Transport in Animals (3.2): Eduqas A Level Biology Exam Questions by Topic

26 questions · 68 marks · about 82 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · AS Component 2 · June 2016 · Q5(b) · 2 marks

(b) A double circulatory system is found in mammals whereas a single system is found in fish. Describe the difference between the systems and explain why a double system is more efficient. [2]

Question 2 · AS Component 2 · June 2024 · Q5(a)(i) · 2 marks

5. (a) Insects have open circulatory systems. Their body cavity (haemocoel) is filled with fluid that has direct contact with tissues and contains no haemoglobin.

(i) State **one** advantage and **one** disadvantage of an open circulatory system. [2]

Advantage: .....

.....

Disadvantage: .....

.....

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Question 3 · AS Component 2 · June 2019 · Q5(b)(i) · 2 marks

(b) Many small animals such as earthworms have a circulatory system with a respiratory pigment such as haemoglobin.

(i) Explain why earthworms need a respiratory pigment, but insects do not. [2]

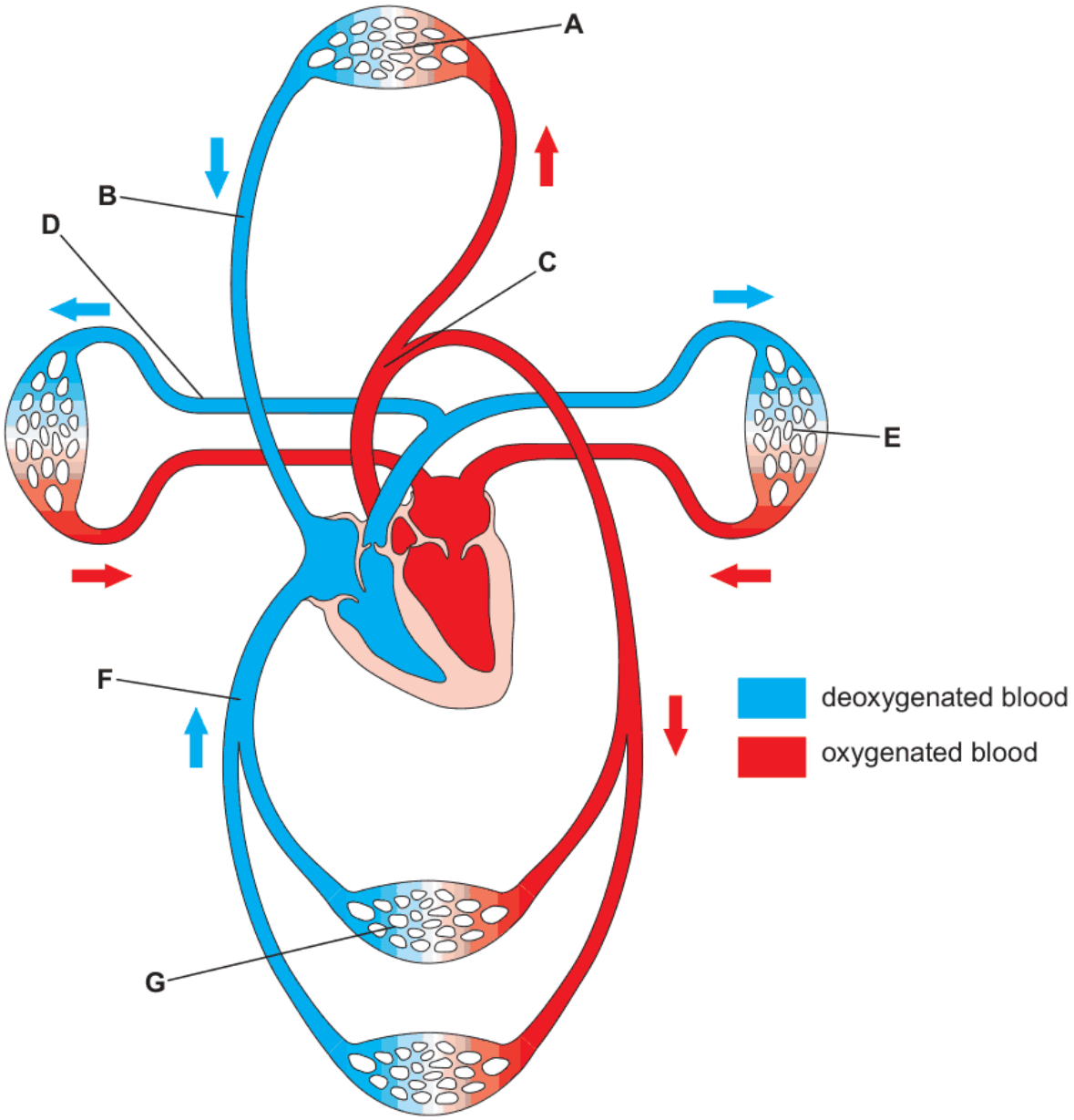
Question 4 · A level Component 3 · June 2019 · Q6(c)(ii) · 2 marks

(ii) To increase the efficiency of glucose transport to their tissues, earthworms have evolved a closed circulatory system. Explain why this is more efficient than the open circulatory system found in insects. [2]

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Question 5 · A level Component 3 · June 2018 · Q2(a) · 3 marks

2. Mammals have a double circulatory system as shown in the diagram below. The arrows show the direction of blood flow.

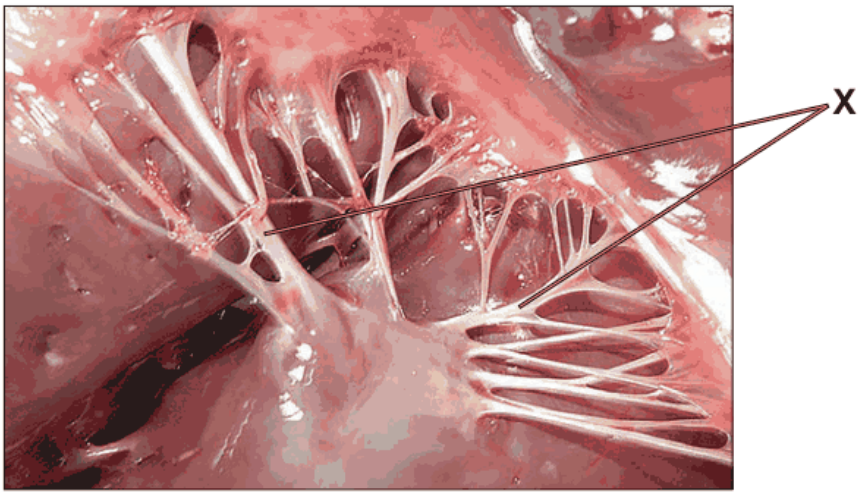


(a) Using **only** the letters **A** to **G** from the diagram, identify the following (letters may be used once, more than once or not at all): [3]

Questions, mark schemes and examiners' report extracts © WJEC CBAC Ltd (Eduqas).

