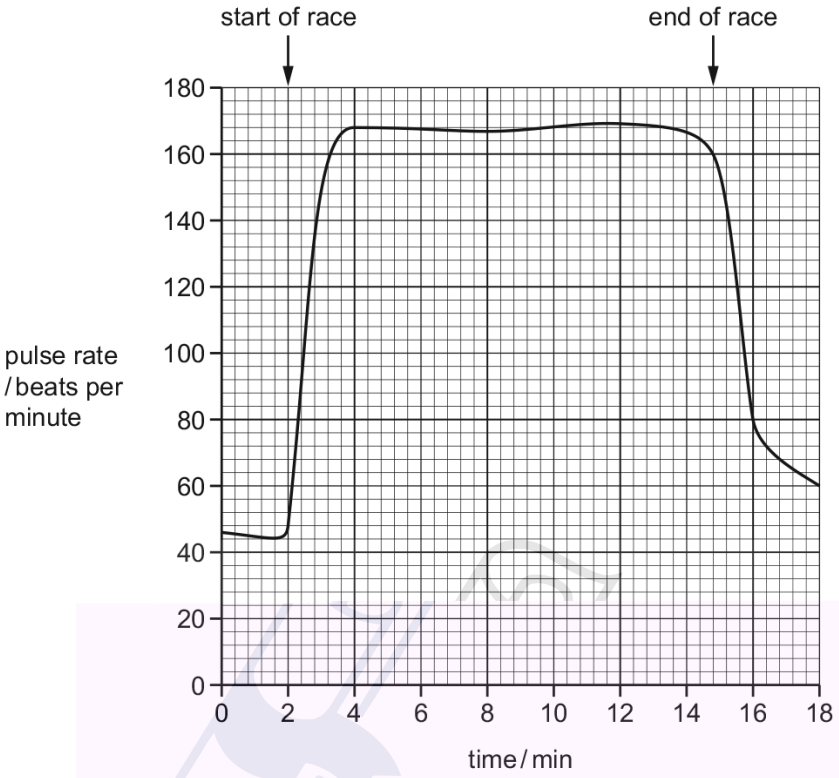

Fig. 1.2

(i) Use data from Fig. 1.2 to describe the effect of exercise on the pulse rate of the athlete.

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..... [3]

(ii) Explain the change in pulse rate between 2 minutes and 3 minutes after the recordings started.

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..... [4]

[Total: 13]

06. 0610_s16_qp_42 Q: 1

All mammals have a double circulatory system. Fig. 1.1 shows part of the human double circulatory system.

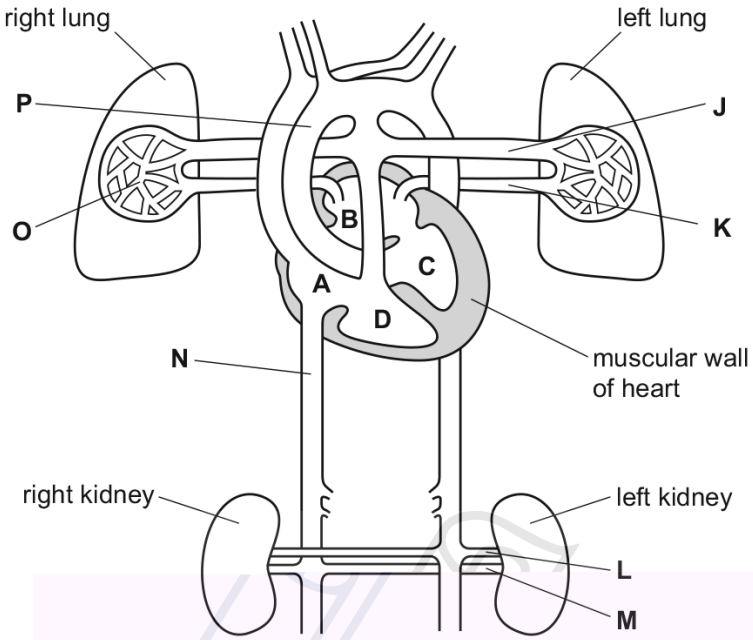

Fig. 1.1

(a) Name the muscular wall that separates the left and right sides of the human heart.

..... [1]

(b) **(i)** Describe what is meant by the term *double circulation*.

.....

.....

..... [1]

(ii) State **one** advantage of a double circulation.

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..... [1]

(c) Table 1.1 describes some of the structures of the human circulatory system shown in Fig.1.1.

Complete the table.

One row has been done for you.

Table 1.1

description	name of structure	letter on Fig. 1.1
heart chamber with the thickest muscular wall		
blood vessel that carries oxygenated blood to the heart		
blood vessel that carries oxygenated blood away from the heart		
blood vessel that carries blood away from the kidneys		
blood vessel with the largest lumen	vena cava	**N**

[4]

(d) Describe how blood is transported from the vena cava to the lungs. You may use the letters on Fig. 1.1 in your description.

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..... [4]

(e) **(i)** Doctors recommend that a healthy diet can reduce the risk of coronary heart disease.

Give **one** other lifestyle improvement patients can make that can reduce the risk of coronary heart disease.

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..... [1]

(ii) Sometimes surgery is required to treat coronary heart disease.

Describe **one** named example of surgery that can treat coronary heart disease.

.....

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..... [2]

[Total: 14]

07. 0610_s17_qp_43 Q: 1

Fig. 1.1 is a diagram of the human heart. The diagram shows the phase during the heart beat when the atria contract. The blood vessels that carry blood to and from the heart are labelled **A** to **F**.

