Write your name, centre number and candidate number in the boxes below.

Surname	Other names

Centre number | | | | | |

Candidate number | | | | |

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Transport in animals

Time allowed: 1 hour 35 minutes

Subject code **0610**

Biology

Questions from Paper 3, Paper 4 and Paper 6

You must have: a ruler marked in centimetres and millimetres, a protractor, compasses, a pen, an HB pencil and an eraser.

Total marks

/ 96

Instructions

- Answer every question in the space provided on this paper.
- Write in black or dark blue ink. Pencil may be used for diagrams and graphs.
- Fill in your name, centre number and candidate number above.
- Show your working: a correct method can earn marks even if the answer is wrong.

Information

- This paper has 10 questions worth 96 marks in total.
- The marks for each question or part are shown in brackets, for example [3].

Advice

- Read every question through once before you write anything.
- Use the marks in brackets to judge how long to spend on each part.
- If you finish early, go back and check your working.

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Print at 100% (Actual size) so diagrams keep their real measurements.

1 Fig. 2.1 shows an external view of a human heart seen from the front.

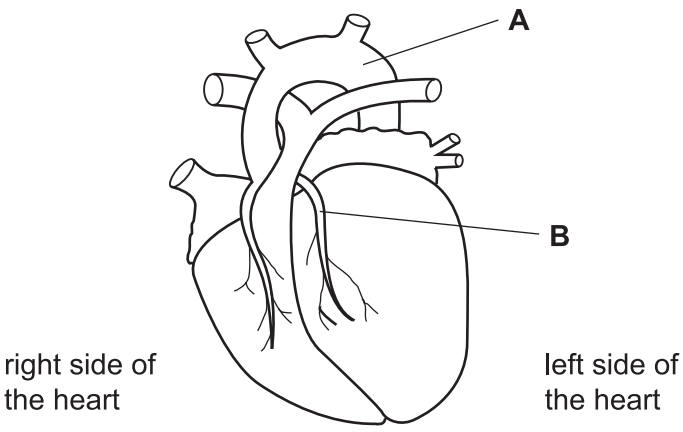


Fig. 2.1

(a) (i) Name blood vessel **A**.

.....

[1]

(ii) Blood vessel **B** supplies blood to the muscle of the heart wall.

Name blood vessel **B**.

.....

[1]

(iii) State what happens if blood vessel **B** becomes blocked.

.....

.....

[1]

(iv) Describe **and** explain how the structure of the left ventricle differs from the structure of the right ventricle.

.....

.....

.....

.....

.....

[2]

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(b) Exercise affects pulse rate.

Describe how you would measure a person's pulse rate.

.....

.....

.....

.....

..... [2]

[Total: 7]

Heart and circulation Click for more variations

Reduced to 75% to fit the page (wider than A4).

1 (a) (i)	aorta;	[1]	
(ii)	coronary artery;	[1]	A – coronary vessel R – coronary vein
(iii)	no oxygen getting to heart muscle; severe pain / heart attack occurs / heart muscle dies;	 Max [1]	 A – description of heart attack
(iv)	wall / muscle of left ventricle much thicker / stronger than wall / muscle of right ventricle; L.V. has to force blood all round body / must create more force / pressure;	 [2]	A – ref LV valve 2 flaps, RV valve 3 flaps – 1 mark A – ORA
(b)	select suitable / named position (of artery); press on artery with fingers; count number of beats per minute / unit time;	 Max [2]	 R – thumb A – ref to pulse / heart rate meter
		[Total: 7]	

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2 **(a)** Arteries are a type of blood vessel.

State **two** structural features of arteries.

1 .....

2 .....

[2]

(b) Capillaries are another type of blood vessel.

State **one** function of capillaries.

.....

..... [1]

(c) State the name of the structures in veins that ensure the one-way flow of blood.

..... [1]

(d) Fig. 1.1 is a diagram of part of the human circulatory system.

The arrows show the direction of blood flow.

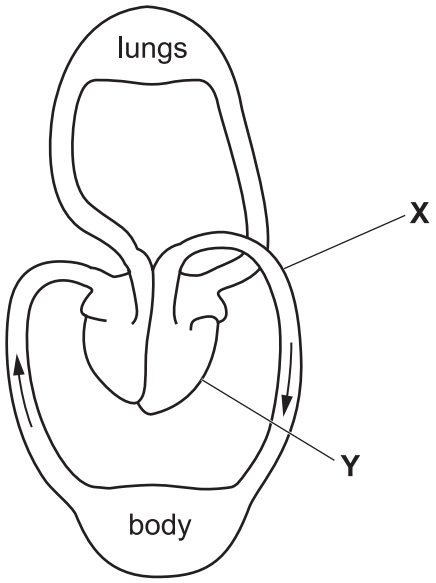


Fig. 1.1

(i) **On Fig. 1.1**, draw arrows to show the direction of blood flow to and from the lungs. [1]

(ii) State the names of blood vessel **X** and organ **Y** in Fig. 1.1.

blood vessel **X** .....

organ **Y** .....