Question 6 · AS Component 2 · June 2019 · Q1(c)(i) · 1 mark

(c) The photograph below shows the detail of the interior of the ventricle of a dissected mammalian heart.



(i) Name the structures labelled **X** in the diagram which are attached to the bicuspid valve. [1]

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Question 7 · AS Component 2 · June 2019 · Q1(c)(ii) · 2 marks

(ii) Explain the function of the structures labelled **X**. [2]

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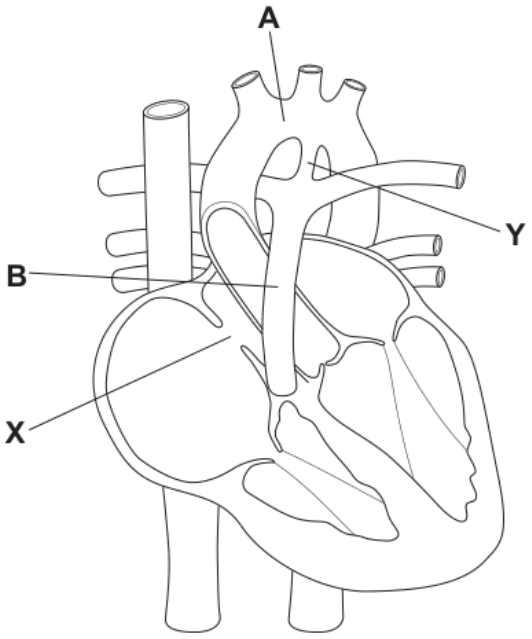
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Question 8 · A level Component 3 · June 2023 · Q3(a)(i) · 3 marks

3. (a) Major changes take place in the circulatory system in humans at birth. A diagram of the foetal heart and associated blood vessels is shown in **Image 3.1**.

Image 3.1



(i) During foetal development there is a hole between the right and left sides of the heart as shown by **X** in **Image 3.1**.
Suggest why this hole is open during foetal development. [3]

Question 9 · A level Component 3 · June 2023 · Q3(a)(ii) · 2 marks

(ii) Shortly after birth, this hole closes. If this hole does not close after birth the individual would have symptoms of fatigue.
Suggest why these symptoms occur. [2]

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Question 10 · A level Component 3 · Autumn 2021 · Q3(d)(ii) · 2 marks

(ii) Explain **one** advantage of capillaries being narrow. [2]

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Question 11 · AS Component 2 · June 2017 · Q1(b)(ii)I · 2 marks

(ii) These events in the cardiac cycle are coordinated by specialised tissues in the heart muscle. Describe the role of the following tissues in the cycle.

I. Sino-atrial node [2]

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Question 12 · AS Component 2 · June 2017 · Q1(b)(ii)II · 2 marks

II. Atrio-ventricular node [2]

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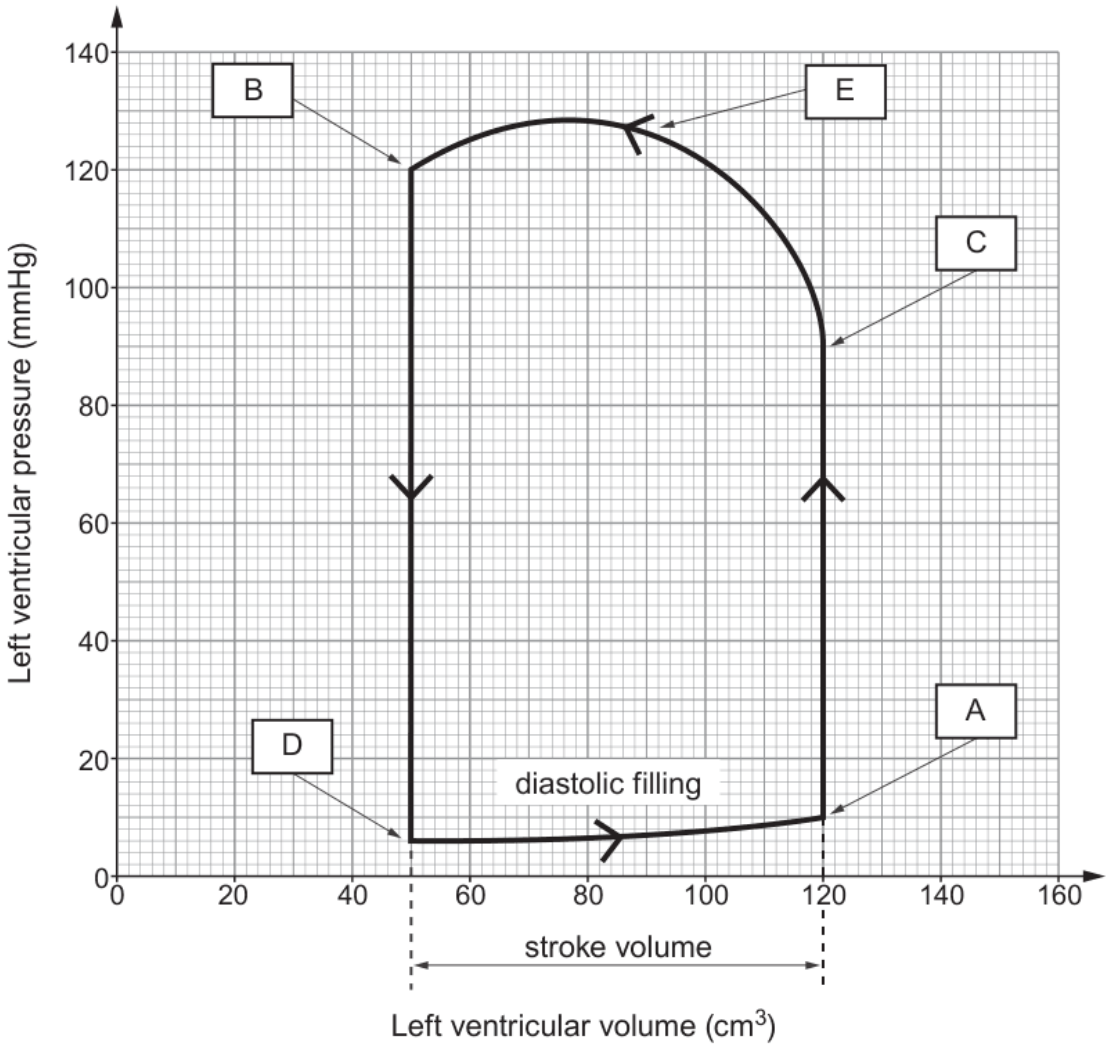
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3. **Graph 3.1** shows how pressure and volume change in the left ventricle during the cardiac cycle in mammals. This is known as a pressure-volume loop. The arrows represent the sequence of these changes during one cardiac cycle. The diagram also shows the stroke volume (SV), which is the volume of blood pumped from the left ventricle during each contraction.