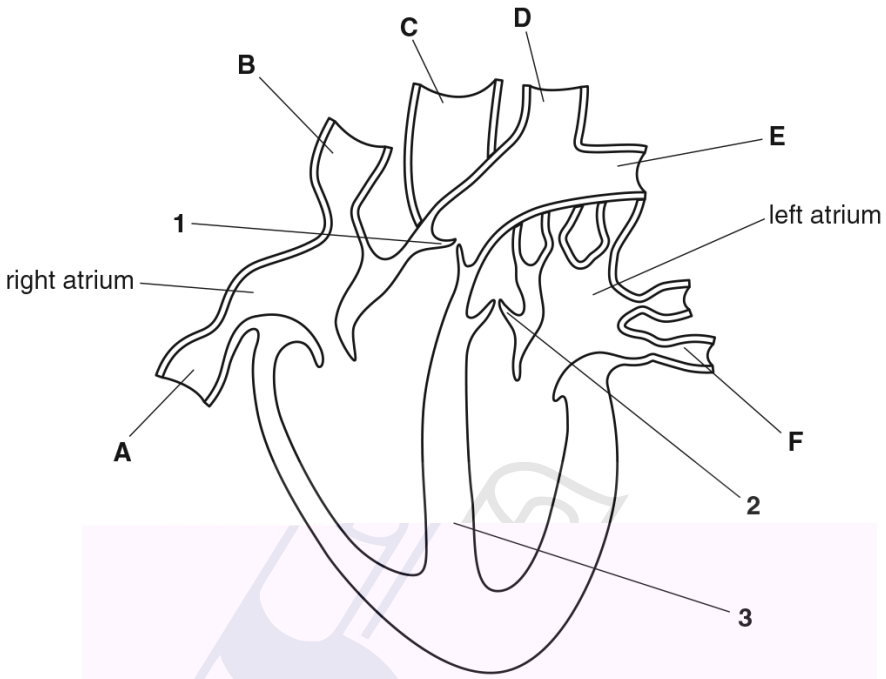

Fig. 1.1

(a) (i) Draw **one** arrow on Fig. 1.1 to show the pathway taken by blood from a vein into the **right ventricle**. [1]

(ii) Identify the letter of the blood vessel that carries blood at the highest pressure and state its name.

letter .....

name of the blood vessel .....
[1]

(b) (i) Suggest what causes the valves at **1** and **2** to close during a heart beat.

.....

.....[1]

(ii) State the function of valves **1** and **2** in the heart.

.....[1]

(c) Fig. 1.1 shows the phase of the heartbeat when the ventricles are filling with blood.

Using Fig. 1.1, describe **and** explain how the blood travels from the right ventricle to the lungs.

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.....[4]

(d) State the name of the part of the heart labelled **3** and state its role in the mammalian circulation.

name .....

role .....

.....

[2]

[Total: 10]

08. 0610_s19_qp_43 Q: 4

Mammals have a double circulation.

(a) State what is meant by the term *double circulation*.

.....

.....

..... [1]

(b) Table 4.1 shows some information about the functions of the components of blood.

Complete Table 4.1.

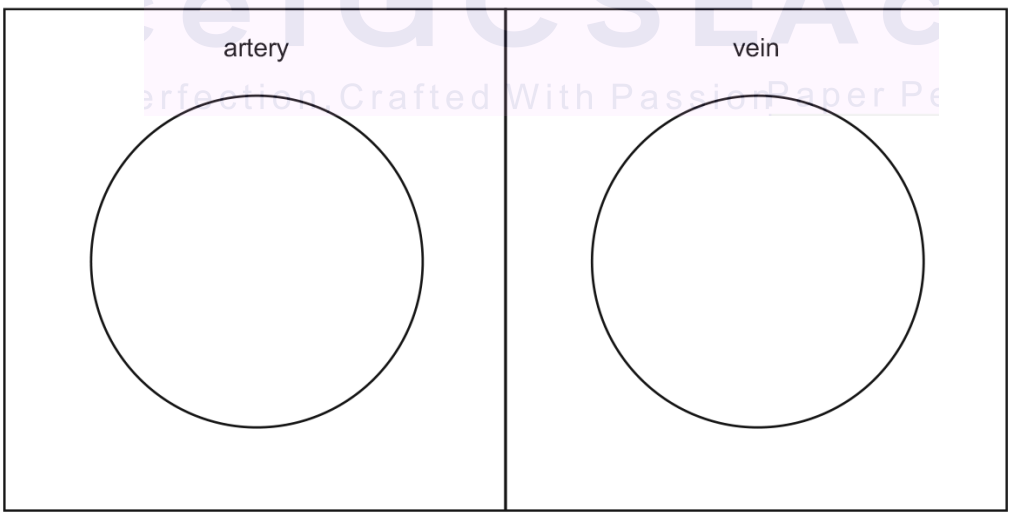
Table 4.1

function	type of cell
production of antibodies	
	phagocyte
promotes blood clotting	
transports oxygen	

[4]

(c) Blood is transported in arteries and veins.

Complete the drawings of the cross-sections of an artery and a vein to show the differences between these two types of blood vessel. Label the lumen in each drawing.



[2]

(d) A diagram of a mammalian heart and associated blood vessels is shown in Fig. 4.1.