[2]

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(e) State the name of the blood vessel that transports oxygenated blood to the kidney.

..... [1]

[Total: 8]

Blood vessels Click for more variations

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2(a)	*any two from:* narrow lumen **;** thick wall **;** (wall contains) muscle layer **;** contains elastic fibres **;** AVP **;**	**2**	
2(b)	transfer of (named) materials between blood and tissues / transport materials, to / from, cells / transport materials, to / from, blood / AW **;**	**1**	
2(c)	valves **;**	**1**	
2(d)(i)	arrows drawn from the pulmonary artery to the lungs **and** arrow from the lungs to the left atrium **;**	**1**	
2(d)(ii)	***X****:* aorta **;** ***Y****:* heart **;**	**2**	
2(e)	renal artery **;**	**1**	

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3 **(a)** Fig. 7.1 is a diagram of the circulatory system.

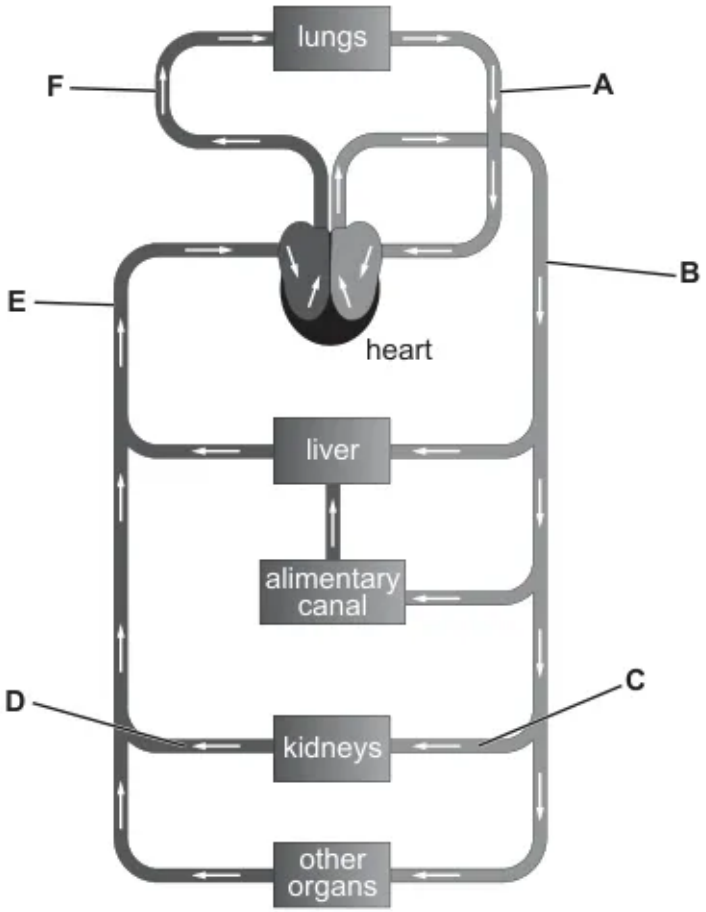


Fig. 7.1

(i) State the names of the blood vessels labelled **A**, **C** and **E** in Fig. 7.1.

A .....

C .....

E .....

[3]

(ii) State the letter in Fig. 7.1 that identifies the blood vessel that contains the highest oxygen concentration.

..... [1]

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(b) Describe **three** ways the structure of arteries differs from the structure of veins.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) White blood cells are one of the components of blood.

(i) State **two** functions of white blood cells.

1 .....

2 .....

[2]

(ii) State **two other** main components of blood.

1 .....

2 .....

[2]

[Total: 11]

Blood vessels Click for more variations

Reduced to 75% to fit the page (wider than A4).

3(a)(i)	**A** - pulmonary vein ; **C** - renal artery ; **E** - vena cava ;	**3**	
3(a)(ii)	**A** ;	**1**	**A** any artery except **F**
3(b)	*any three from:* *(arteries have)* thick(er) wall ; thick(er) / more, muscle ; thick(er) / more, elastic layer ; narrow(er) lumen / **AW** ; absence of valves (usually) ; **AVP** ; e.g. convoluted, endothelium / inner layer **AW** / more connective tissue	**3**	
3(c)(i)	phagocytosis ; antibody production ;	**2**	
3(c)(ii)	red blood cells ; plasma ; platelets ;	**2**	

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4 **(a)** Fig. 1.1 is a diagram of part of the human circulatory system.