Graph 3.1



(a) (i) Using **graph 3.1**, determine which letter(s) fits the statements in **table 3.2**. The letters can be used, once, more than once or not at all. [4]

Table 3.2

Statement	Letter(s)
Atrio-ventricular valve closes	
Left ventricle is relaxed	
Left ventricle pressure is greater than in the aorta	

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Question 14 · AS Component 2 · Autumn 2020 · Q3(b)(ii) · 3 marks

(ii) Explain why blood only flows into the aorta and nowhere else when the left ventricle contracts. [3]

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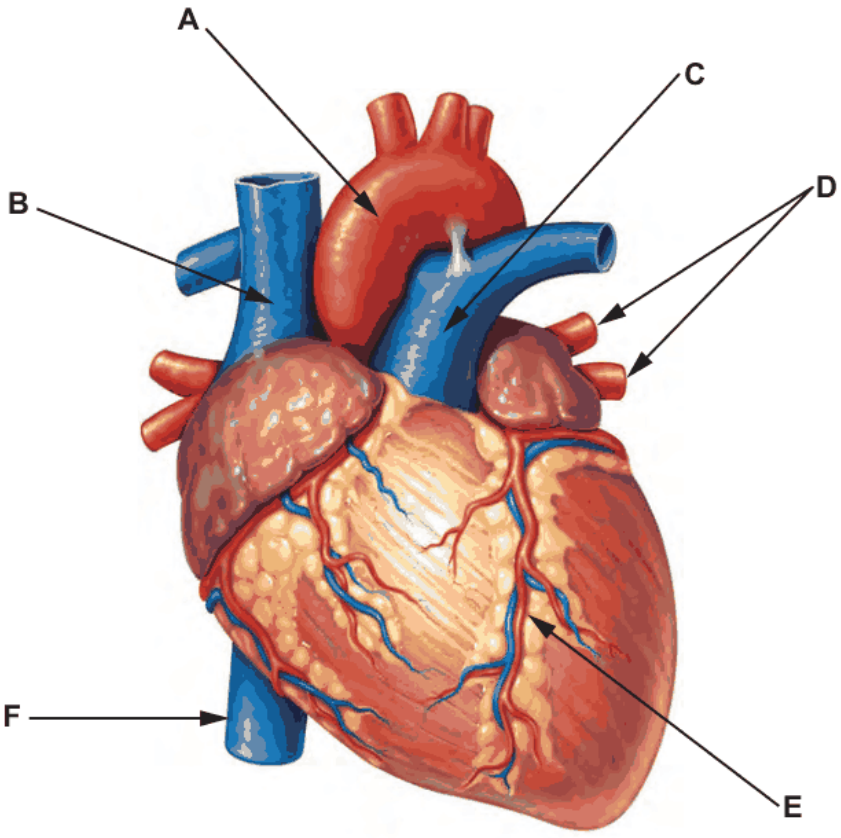
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Question 15 · information from earlier in the question

3. In the UK, coronary heart disease accounts for nearly 73 000 deaths per year and it is estimated that approximately 2.3 million people suffer from a condition called angina. This form of heart disease develops when the blood vessels supplying the heart muscle become narrowed due to the build-up of fatty substances on the inside wall of the vessels. The fatty deposits are called atheroma and cause a condition called atherosclerosis.

The image below shows a model of the human heart together with some of its associated blood vessels.



Questions, mark schemes and examiners' report extracts © WJEC CBAC Ltd (Eduqas).

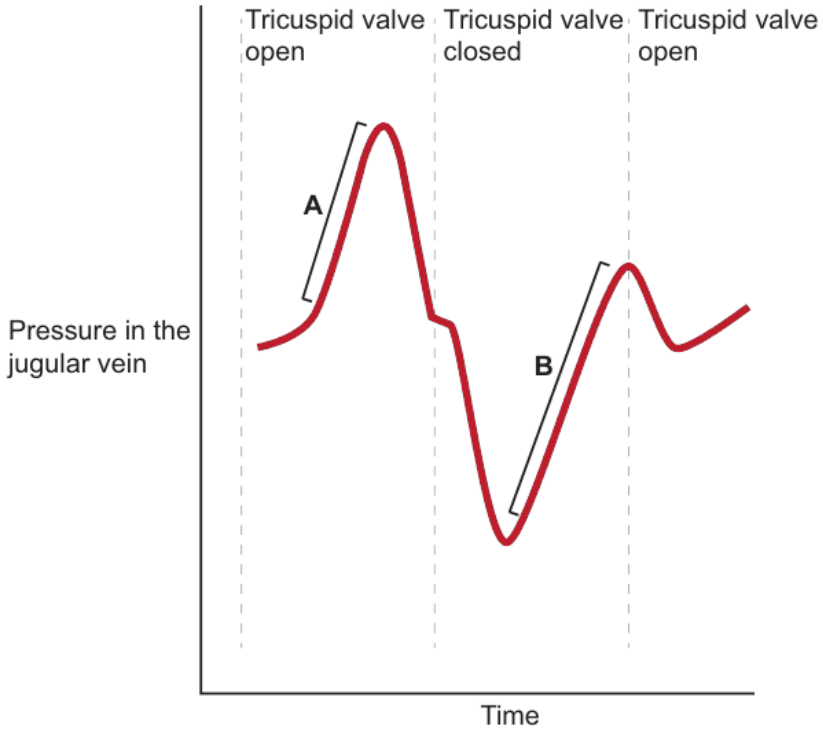
Question 15 · A level Component 3 · June 2017 · Q3(b)(i) · 1 mark

(b) The jugular vein carries blood from the head back to the heart via the vena cava. There are no valves between the jugular vein and the heart. Therefore, the pressure in the jugular vein can be used as an indication of the ability of the heart to pump blood around the body.