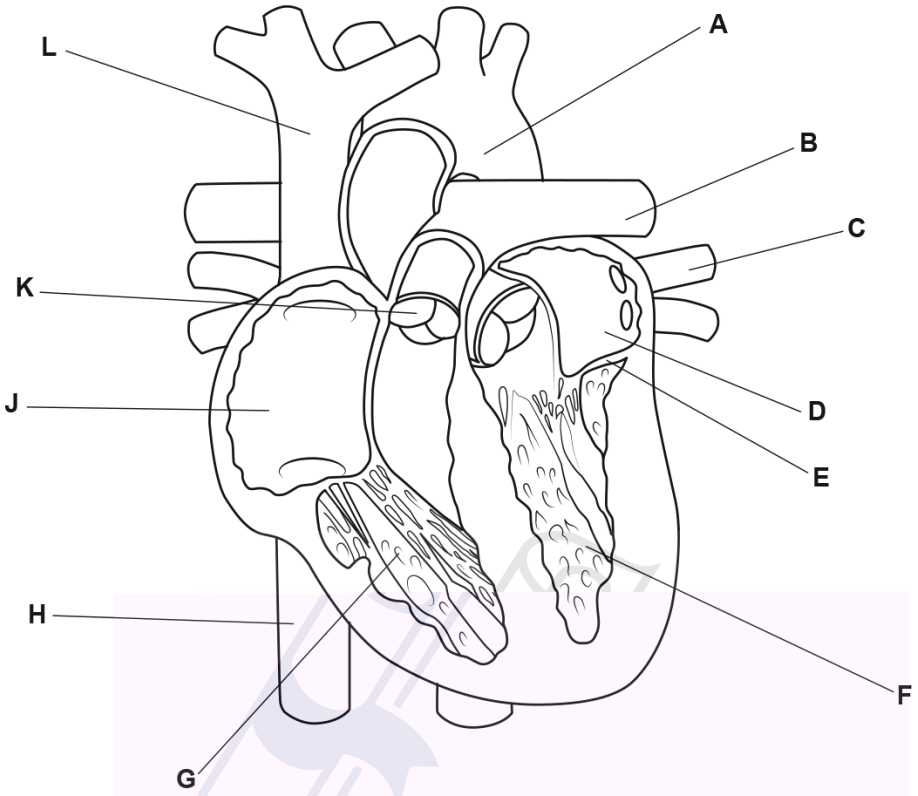


Fig. 4.1

(i) Sketch arrows on Fig. 4.1 to show the pathway taken by deoxygenated blood from the heart towards the lungs. [2]

(ii) Table 4.2 contains statements about the structures visible in Fig. 4.1.

Complete Table 4.2 by:

- stating the name of each structure
- identifying the structure with the corresponding letter from Fig. 4.1.

Table 4.2

statement	name of structure	letter from Fig. 4.1
chamber that creates the highest blood pressure		
blood vessel containing blood with the highest concentration of oxygen		
structure that prevents blood going from ventricle to atrium		
structure that prevents backflow of blood from artery to ventricle		
chamber that receives blood from vena cava		

[5]

(e) Mammals also have a lymphatic system.

Outline the functions of the lymphatic system.

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..... [3]

[Total: 17]

Fig. 5.1 shows an angiogram of a heart before and after treatment for coronary heart disease (CHD). An angiogram is an image of the blood flow through the blood vessels of the heart.

before treatment after treatment

Fig. 5.1

(a) The arrow on Fig. 5.1 shows the position of a blockage in a blood vessel.

(i) State the name of the blocked blood vessel.

..... [1]

(ii) The blockage is caused by a blood clot.

Describe how a blood clot forms.

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.....

..... [3]

(iii) State the name of a drug that can be used to treat coronary heart disease.

..... [1]

(b) Many health specialists think that the risk of coronary heart disease can be reduced by doing regular exercise.

A long-term study of a large group of women was used to test this hypothesis.
The women were between 35 and 45 years old at the start of the study.
Every two years the same group of women were asked how much they were exercising.

After 28 years the researchers analysed their data:

- They calculated the average time spent exercising per week by each woman.
- They put the women into categories determined by how much exercise they had done.
- For each category, they calculated the number of women who died from coronary heart disease (CHD).

The results are shown in Fig. 5.2.