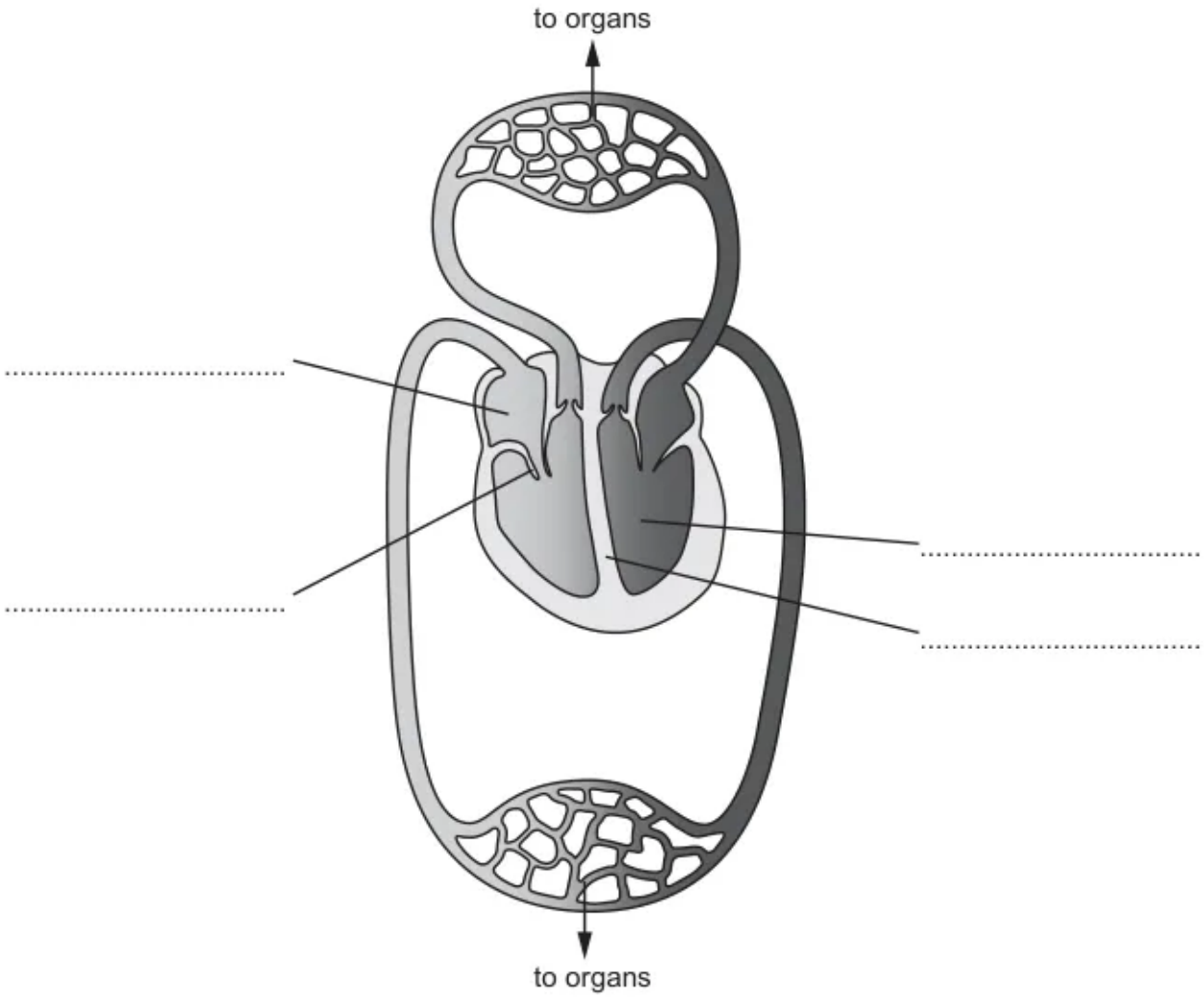


Fig. 1.1

(i) Identify and label on Fig. 1.1 in the spaces provided:

- the left ventricle
- the right atrium
- the septum
- a valve

[4]