(i) Which of the blood vessels labelled **A** to **F** on the image of the heart opposite will return blood from the jugular vein to the heart? [1]

Letter .....

The graph below shows how the pressure in the jugular vein changes during the course of one cardiac cycle.



Question 16 · A level Component 3 · June 2017 · Q3(b)(iii) · 4 marks

(iii) Suggest what causes the increase in pressure in the jugular vein in the regions labelled **A** and **B** on the graph. [4]

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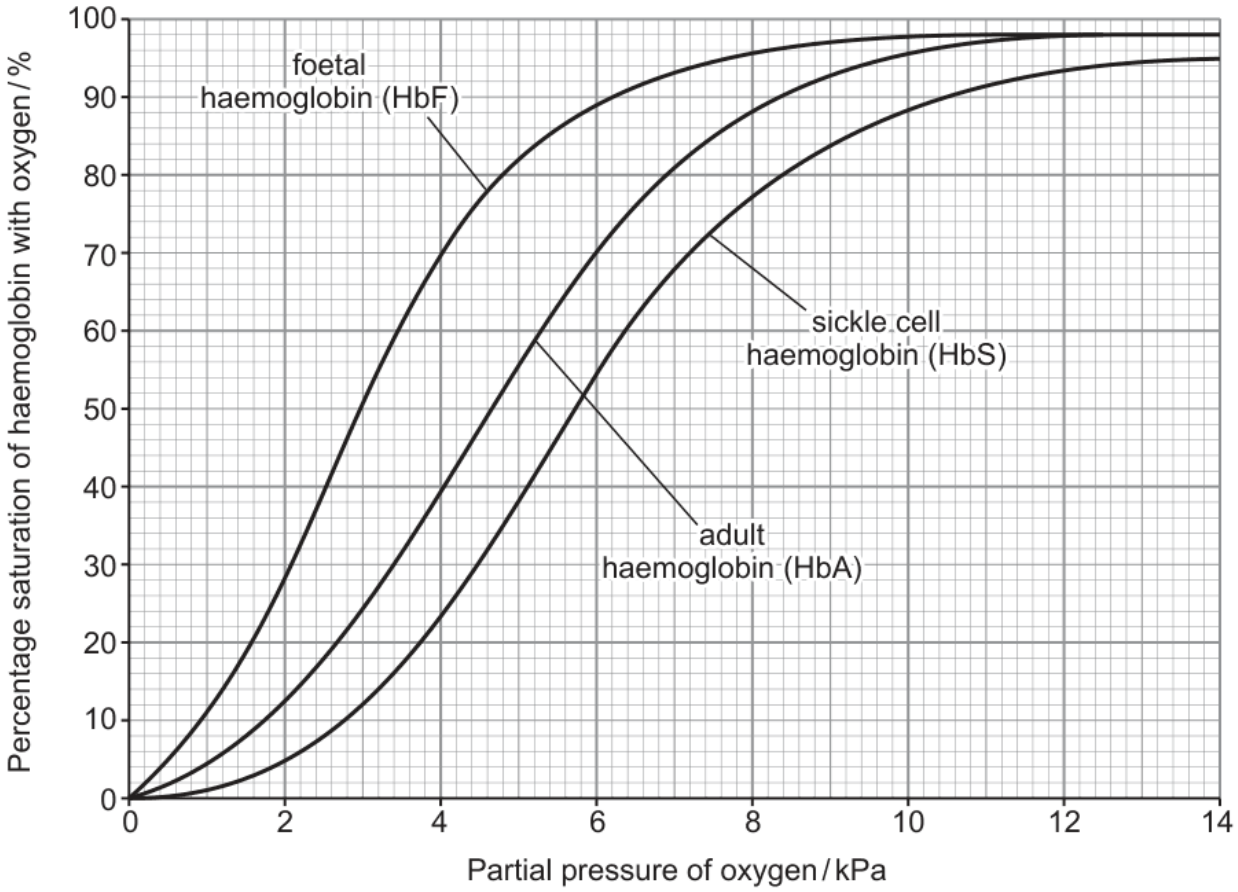
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(b) In the uterus, a developing foetus gains oxygen from maternal blood via the placenta. The foetal erythrocytes contain foetal haemoglobin (HbF) rather than adult haemoglobin (HbA).
People with sickle cell anaemia have a gene mutation resulting in the production of sickle cell haemoglobin (HbS).

