Transport in Animals (3.1.2): OCR A Level Biology Exam Questions by To

20 questions · 49 marks · about 59 minutes. Answer in the spaces, then check the mark schemes at the end.

Question 1 · AS Paper 1 · June 2025 · Q25(a) · 2 marks

25

(a) The Asian elephant, *Elephas maximus*, is the largest land mammal in Asia. It is an endangered species.

Asian elephants need a transport system because they are a very large mammal and diffusion distances are too long.

Explain **two other** reasons why an Asian elephant has a transport system.

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

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(ii) A diagram of the circulatory system of *S. fasciatum* is shown in **Fig. 4.2**.

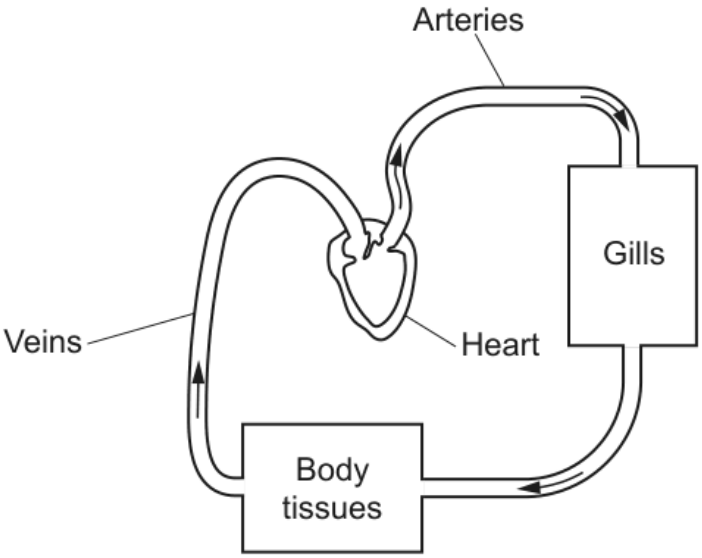


Fig. 4.2

Describe the type of circulatory system that *S. fasciatum* has.

.....

.....

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

Turn over

Questions, mark schemes and examiners' report extracts © OCR.

(d) **Fig. 2.2** shows stained tissue that includes two different blood vessels, labelled **L** and **M**, and a substance labelled **N**.