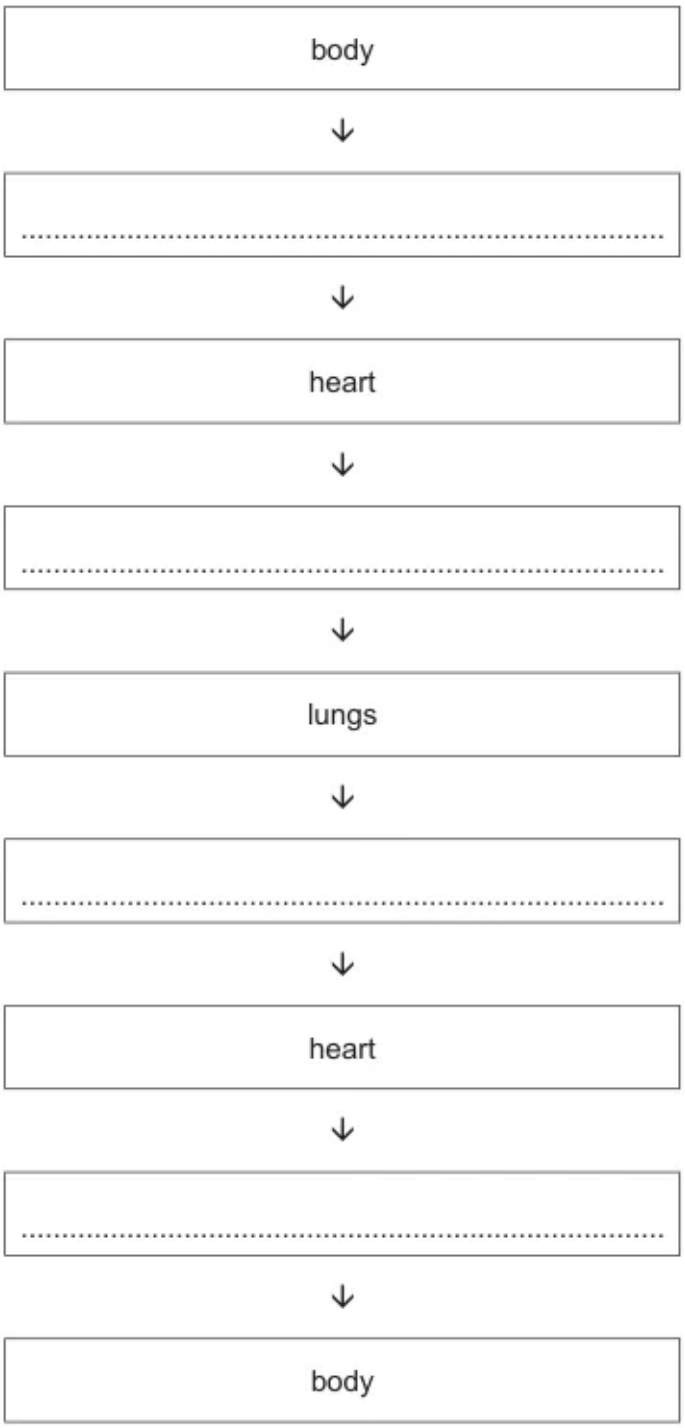
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(ii) Complete the flow chart of the circulatory system by writing the correct blood vessels from the list, in the spaces provided.

The arrows show the direction of blood flow.

Each word or phrase may be used once, more than once or not at all.

aorta	**pulmonary artery**	**pulmonary vein**
renal artery	**renal vein**	**vena cava**



[4]

(b) A healthy diet is recommended to reduce the risk of coronary heart disease (CHD).

State **three** other risk factors for CHD.

1 .....

2 .....

3 .....

[3]

[Total: 11]

Heart and circulation Click for more variations

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4(a)(i)	left ventricle ; septum ; valve ; right atrium ;	**4**	labels in this order starting clockwise from top right side of the diagram
4(a)(ii)	vena cava ; pulmonary artery ; pulmonary vein ; aorta ;	**4**	
4(b)	*any three from:* stress ; smoking ; genetic (predisposition) ; age ; sex ; AVP ;;; e.g. lack of exercise / high blood pressure / high (blood) cholesterol / diabetes / obesity	**3**	

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5 The heart pumps blood around the body.

(a) Explain why the heart is an organ.

.....

.....

..... [1]

(b) Complete the sentences:

The ..... system includes the heart and blood vessels. Deoxygenated blood from the body is transported to the heart in the ..... .

During a heart beat the ventricles contract. The right ventricle pumps deoxygenated blood to the lungs. The right ventricle has a ..... muscular wall than the left ventricle.

Gas exchange in the lungs occurs by ..... . Oxygenated blood travels back to the heart where it enters the ..... of the heart.

The two sides of the heart are separated by the ..... . This structure prevents the mixing of oxygenated and deoxygenated blood. Oxygenated blood is then delivered to the rest of the body. Blood is supplied to the muscle of the heart in the ..... .

[7]

(c) Many people monitor their heart rate by counting their pulse.

State **one** other method of monitoring heart rate.