Graph 2.3 shows the oxygen dissociation curves for HbF, HbA and HbS

Graph 2.3

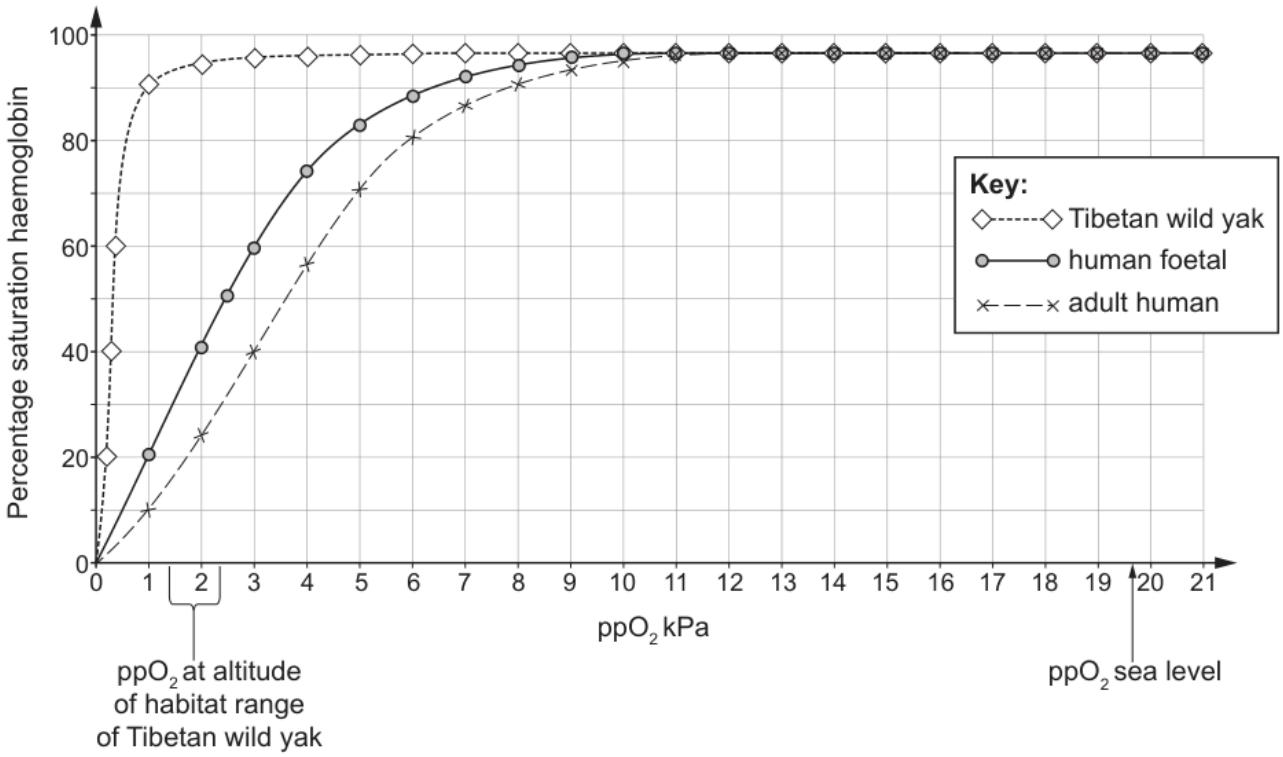


(i) Use data from **Graph 2.3** to explain the advantage to a foetus of having HbF rather than HbA. [3]

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(e) The oxygen dissociation curves for human foetal haemoglobin (HbF), adult haemoglobin (HbA) and the Tibetan wild yak (*Bos mutus*) are shown in **Graph 3.4**.

Graph 3.4



(i) Explain the position of the oxygen dissociation curve of foetal haemoglobin relative to that of adult haemoglobin. [2]

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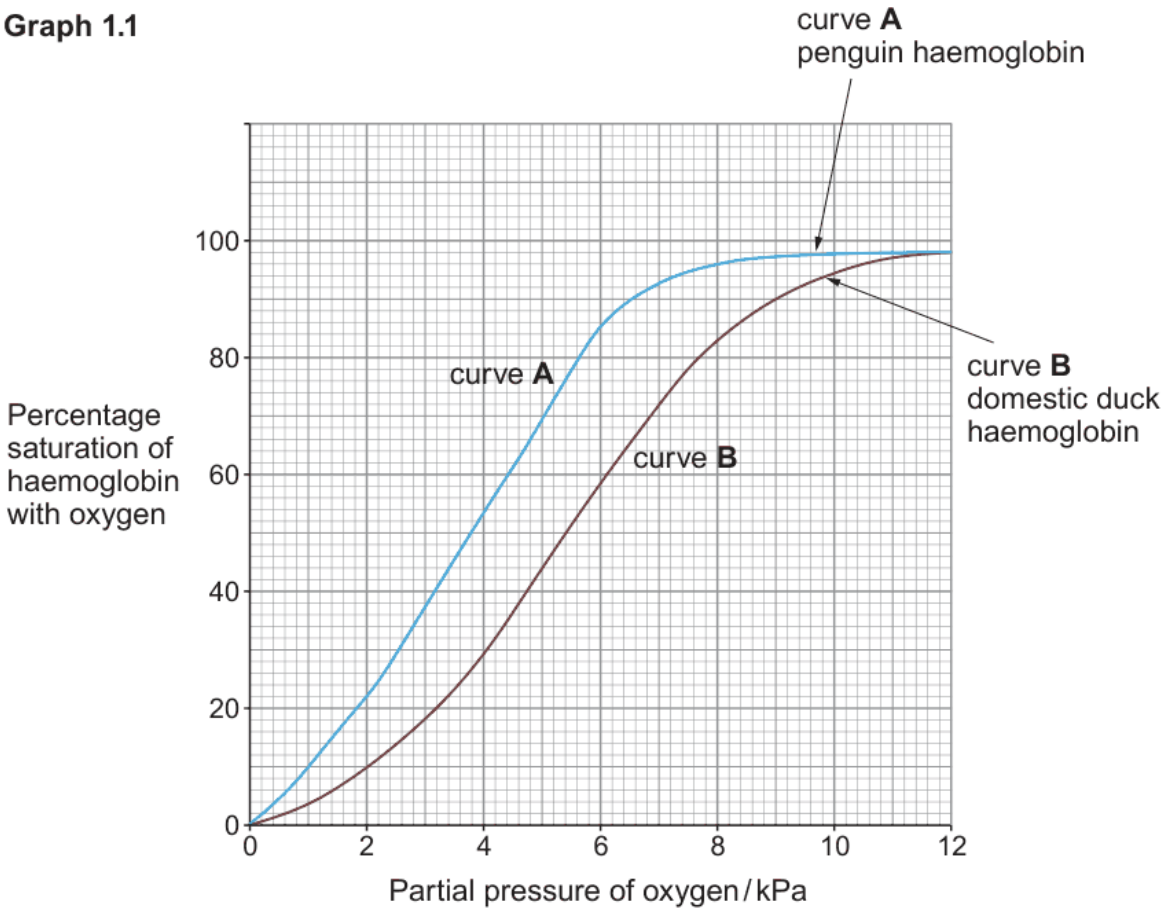
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1. Emperor penguins live in the Antarctic. They hunt for fish and can dive for 25 minutes at a time when they are looking for food.

Graph 1.1 shows the oxygen dissociation curve for emperor penguin haemoglobin and domestic duck haemoglobin.