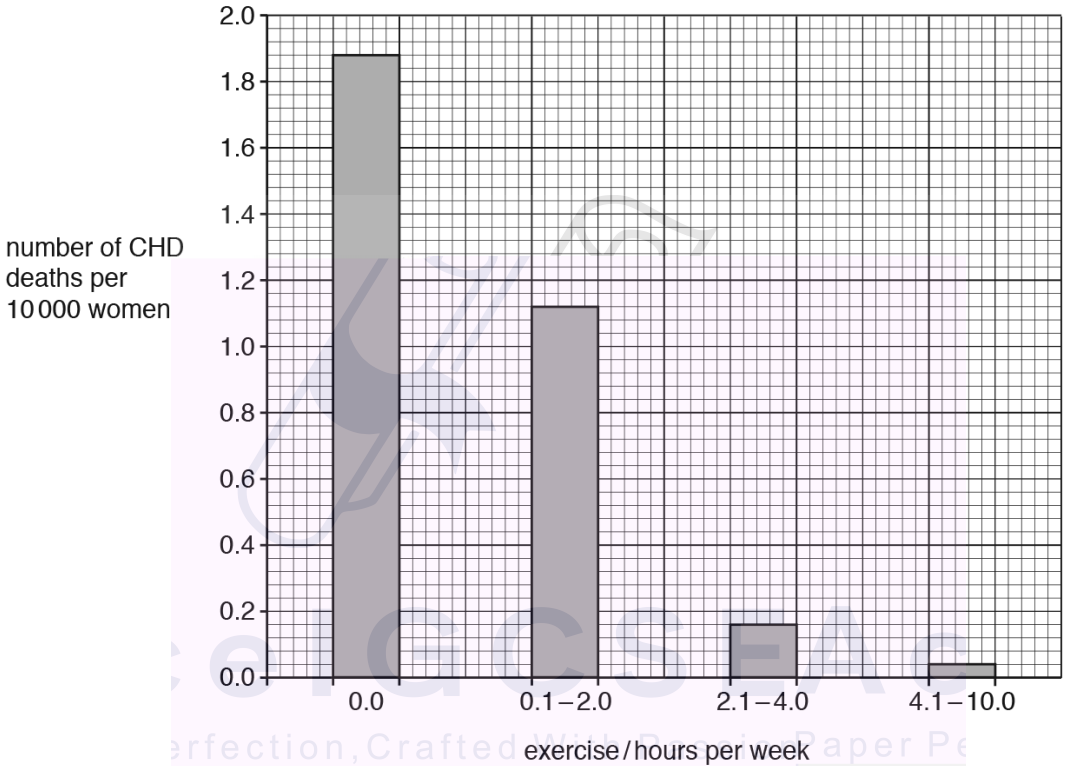

Fig. 5.2

(i) Calculate the percentage **decrease** in the number of CHD deaths per 10 000 women between those who did no exercise and those who exercised for 4.1 to 10.0 hours a week, using the data in Fig. 5.2.

number of CHD deaths per 10 000 women who did no exercise .....

number of CHD deaths per 10 000 women who did 4.1 to 10.0 hours per week of exercise

.....

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

(ii) Health professionals wanted to use the results of this study to encourage the whole population to take more exercise.

Discuss the arguments for and against health professionals using this study in this way.

Use the information about how the study was designed and the results in Fig. 5.2 in your arguments.

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..... [5]

(c) Exercise causes heart rate to increase.

Explain why exercise causes an increase in heart rate.

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..... [3]

[Total: 16]

10. 0610_w18_qp_43 Q: 6

Fig. 6.1 is a diagram showing some body cells and parts of the human lymphatic and circulatory systems.

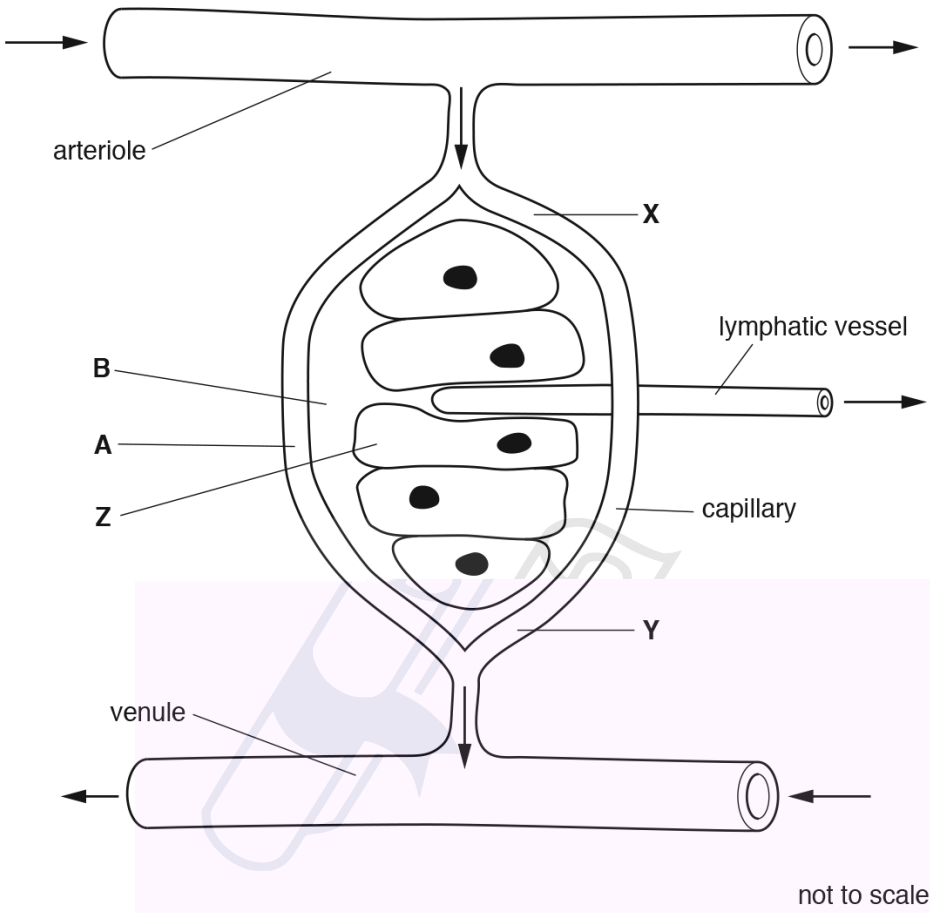

Fig. 6.1

(a) Capillaries allow blood to reach most cells in the body.

(i) State the name of the process by which oxygen moves from **A** to **Z** as shown in Fig. 6.1.

.....[1]

(ii) Describe how some of the liquid in **A** moves to **B** in Fig. 6.1.

.....

.....

.....[2]

(iii) State **one** component of blood that remains inside the capillaries as the blood flows from **X** to **Y** in Fig. 6.1.

.....[1]

(b) Lymphatic vessels are similar in structure to veins.

(i) Describe the structure of veins.

.....

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.....

.....

.....[2]

(ii) Describe the role of the lymphatic vessel shown in Fig. 6.1.

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.....

.....

.....

.....[2]

(c) Lacteals are another part of the lymphatic system.

State where in the body lacteals are found and state their function.

location in the body .....

function .....

.....

[2]

(d) In the lymphatic system, there are structures that contain large numbers of lymphocytes.