..... [1]

[Total: 9]

Heart and circulation Click for more variations

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5(a)	(group of) tissues working together, to pump blood around the body / AW / performing the (same) function ;	**1**	
5(b)	**1** circulatory ; **2** vena cava ; **3** thinner ; **4** diffusion ; **5** left atrium ; **6** septum ; **7** coronary, artery / arteries ;	**7**	MP1 **A** cardiovascular / circulation MP2 **A** veins MP3 **A** less
5(c)	ECG / electrocardiogram / listening to valves close / AVP ;	**1**	

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6 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**.

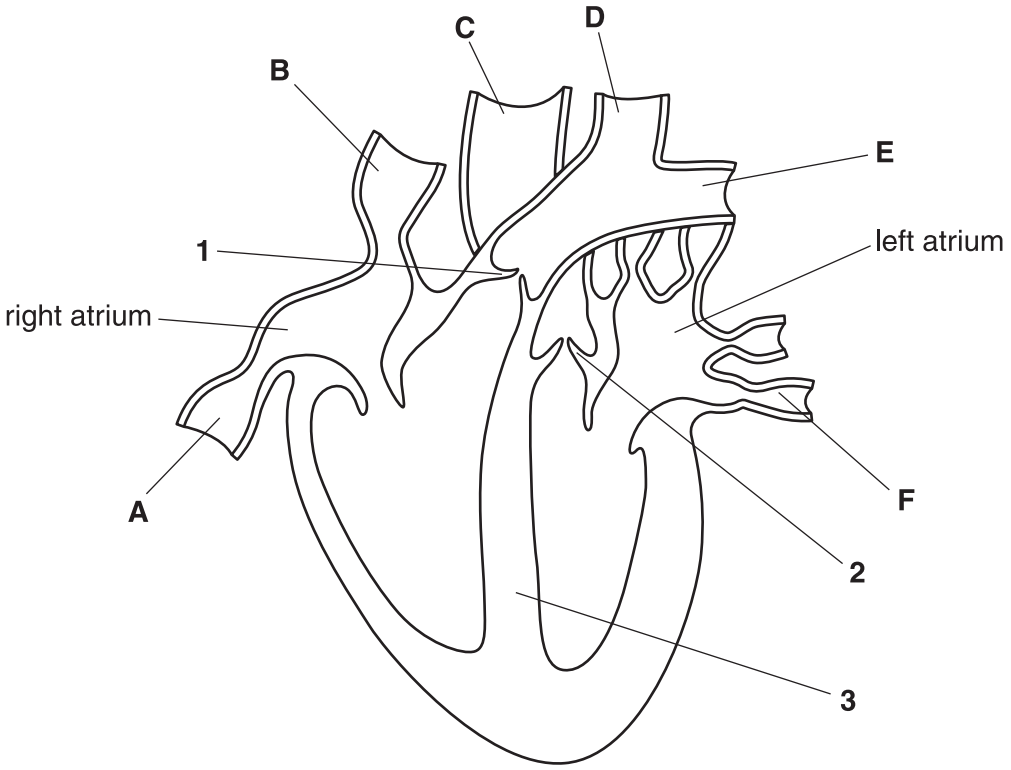


Fig. 1.1

(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]

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(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.

.....

.....

.....

.....

.....

.....

.....

.....

.....[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]

Heart and circulation Click for more variations

Reduced to 77% to fit the page (wider than A4).

6(a)(i)	arrow / (s) from a vena cava through atria and into right ventricle ;	**1**	
6(a)(ii)	**C**, aorta ;	**1**	
6(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**	
6(b)(ii)	stop back-flow (of blood) / ensure (blood) flows one way ;	**1**	**I** pressure changes
6(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
6(d)	1 septum ; *either* 2 separates oxygenated and deoxygenated blood ; *or* 3 to allow a double circulation ;	**2**	

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7 Fig. 4.1 shows a vertical section of a human heart.