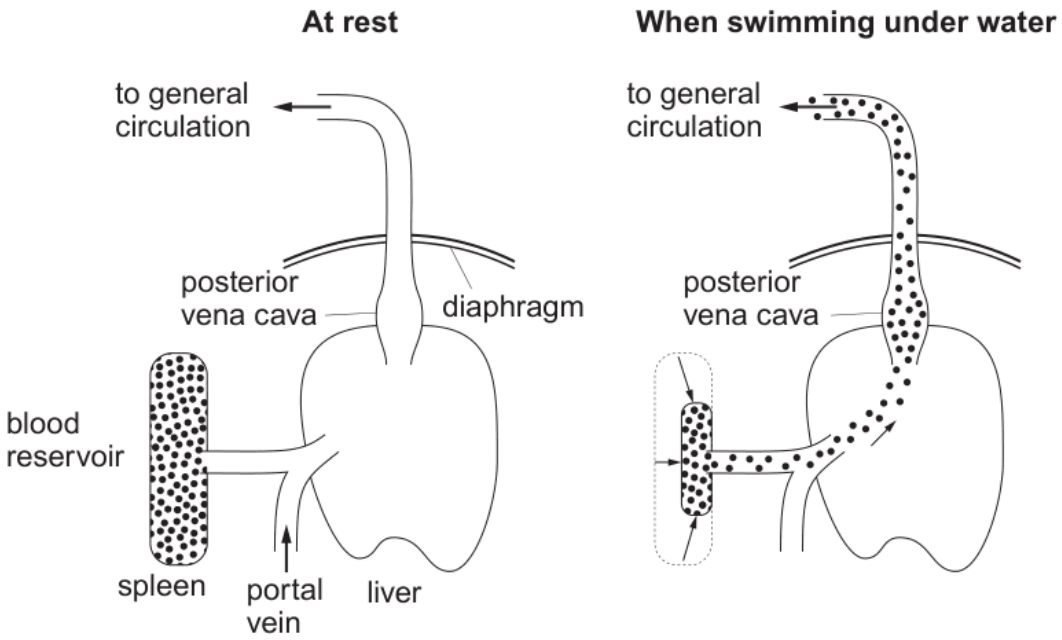
Graph 1.1



(a) Explain the advantage to the penguin of having the haemoglobin dissociation curve as shown on **graph 1.1**. [3]

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All mammals have an organ, known as the spleen, which acts as a reservoir for blood. When the seal swims under water, the spleen contracts forcing more blood into the general circulation as shown in the diagram below.



(b) Suggest how this adaptation helps the seal stay under water for prolonged periods when hunting its prey. [4]

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Question 21 · AS Component 2 · June 2016 · Q1(b)(i) · 3 marks

(b) (i) The physiology of delivering oxygen to muscles during exercise is linked to the removal of carbon dioxide which is mainly transported in the form of hydrogen carbonate ions. Explain how carbon dioxide in the plasma becomes hydrogen carbonate ions inside red blood cells. [3]

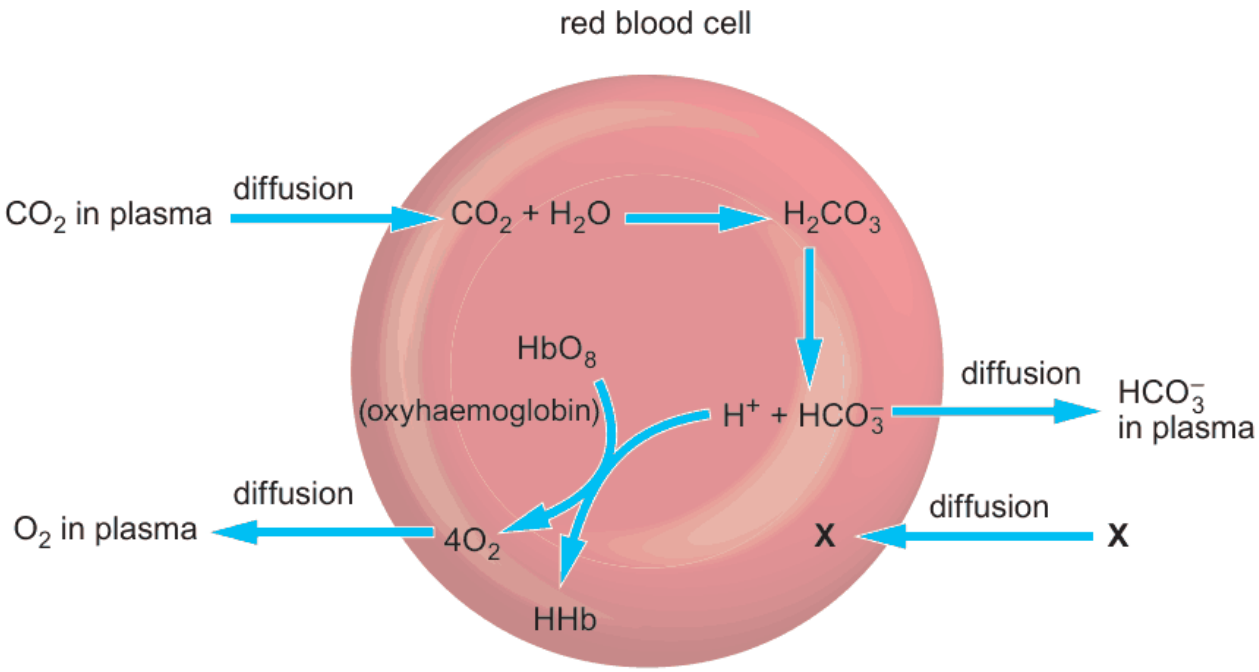
Question 22 · AS Component 2 · June 2016 · Q1(b)(ii) · 2 marks

(ii) Describe how the production of hydrogen carbonate ions accounts for the Bohr Effect. [2]

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Question 23 · information from earlier in the question

(b) The diagram below shows the process by which a red blood cell located in a capillary of actively respiring tissue is involved in the transport of carbon dioxide.