(i) State the name of these structures.

.....[1]

(ii) State the role of lymphocytes.

.....

.....

.....[2]

[Total: 13]

11. 0610_s16_qp_43 Q: 4

A student investigated the diffusion of substances through Visking tubing, an artificial membrane which has some of the properties of cell membranes.

The student made a bag of Visking tubing as shown in Fig. 4.1.

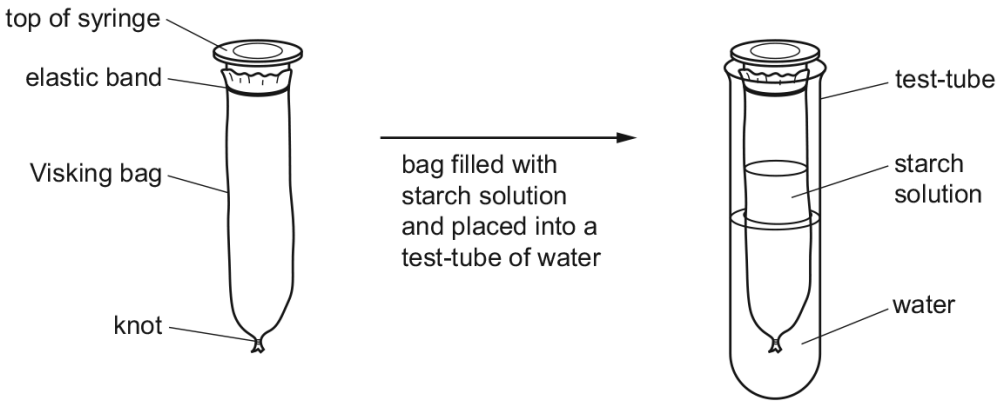

Fig. 4.1

The student added some iodine solution to the water in the test-tube.

After 30 minutes at room temperature, the contents of the Visking bag were stained blue-black, but the water outside remained a yellow colour.

(a) **(i)** Explain these results.

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.....

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.....

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.....

.....

..... [4]

(ii) State **three** factors that influence the movement of molecules through membranes.

1 .....

2 .....

3 .....

[3]

(b) Fig. 4.2 is an electron micrograph of a red blood cell within a capillary.

magnification ×6500

Fig. 4.2

(i) Molecules of carbon dioxide that are produced in muscle cells are transported to the blood.

Describe the pathway taken by these molecules of carbon dioxide.

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..... [3]

(ii) Explain how capillaries are adapted for their functions.

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..... [3]

(c) Mammals have a transport system for carbon dioxide. Plants absorb carbon dioxide from their surroundings to use in photosynthesis.

Explain how a molecule of carbon dioxide from the atmosphere reaches the site of photosynthesis in a leaf.

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.....

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..... [4]

[Total: 17]

01. 0610_s17_MS_41 Q: 4

	Answer	Mark	Partial Marks
(a)	blood travels through the heart once in a, circuit / cycle (of the body) / AW ;	1	
(b)	**D** ;	1	
(c)	**1** large surface area ; **2** thin (surface) / one cell thick ; **3** short diffusion distance ; **4** good blood supply / many capillaries ; **5** good ventilation / good movement of air *or* water / good oxygen supply ; **6** permeable ; **7** moist ;	2	

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02. 0610_m17_MS_42 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	**L** – atrioventricular valve ; **M** – septum ; **O** – semi-lunar valve ;	3	
(a)(ii)	**N / P** ; **J / K** ; **J** ;	3	
(b)(i)	**1** blood from pulmonary vein / K, enters left atrium ; **2** atria contract ; **3** atrioventricular valve / L, opens due to pressure from blood ; **4** blood forced into left ventricle ; **5** ventricle contract ; **6** atrioventricular valves / L, shut to prevent blood entering atrium ; **7** semi-lunar valves / O, open ; **8** blood forced into, aorta / J ; **9** AVP;	5	
(b)(ii)	left ventricle wall contains more muscle ; left ventricle pumps blood further ; left ventricle has to overcome more resistance ; left ventricle pumps blood at higher pressure ;	2	

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03. 0610_s17_MS_41 Q: 1

	Answer	Mark	Partial Marks
(a)	**1** (for) energy / energy source / respiration ; **2** storage / stored ; (fat or vitamins or energy) **3** insulation / reduce heat loss / maintains temperature / ref to myelin ; **4** protection (against mechanical damage) / cushions organs / shock absorber ; **5** AVP ; **6** AVP ;	**3**	**R** 'produce energy' **I** homeostasis e.g. buoyancy making (some) hormones making (cell) membranes provide heat absorption of vitamins waterproofing
(b)(i)	lipase ;	**1**	
(b)(ii)	fatty acids and glycerol ;	**1**	
(b)(iii)	bile ;	**1**	
(b)(iv)	gall bladder ;	**1**	
(c)	(bile) emulsifies fats ; breaks down into / changed into smaller, globules / AW ; increases surface area (to volume ratio) ; for, enzyme(s) / lipase ;	**2**	**R** molecules
(d)	*fatty acids / glycerol / fats, enter / AW* **1** (micro)villi ; **2** capillaries / blood vessels / blood / circulatory system ; **3** lacteals / lymphatic capillary ; **4** (travel via) lymph / in lymph vessels / in lymph(atic) system ; **5** lymph empties into blood ;	**3**	**MP5 A** tissue fluid / 'body fluid' for lymph **A** lymphatic vessels empty into blood
(e)	**1** fat is deposited in (walls of) arteries ; **2** coronary arteries ; **3** arteries are blocked / blood flow is restricted in arteries ; **4** less / no, blood flow to, heart muscle / cardiac muscle / wall of heart ; **5** less / no, nutrients / glucose / oxygen, reaches heart, muscle / walls / cells ; **6** AVP ;	**3**	**I** veins / blood vessels **A** narrows (lumen of) arteries e.g. to form, plaques / atheroma / atherosclerosis roughens the lining of arteries increases blood pressure promotes, blood clotting / thrombus / thrombosis heart muscle, cannot respire (aerobically) / respires anaerobically heart muscle, fatigues / tires / AW ref. to cholesterol heart muscle produces lactic acid
(f)	**1** drug treatment ; **2** aspirin ; **3** to, reduce risk of / prevent, blood clotting ; **4** surgery / operation ; **5** (coronary) by-pass ; **6** described / a piece of blood vessel attached to carry blood around the blocked artery ; **7** angioplasty ; **8** described / tube *or* balloon inserted into artery and inflated to widen artery ; **9** stent(s) ; **10** tube / AW, to, hold arteries open / stop arteries collapsing ; **11** to restore blood supply (to heart muscle) ; **12** AVP ;	**6**	**A** antiplatelets / warfarin **I** 'thins the blood'