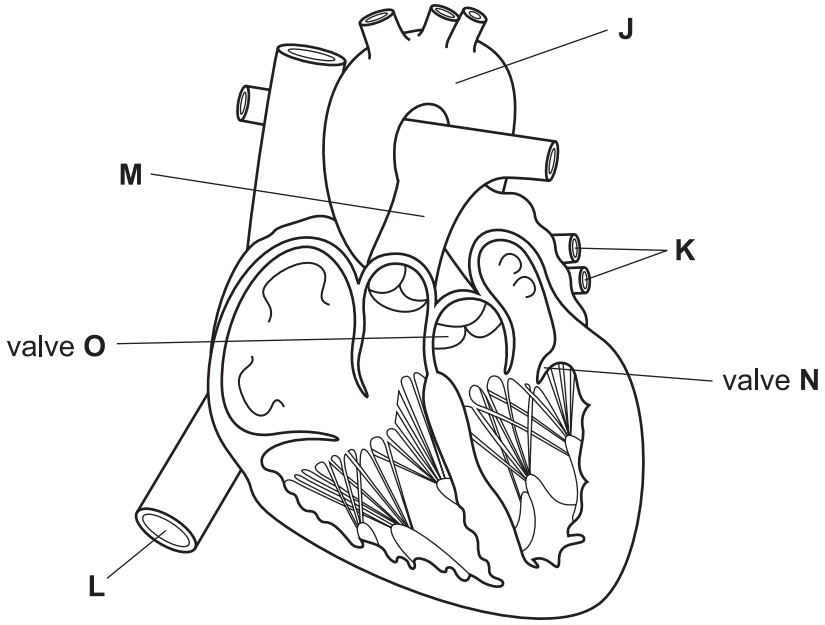


Fig. 4.1

(a) Identify the blood vessels labelled **J** to **M**.

J .....

K .....

L .....

M ..... [4]

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(b) Sensors that detect changes in blood pressure were placed into the blood vessels surrounding the heart. Recordings were taken at the times when the ventricles contracted and when they relaxed.

The blood pressures recorded are shown in Table 4.1.

Table 4.1

blood vessel	blood pressure / kPa	
	contraction of the ventricles	relaxation of the ventricles
J	16.0	10.0
K	0.3	0.3
L	0.3	0.3
M	2.0	0.5

(i) Explain why the pressure in blood vessel **J** is greater than the pressure in blood vessel **M**.

.....

.....

.....

.....

..... [2]

(ii) Explain why the pressure in blood vessels **K** and **L** is much less than the pressure in blood vessels **J** and **M**.

.....

.....

.....

..... [2]

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(c) Explain how the valves at **N** and **O** maintain one-way flow of blood through the heart.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(d) Other than in the heart, state where valves similar to those at **O** are found in the circulatory system.

.....

..... [1]

[Total: 13]

Blood vessels Click for more variations

Reduced to 77% to fit the page (wider than A4).

7 **(a)**	**J** – aorta ; **K** – pulmonary vein ; **L** – vena cava ; **M** – pulmonary artery ;	[4]	
(b) **(i)** **1** **2** **3** **4** **5**	**J** – blood goes to the whole body / greater distance ; **M** – blood goes to the lungs / shorter distance ; **J** – blood is pumped by, more muscular, ventricle ; **M** – blood is pumped by, less muscular, ventricle ; greater resistance to blood flow in circulation to the body / ora ;	[max 2]	
(ii)	(blood in **K** and **L**) travelled through the capillaries ; larger / wider lumen ;	[2]	
(c) **1** **2** **3** **4** **5** **6** **7**	*Valve N* opens when, atrium contracts ; closes when ventricle contracts ; stops back flow from ventricle to atrium ; *Valve O* opens when ventricle contracts ; closes when ventricle relaxes ; stops back flow from, **J**, to ventricle ; description of way in which valve 'flaps' or 'pockets' prevent backflow ;	[max 4]	
(d)	veins ;	[1]	

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8 Fig. 6.1 is a photomicrograph of a blood clot.

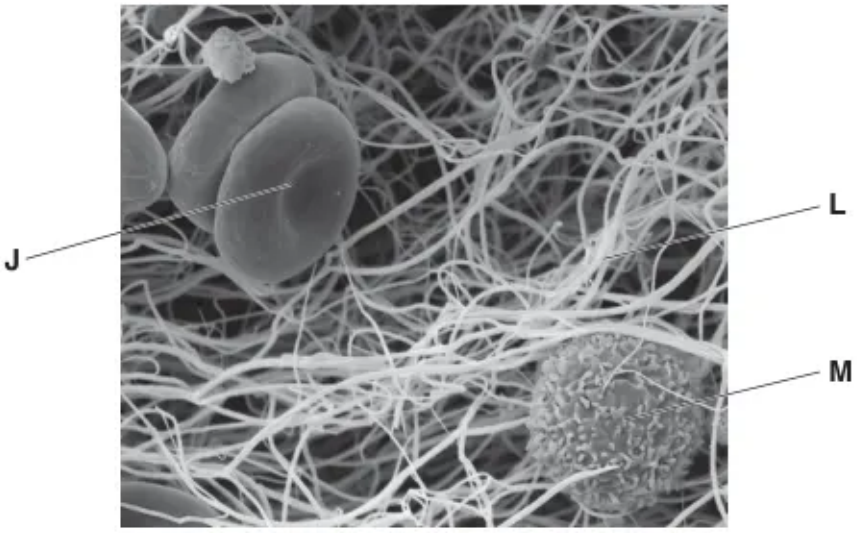


Fig. 6.1

(a) Describe how a blood clot forms.