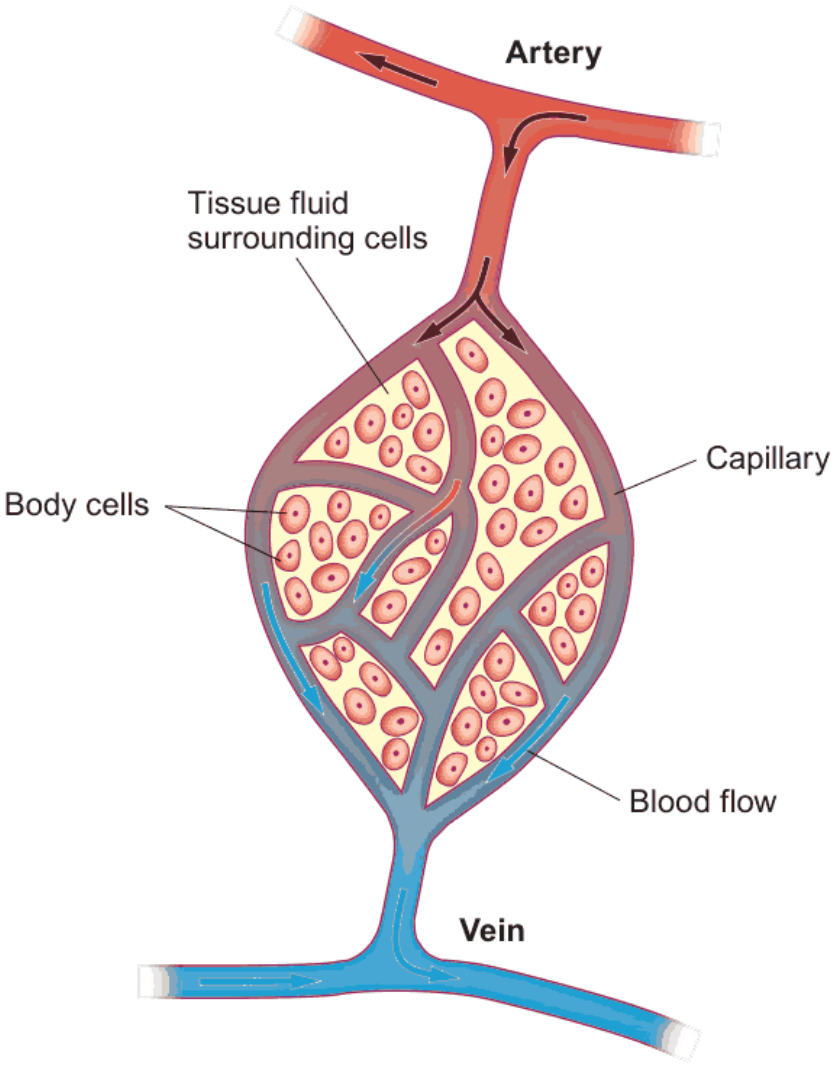


Question 23 · AS Component 2 · June 2019 · Q3(b)(iii) · 4 marks

(iii) Use the diagram to explain why an increase in the rate of respiration would lead to more oxygen being released from oxyhaemoglobin. [4]

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The diagram below shows the arrangement of blood vessels in a capillary bed.



(d) With reference to the diagram, describe how tissue fluid is formed. [3]

Questions, mark schemes and examiners' report extracts © WJEC CBAC Ltd (Eduqas).

Question 25 · A level Component 3 · June 2018 · Q2(b)(ii) · 4 marks

(ii) Explain why a low protein diet would result in fluid retention in the tissues. [4]

Question 26 · A level Component 3 · June 2022 · Q4(b)(ii) · 3 marks

(ii) Explain how high blood pressure can also lead to the swelling of some tissues of the body (oedema). [3]

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Mark schemes

Question 1 · AS Component 2 · June 2016 · Q5(b) · 2 marks

(b)	In single systems there one circuit in double system there are two (separate) circuits /blood passes through heart once compared with twice (1) It allows (oxygenated) blood to be delivered (to organs) under (high) pressure/ there is no sustained drop in pressure (after passing through lungs) (1)	2	2

Question 2 · AS Component 2 · June 2024 · Q5(a)(i) · 2 marks

5	(a)	(i)	Advantage; {Diffusion / transport distance} between {blood / fluid} and cells is {decreased / very short}. (1) Disadvantage; {Flow / movement / transport} of {blood / fluid} is slow. (1)	2	2	

Question 3 · AS Component 2 · June 2019 · Q5(b)(i) · 2 marks

(b)	(i)	Earthworm gas exchange surface is not in contact with all cells so needs {haemoglobin/ a pigment} to transport oxygen (1) Gas exchange surface in insect is in contact with muscle cells so no transport is needed (1)	2	2

Question 4 · A level Component 3 · June 2019 · Q6(c)(ii) · 2 marks

	(ii)		Any **two** (×1) from Blood at higher pressure (1) {circulates/ travels} faster / transported over longer distances (1) ora Maintains a higher concentration gradient between blood and tissues (1) ora	2	2		

Question 5 · A level Component 3 · June 2018 · Q2(a) · 3 marks

2	(a)	(i)	D and E 1		1
		(ii)	C and D	1	1
		(iii)	B and F	1	1

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Question 6 · AS Component 2 · June 2019 · Q1(c)(i) · 1 mark

	(c)	(i)		Tendons / chordae tendineae	1	1	

Question 7 · AS Component 2 · June 2019 · Q1(c)(ii) · 2 marks

	(ii)	Prevent inversion of (bicuspid) valve/ owtte (1) During contraction of (left) ventricle (1)		2	2	

Question 8 · A level Component 3 · June 2023 · Q3(a)(i) · 3 marks

3	(a)	(i)		**Any three (x1) from** • RA pumps blood into RV to lungs (in adult). (1) • Lungs not functional in foetus/ {no need for pulmonary circulation/ owtte} in foetus (1) • as O_2 from {mother/placenta} (1) • Hole allows blood to pass {RA→ LA(→ LV)/ missing out the lungs} (1)		1	1 1	3	

Question 9 · A level Component 3 · June 2023 · Q3(a)(ii) · 2 marks

		(ii)		**Any two (x1) from** {Deoxygenated blood/ blood containing less oxygen} around body/ ref to oxygenated and deoxygenated being mixed (1) (less oxygen) to the {tissues / muscles/ cells} (1) less (aerobic) respiration (1)					

	1	1	2	

Question 10 · A level Component 3 · Autumn 2021 · Q3(d)(ii) · 2 marks

	(ii)	Large surface area of capillary wall in contact with blood cells (1) So faster exchange/diffusion (1) OR More friction slows down blood flow (1) So more time for exchange to occur (1)	2	2