04. 0610_w17_MS_43 Q: 2

	Answer	Mark	Partial Marks
(a)(i)	**1** exercise will increase heart rate (from resting rate) ; **2** after exercise heart rate will, remain high / start decreasing ; **OR** **3** there is no effect of exercise on heart rate ; is the null hypothesis ;	**2**	**A** before exercise heart rate will be lower
(a)(ii)	**1** fingers on, wrist / neck / artery ; **2** number beats over a period of time / bpm ; **3** use a heart rate monitor / AW ; **4** contact of sensor with skin ;	**2**	
(b)	**1** lack of, blood supply / oxygen / glucose to heart, wall / muscle / tissues / cells ; **2** less / no, (aerobic) respiration / described ; **3** (heart) tissue / cells, die ; **4** heart (muscle) cannot contract ;	**2**	**A** more anaerobic
(c)	*description* **1** no difference between groups at 0 months ; **2** HRR in **A** increases and **B** increases and then decreases ; **3** (at) 3 months, little difference between groups / group **B** higher ; **4** (at) 6 months / at end, group **A** higher HRR (than group **B**) ; **5** comparative data quote with units ; *explanation* **6** (regular) exercise improves, HRR / fitness ; **7** exercise, strengthens heart muscle / increases, stroke volume / cardiac output ; **8** *idea that* anaerobic respiration / oxygen debt reduces HRR ; **ora** **9** given plan has better long term effect / without given plan better short term effect ; **10** patients may stick to given plan better (than their plan) ; **ora** **11** without a given plan patients probably started with a higher intensity plan ; **ora** **12** given plan may be better designed (to improve HRR long term) ; **ora**	**6**	**A** fitness or HR for HRR throughout **A** both groups increase HRR overall
(d)	**1** reduced, salt / (saturated) fats / cholesterol ; **2** stop smoking ; **3** reduce stress ; **4** AVP ; e.g. / medication qualified / control diabetes / reduced alcohol / reduce blood pressure	**1**	

05. 0610_s16_MS_41 Q: 1

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>
<table>
<tr><th>function</th><th>letter on Fig. 1.1</th><th>name</th></tr>
<tr><td>structure that separates oxygenated and deoxygenated blood</td><td>F</td><td>septum ;</td></tr>
<tr><td>structure that prevents backflow of blood from ventricle to atrium</td><td>D</td><td>bicuspid / mitral / atrioventricular, valve ;</td></tr>
<tr><td>blood vessel that carries oxygenated blood</td><td>A</td><td>aorta</td></tr>
<tr><td>blood vessel that carries deoxygenated blood</td><td>B
H</td><td>pulmonary artery
vena cava ;</td></tr>
<tr><td>structure that prevents backflow of blood from pulmonary artery to right ventricle</td><td>K</td><td>semilunar valve ;</td></tr>
<tr><td>chamber of the heart that contains oxygenated blood</td><td>C
E</td><td>left atrium
left ventricle ;</td></tr>
<tr><td>chamber of the heart that pumps deoxygenated blood</td><td>J
G</td><td>right atrium
right ventricle ;</td></tr>
</table>
</td><td>[6]</td><td>A ‘AV valve’
R right atrioventricular valve</td></tr>
<tr><td>(b) (i)</td><td>pulse rate increases and remains constant ;
immediate / sudden / steep / rapid / AW, increase in pulse rate ;
increases from 44–48 bpm to 164–170 bpm ;

maximum / 164–170 bpm, at, 4 min(utes) / 2 min(utes) after race starts ;</td><td>[max 3]</td><td>units must be used
R exponential
increases by 120–126 bpm / by 3.5 to 4 times or approx. 4</td></tr>
<tr><td>(ii)</td><td>adrenaline stimulates increase in, heart / pulse, rate ;
increase in blood, carbon dioxide (concentration) / acidity, detected ;

nerves stimulate heart to beat faster ;

ref to muscle contraction / AW ;
muscles require more energy / muscles are doing more work ;
(rate of aerobic) respiration increases ;
increase demand for, oxygen / glucose ;
ref to removal of, carbon dioxide / lactic acid / heat ;
more, blood / carbon dioxide, to lungs (per unit time) ;
more, blood / oxygen / glucose, to muscles ;

AVP ; e.g. ref to ATP / vasodilation in muscles</td><td>[max 4]</td><td>A decrease in pH