Use the letters in Fig. 6.1 in your answer.

.....

.....

.....

.....

.....

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.....

.....

..... [5]

STEM

(b) State the importance of blood clotting.

.....

.....

.....

.....

..... [2]

(c) There are four blood group phenotypes A, B, AB and O in humans.

(i) Define the term *phenotype*.

.....

.....

..... [1]

(ii) State the name of the type of inheritance that is shown by blood groups.

..... [1]

(iii) State the **two** possible genotypes for a person who has the phenotype blood group A.

1 .....

2 .....
[2]

[Total: 11]

Blood Click for more variations

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8(a)	*ref. to* platelets ; fibrinogen is converted to fibrin / **L** ; fibrinogen is soluble / fibrin is insoluble ; (**L** / fibrin) forms a, mesh / AW ; (**L** / fibrin) traps / AW, blood cells / **J** / **M** ; **J** is a red (blood) cell ; **L** is fibrin ; **M** is a, white (blood) cell / lymphocyte / phagocyte ;	**5**	
8(b)	prevents blood loss / AW ; prevent (named) pathogens entering a wound ;	**2**	
8(c)(i)	observable features (of an organism) ;	**1**	
8(c)(ii)	co-dominance ;	**1**	
8(c)(iii)	I^AI^A ; I^Ai^o ;	**2**	

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9 Pathogens cause disease.

(a) Fig. 2.1 shows some cells that are part of the human immune system. These cells are responding to one type of pathogen.

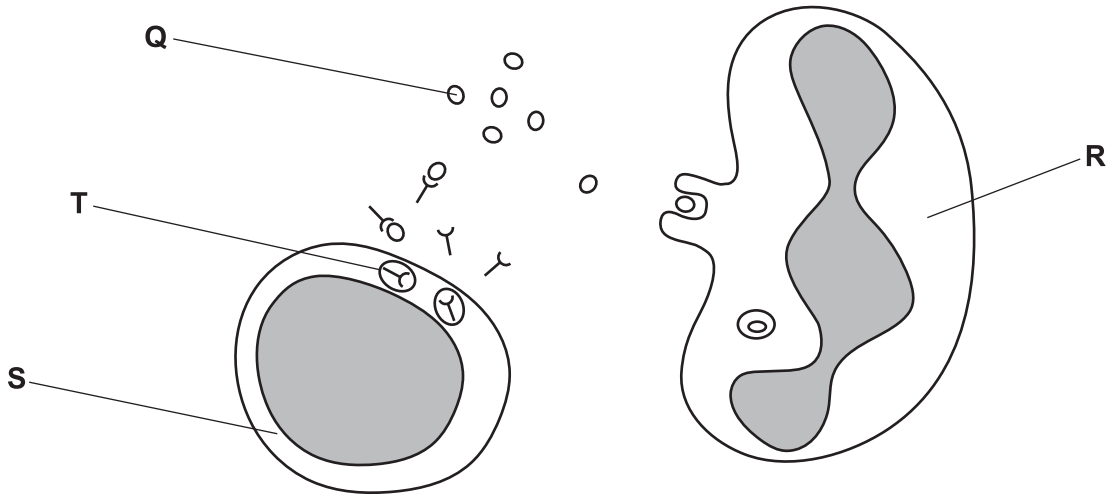


Fig. 2.1

Explain how the immune system responds to an invasion of pathogens.

Use the letters in Fig. 2.1 in your answer.

.....

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..... [6]

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(b) A vaccine was introduced in 1942 for a particular disease.

Fig. 2.2 shows the effect of introducing the vaccine on the number of cases of the disease in one country.