Question 11 · AS Component 2 · June 2017 · Q1(b)(ii)I · 2 marks

(ii)	I	**SAN**: Initiates {the cardiac cycle / an impulse/ wave of excitation/ depolarisation/ electrical signal} /(acts as) pacemaker (1) NOT message/ signal causes atria to contract/ atrial systole (1)	2	2	

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Question 12 · AS Component 2 · June 2017 · Q1(b)(ii)II · 2 marks

II	**AVN:** passes {impulse/ electrical signal} down {Purkinje/ Purkyne fibres/ Bundle of His} (1) Results in delay (1)	2	2

Question 13 · AS Component 2 · Autumn 2020 · Q3(a)(i) · 4 marks

3	(a)	(i)	**Statement** / **Letter(s)** AV valve closes / A Left ventricle is relaxed / (B), D/A Left ventricle pressure is greater than in the aorta / C/ E Semilunar valves close / B	1 1 1 1	4

Question 14 · AS Component 2 · Autumn 2020 · Q3(b)(ii) · 3 marks

(ii)	Ventricular systole/contract increasing pressure > aorta pressure (1) Causing SL valves open (1) causes AV valves to close so blood can't flow back into atria (1) Accept reverse answer for each mp	3	3

Question 15 · A level Component 3 · June 2017 · Q3(b)(i) · 1 mark

(b)	(i)	B (superior vena cava)	1	1	1

Question 16 · A level Component 3 · June 2017 · Q3(b)(iii) · 4 marks

(iii)	**Any 4 (x1) from**: A. pressure increases in jugular due to increase in atrial pressure B. Because no valves between jugular and atrium/ backflow of blood into jugular **Atrial pressure increases due to:** C. Atrial systole/ atrial contraction(1) D. Atria filling with blood (1) E. ventricle contracts closing {tricuspid/ AV} valve(1) F. increased pressure in ventricle pushes back on atrium (1)			4	4

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Question 17 · A level Component 3 · June 2025 · Q2(b)(i) · 3 marks

(b)	(i)	Use of data e.g. at 4 kPa ppO2 70% saturation in foetus = 40%, in adult (1) **Any two (x1) from:** • {HbF has a higher {affinity for oxygen / saturation at lower partial pressures} (1) • (therefore) HbF can bind oxygen from mother's (blood) / oxygen can {diffuse / pass} from mother to baby (1) • Foetus lives in (the uterus which is a) low oxygen environment (1)	3	3	1

Question 18 · A level Component 3 · June 2023 · Q3(e)(i) · 2 marks

(e)	(i)	**Any two (x1) from** (Haemoglobin has) greater affinity for oxygen. (1) more saturated than adult haemoglobin {at values of less than approx. 11 ppO_2 / at lower pp} (1) so oxygen is able to pass from mother to foetus/ owtte (1)	2			2	

Question 19 · A level Component 3 · Autumn 2020 · Q1(a) · 3 marks

1	*(a)*	Any **three** (x1) from: Haemoglobin has a higher affinity for oxygen (1) Acts as an oxygen store (1) Only releases oxygen when the pp oxygen is lower/ use of data (1) Delays anaerobic respiration / allows them to dive for longer (1)	3	3

Question 20 · AS Component 2 · June 2017 · Q4(b) · 4 marks

(b)	A. More red blood cells in general circulation (1) B. more haemoglobin available (1) C. More oxygen supplied to {muscle / brain / tissue/ cells} (1) D. Aerobic respiration can continue for longer / seal does not need to come to surface {to breathe / for oxygen/ for air} as often / anaerobic respiration is not required(1)	4	4

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Question 21 · AS Component 2 · June 2016 · Q1(b)(i) · 3 marks

(b)	(i)	Any three from: • CO_2 enters rbc because {CO_2 is lower inside than outside / by diffusion} (1) • (Combines with water) to form carbonic acid (H_2CO_3) (1) • (due to) presence of carbonic anhydrase inside red blood cells (1) • carbonic acid dissociates into hydrogen (ions) and hydrogen carbonate (ions) (1)	3	3

Question 22 · AS Component 2 · June 2016 · Q1(b)(ii) · 2 marks

	(ii)	• The {H^+/ hydrogen ions} from (the dissociation of carbonic acid) combine with (oxy-)haemoglobin/ lowers the pH/ forms haemoglobinic acid(1) • It {displaces/ releases} the oxygen / lowers affinity of haemoglobin (for oxygen) (1) H^+ displaces oxygen from haemoglobin = 2 marks	2	2

Question 23 · AS Component 2 · June 2019 · Q3(b)(iii) · 4 marks

	(iii)	Any **four** (×1) from: Increased rate of respiration leads to {increased carbon dioxide concentration/ more carbon dioxide produced} (1) Bohr effect (1) Increased carbonic acid concentration (1) Leads to increase in H^+ concentration / increased acidity (1) Decrease in affinity of haemoglobin for oxygen/ more oxygen released from oxyhaemoglobin (1)	2	2		4		

Question 24 · AS Component 2 · June 2018 · Q4(d) · 3 marks

(d)	hydrostatic pressure is higher than osmotic pressure at the arterial end (1) Forces {water and small soluble molecules/fluid} out of capillary (1) Blood cells and larger protein molecules retained in capillary (1)	3	3

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Question 25 · A level Component 3 · June 2018 · Q2(b)(ii) · 4 marks

(ii)	**Any four (x1) from:** A. low protein diet reduces {plasma protein/albumin} levels (1) B. {plasma proteins/albumin} reduce water potential of blood (1) C. (Lack of protein)water potential of plasma becomes higher (1) D. Decreases water potential gradient (1) E. so less <u>water</u> reabsorbed/ more <u>water</u> remains in tissue fluid/ <u>water</u> moves out of the blood into the tissue fluid (1) Accept blood in place of plasma Accept blood proteins in place of plasma proteins	3	1	4

Question 26 · A level Component 3 · June 2022 · Q4(b)(ii) · 3 marks

(ii)	High blood pressure {increases pressure/ causes high pressure} (at arterial end) capillary/ hydrostatic pressure is greater than osmotic pressure (1) So more (tissue) fluid formed than can be reabsorbed/ so excess fluid cannot be reabsorbed/ owtte (1) Fluid accumulates in tissues/ tissues retain more fluid (1)	3	3	

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