‘more’ / ‘increases’, is only needed once

R ‘produce energy’ once only</td></tr>
<tr><td></td><td></td><td>[Total: 13]</td><td></td></tr>
</table>

06. 0610_s16_MS_42 Q: 1

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>septum ;</td><td>[1]</td><td></td></tr>
<tr><td>(b) (i)</td><td>blood flows through heart twice, for one (complete) circuit / to get backto the same point ;
one loop to lungs, and one loop to rest of the body ;</td><td>[max 1]</td><td></td></tr>
<tr><td>(ii)</td><td>high(er), blood pressure / flow rate (than single circulation) ;
allows different blood pressure in each loop ;
prevent mixing of oxygenated and deoxygenated blood ;
allows animals to have high metabolic rates ;
allows animals to be, large / tall ;</td><td>[max 1]</td><td>A more efficient / faster, delivery / removal, of a named blood component e.g. oxygen
I maintain blood pressure</td></tr>
<tr><td>(c)</td><td><table><tr><th>description</th><th>name of structure</th><th>letter on Fig 1.1</th></tr><tr><td>heart chamber with the thickest muscular wall</td><td>left ventricle</td><td>C ;</td></tr><tr><td>the blood vessel carrying oxygenated blood to the heart</td><td>pulmonary vein</td><td>K ;</td></tr><tr><td>the blood vessel that carries oxygenated blood away from the heart</td><td>aorta</td><td>P ;</td></tr><tr><td>a blood vessel that carries blood away from the kidneys</td><td>renal vein</td><td>M ;</td></tr><tr><td>the blood vessel with the largest lumen</td><td>vena cava</td><td>N</td></tr></table></td><td>[4]</td><td>one mark for each correct row</td></tr>
<tr><td>(d)</td><td>(blood) enters heart at right atrium / A (from the vena cava / N) ;
then atrium contracts ;
correct ref to atrioventricular valve ;
then to right ventricle / D ;
then ventricle contracts ;
correct ref to semi-lunar valves ;
then pulmonary artery / J, to lungs / O ;</td><td>[max 4]</td><td>R contradictions between letters and structures
I valves unqualified</td></tr>
<tr><td>(e) (i)</td><td>(more) exercise / AW ;
stop / less, smoking ;
reduced stress ;</td><td>[max 1]</td><td>I ref to diet</td></tr>
<tr><td>(ii)</td><td>stent ;
small mesh tube inserted in artery ;
opens / supports, (narrow / weak) artery ;
(balloon) angioplasty / dilatation ;
(tube / catheter with) balloon inserted into artery ;
inflate balloon to widen artery ;
by-pass ;
(another / shunt) blood vessel joined / grafted / replace, artery ;</td><td>[max 2]</td><td>max 1 if no named procedure.
I open heart surgery / heart transplants</td></tr>
<tr><td></td><td></td><td>[Total: 14]</td><td></td></tr>
</table>

07. 0610_s17_MS_43 Q: 1

	Answer	Mark	Partial Marks
(a)(i)	arrow / (s) from a vena cava through atria and into right ventricle ;	1	
(a)(ii)	**C**, aorta ;	1	
(b)(i)	ventricles relax ; increased volume of ventricles ; higher blood pressure in, the arteries / **C**, **D** and **E** / aorta and pulmonary artery (than in the ventricles) ; **ora**	1	
(b)(ii)	stop back-flow (of blood) / ensure (blood) flows one way ;	1	**I** pressure changes
(c)	1 (right) ventricle contracts ; 2 blood pressure increases (in heart) ; 3 higher blood pressure in ventricles than in arteries ; 4 semilunar valve / valve **1**, opens ; 5 blood flows into, **D** / **E** / pulmonary artery ; 6 semilunar valve closes (when blood in pulmonary artery) ; 7 **D** / **E**, is a pulmonary artery ; 8 valve **1** is a semilunar valve ;	4	sequence of events must be in the correct order
(d)	1 septum ; *either* 2 separates oxygenated and deoxygenated blood ; *or* 3 to allow a double circulation ;	2	

08. 0610_s19_MS_43 Q: 4

<table>
<tr><th></th><th>Answer</th><th>Mark</th><th>Partial Marks</th></tr>
<tr><td>(a)</td><td>one loop to lungs / pulmonary circulation, and one loop to rest of the body / systemic circulation ;
blood flows through heart twice, for one (complete) circuit / to get back to the same point ;</td><td>1</td><td></td></tr>
<tr><td>(b)</td><td>lymphocyte / AW ;
engulf/ digest / kill / destroy, bacteria / pathogens ;
platelet ;
red blood cell ;</td><td>4</td><td></td></tr>
<tr><td>(c)</td><td>wall of artery thicker than wall of vein ;
lumen labelled in both drawings ;</td><td>2</td><td></td></tr>
<tr><td>(d)(i)</td><td>arrow(s) start in right-hand side of heart in correct direction ;
arrow(s) point upwards inside pulmonary artery ;</td><td>2</td><td></td></tr>
<tr><td>(d)(ii)</td><td><table><tr><th>statement</th><th>name of structure</th><th>letter from Fig. 4.1</th></tr><tr><td>chamber that creates the highest blood pressure</td><td>left ventricle</td><td>F ;</td></tr><tr><td>blood vessel containing blood with the highest concentration of oxygen</td><td>pulmonary vein / aorta</td><td>C / A ;</td></tr><tr><td>structure that prevents blood going from ventricle to atrium</td><td>atrioventricular valve</td><td>E ;</td></tr><tr><td>structure that prevents backflow of blood from artery to ventricle</td><td>semilunar valve</td><td>K ;</td></tr><tr><td>chamber that receives blood from vena cava</td><td>right atrium</td><td>J ;</td></tr></table></td><td>5</td><td>one mark per row</td></tr>
<tr><td>(e)</td><td>tissue fluid drains (into lymphatic vessels) ;
transports tissue fluid ;
back into the blood / circulatory system ;
contains, lymphocytes / antibodies (in lymph nodes) ;
defence against infection / provide (active) immunity / AW ;
(lacteals) absorbs /transports, fats / fatty acids ;
from small intestine / duodenum / ileum ;
AVP ;</td><td>3</td><td></td></tr>
</table>