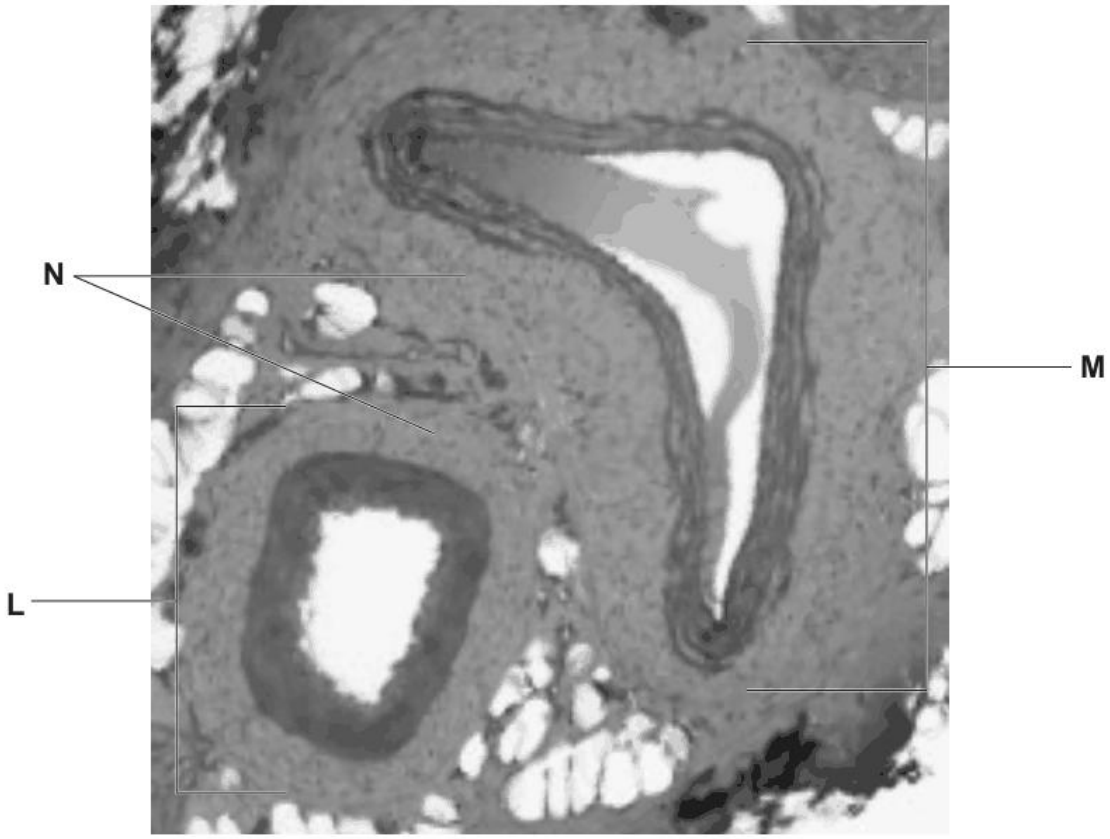


Fig. 2.2

(i) State whether **L** is an artery or a vein **and** give **two** pieces of evidence from **Fig. 2.2** that allow you to reach your decision.

L .....

Evidence 1 .....

.....

Evidence 2 .....

.....

[2]

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Question 4 · AS Paper 2 · June 2024 · Q4(b)(i) · 2 marks

(b)

(i) Explain the role of valves in veins.

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.....

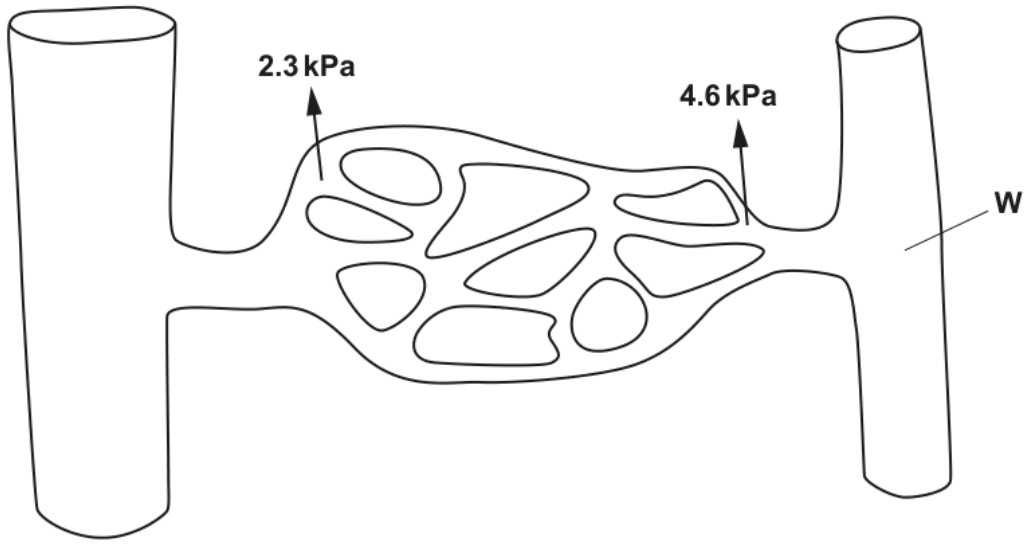
.....

.....

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

Question 5 · information from earlier in the question

23 The diagram shows the change in hydrostatic pressure across a capillary network in muscle tissue.



(a) **(i)** **On the diagram**, draw an arrow to show the direction of movement of blood through the capillary network. **[1]**

Question 5 · AS Paper 1 · June 2022 · Q23(a)(iii) · 1 mark

(iii) Name the structure labelled **W**.

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

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SECTION B

Answer **all** the questions.

16 **Fig. 16.1** shows a drawing of a dissected human heart.