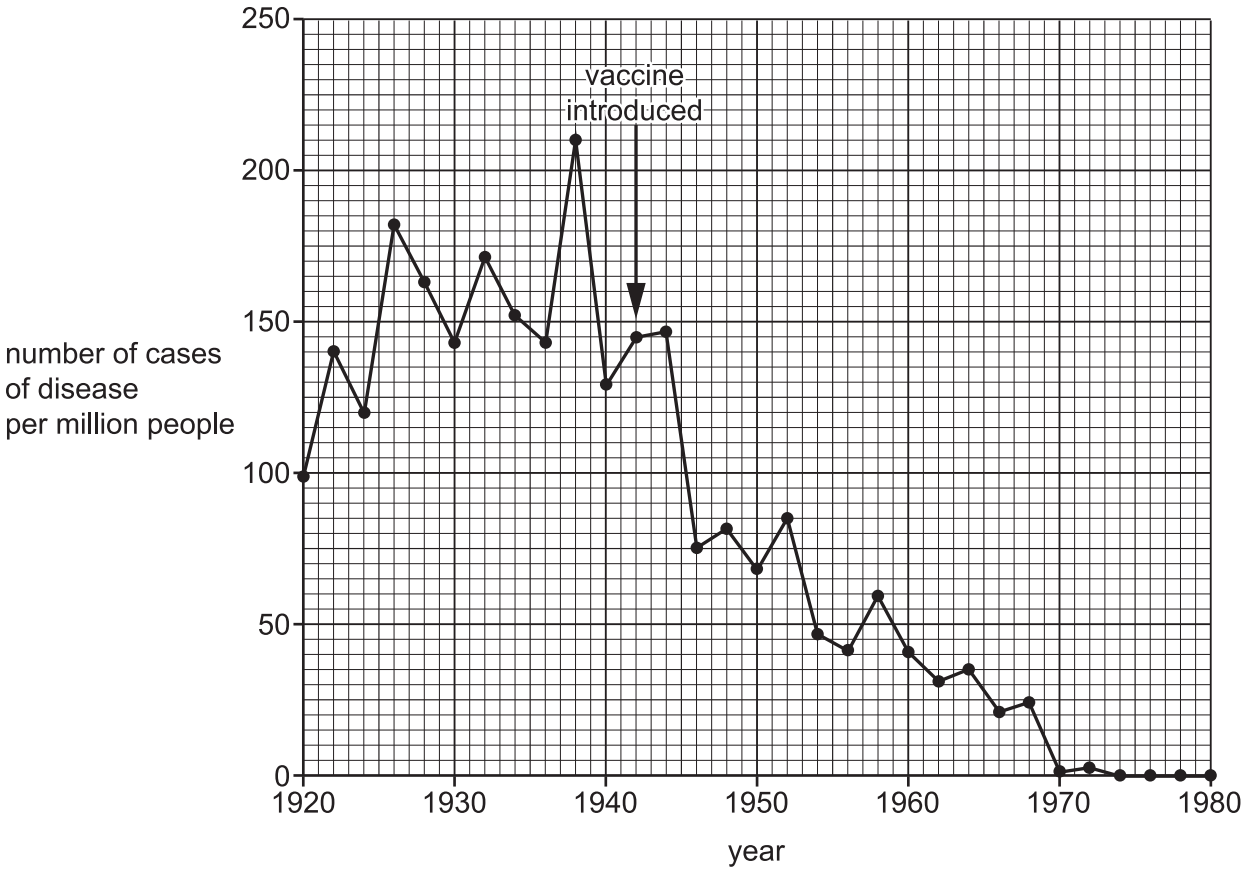


Fig. 2.2

In 1946 the government of the country concluded that the vaccine was successful.

Discuss the evidence, shown in Fig. 2.2, for **and** against this conclusion.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

[Total: 10]

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Blood Click for more variations

9(a)	**Q /** pathogen, are recognized as foreign **;** **Q /** pathogen, will have specific / unique / AW, antigen **;** **S** and **R** are white (blood) cells **;** **S** / lymphocytes, make antibodies **;** **T** are antibodies **;** **T** / antibodies are as specific shape / complementary to, antigen / pathogen / Q **;** **T** / antibodies bind to, antigen / pathogen / Q **;** ref. to forming memory cells **;** ref. to, active / long-term, immunity **;** **R /** phagocytes, engulf, pathogens / antigens **;** **R /** phagocytes, have enzymes / digest pathogens OR antigens **;** **AVP ;**	**6**	
9(b)	*support of conclusion:* general decrease, from 1942 / vaccination **;** cases do not return to pre-vaccine levels / AW **;** no cases from 1974 **;** *against conclusion:* number of cases increased, (during the 2 years) after the vaccine was introduced / until government made its conclusion **;** took 32 years after vaccine introduced before no cases of disease **;** but there are (small) peaks (in cases) / fluctuation (in cases) **;** comparative data quote **;**	**4**	

10 Plan an investigation to determine the effect of exercise intensity on heart rate in humans.

.....

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..... [6]

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Heart and circulation Click for more variations

10	**1** *independent variable* different intensities of exercise / different exercises / exercise for different lengths of time ; **2** *dependent variable* after / during, exercise measure, heart rate / pulse rate ; **3 and 4** *detail of method* ;; • description of named exercise of different intensities • ensuring heart rate returns to resting rate • use of a heart rate monitor **5, 6 and 7** *constant variables* ;;; • same speed / distance / time, of exercise • same age of people • same sex of people • same, person / fitness level / mass of person / height of person / BMI • same, place / time of day / temperature / weather **8** at least three trials / two more repeats ; **9** relevant safety precaution ;	**6**	

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