09. 0610_w19_MS_41 Q: 5

	Answer	Mark	Partial Marks
(a)(i)	coronary artery ;	1	
(a)(ii)	ref. to platelets ; fibrinogen converted to fibrin ; soluble to insoluble ; forms a mesh ; traps, (red blood) cells ;	3	
(a)(iii)	aspirin / AVP ;	1	
(b)(i)	98 (%) ;;;	3	one mark for correct readings from graph one mark for correct calculation one mark for correctly rounding to a whole number
(b)(ii)	*argument for:* as exercise increased CHD deaths decreased ; **ora** comparative data quote with units ; the same group of people were studied ; regular measurements were taken ; large benefit for doing only a small amount of exercise (therefore easy to do) ; even if there are some doubts about the benefits no harm will be done / AW ; *argument against:* only women in the study ; **ora** none younger than 35 (at the start of the study) ; **ora** actual number of deaths per 10 000 is very small even for those that do not exercise ; other risk factors not considered ; named examples of other risk factors ;; e.g. diet / smoking / alcohol / genetics some women may have forgotten / not answered correctly about how much exercise they did / AW ; some women may have been successfully treated for CHD / not died from the condition / AW ; other variables not considered ; e.g. pre-existing conditions / medication / type of exercise / length of exercise	5	
(c)	more blood, to muscles ; to deliver more, oxygen / glucose ; for muscle contraction ; for (aerobic) respiration ; more energy required ; ref. to adrenaline ;	3	

10. 0610_w18_MS_43 Q: 6

	Answer	Mark	Partial Marks
(a)(i)	diffusion ;	1	
(a)(ii)	blood (in capillaries / **A**) is under (high) pressure ; (liquid) forced out (of capillaries / **A**) ; *ref. to* thin walls / pores / holes, in capillary (walls / bed) ; *ref. to* osmosis (through capillary walls / membranes) ; to form tissue fluid (in **B** / outside of cells) ;	2	
(a)(iii)	red blood cells ; (large / named) proteins ; platelets ; AVP ;	1	
(b)(i)	(semi-lunar) valves ; large, lumen / AW ; thin(ner) walls (than arteries) ; (thin) elastic, tissue / layer / wall ; (thin) muscle, tissue / layer / wall ; AVP ;	2	
(b)(ii)	transports lymph ; transports, named component of lymph ; (lymphatic vessel) absorbs excess (tissue) fluid (from **B**) ; returns fluid to, blood / circulatory system ; AVP ;	2	
(c)	*location*: in villi / small intestine ; *function:* absorbs / transports, fats / fatty acids ;	2	
(d)(i)	lymph node ;	1	
(d)(ii)	(lymphocytes) provide (active) immunity ; produce antibodies ; (antibodies) lock-on to antigens ; (antibodies mark) pathogen / antigen, for destruction / AW ; (lymphocytes) produce memory cells ;	2	**A** protect against, infection / pathogen **A** *ref. to* specificity **A** kill pathogen **A** ref. to long-term immunity

11. 0610_s16_MS_43 Q: 4

	Answer	Mark	Partial Marks
(a) (i)	iodine solution diffused, into the bag / through the (Visking) tubing ; iodine molecules small (enough to pass through the membrane) ; iodine solution stains starch **ora** ; no starch diffused, out of the bag / through the (Visking) tubing ; starch molecules too large (to pass through the membrane) ; ref to pore / AW, size ;	[max 4]	**I** osmosis
(ii)	temperature ; (surface) area ; concentration (gradient) / water potential ; size / type, of molecule ; thickness / distance, across membrane / permeability (of membrane) ; pressure ; (number of) protein, channels / pumps / AW ; energy / number of mitochondria ;	[max 3]	**I** distance / thickness unqualified
(b) (i)	*from muscle cell* (produced in) mitochondrion ; diffused ; (diffused) in cytoplasm / tissue fluid / (blood) plasma ; through membrane ; through capillary wall ; *from blood:* vein / vena cava / pulmonary artery / heart ; travels to lungs ; into alveoli ; exhaled / breathed out / excreted ;	[3]	**A** red blood cell **I** exit the body unqualified
(ii)	thin, wall / epithelium ; for efficient, diffusion / gas exchange ; small, diameter / lumen ; idea that many capillaries can fit into tissues / capillaries reach (every cell) throughout the body / relative size to red blood cell ; extensive network ; large surface for diffusion ; capillary cells have pores ; to allow substances to pass in and out of the blood easily ;	[max 3]	adaptations must be linked to correct feature max 2 for features only **A** one cell thick **R** 'thin cell wall'
(c)	diffusion ; down concentration gradient ; (diffuses) through stoma / stomata ; (through) (intercellular) air space / (between) spongy mesophyll ; into / reached, palisade, mesophyll / cell ; chloroplast ; AVP ; e.g. dissolve / diffuse, through cell wall / cell membrane / cytoplasm	[max 4]	**A** lower concentration of carbon dioxide inside leaf / **ora** ; **A** into guard cell / spongy, mesophyll / cell **I** chlorophyll
		[Total: 17]	