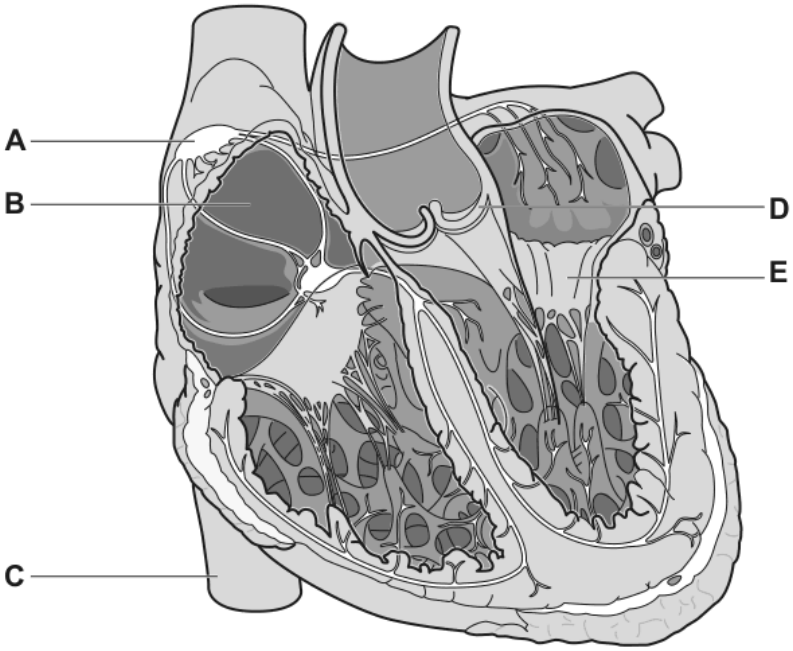


Fig. 16.1

(a) **(i)** Identify the structures labelled **A** to **E** on **Fig. 16.1**.

A .....

B .....

C .....

D .....

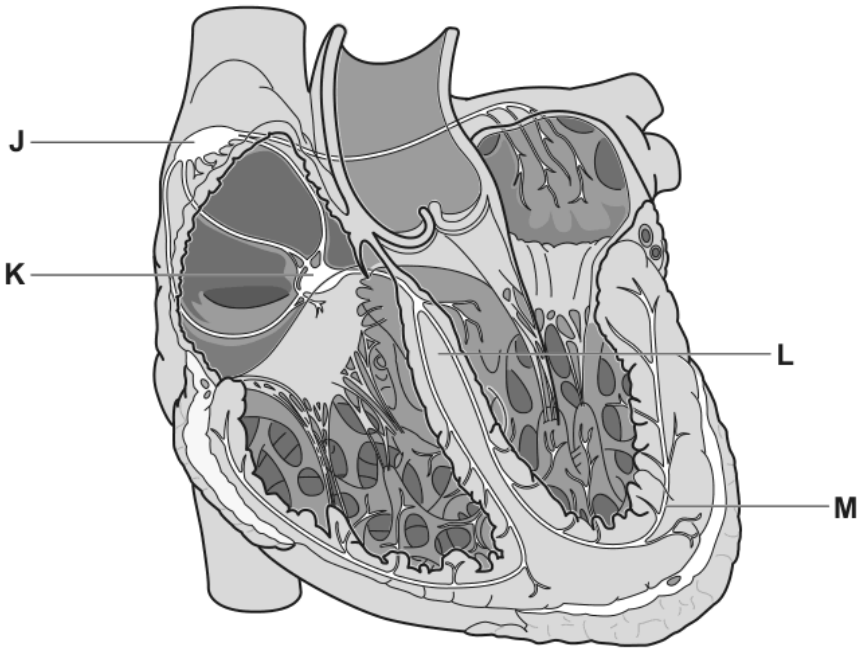
E .....

[5]

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Question 7 · A level Paper 1 · June 2025 · Q20(c) · 4 marks

(c) This is a drawing of a dissected human heart.



Identify the structures labelled **J** to **M**.

J .....

K .....

L .....

M .....

[4]

Turn over

Questions, mark schemes and examiners' report extracts © OCR.

Question 8 · A level Paper 3 · June 2022 · Q6(b) · 3 marks

(b) Haemoglobin plays a crucial role in transporting oxygen in animals. Several ions also have roles in oxygen transport.

Three ions are listed in the table below.

Place ticks (✓) in the correct boxes to indicate which properties and features are true for each ion.

Ion	Has a negative charge	Binds to haemoglobin	A product of the dissociation of carbonic acid	Involved in the chloride shift
Hydrogen				
Hydrogencarbonate				
Chloride				

[3]

Question 9 · A level Paper 1 · June 2025 · Q21(a)(ii) · 3 marks

(ii) Explain why insects can function with open circulatory systems.

.....

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

Questions, mark schemes and examiners' report extracts © OCR.

Question 10 · AS Paper 1 · June 2022 · Q23(b) · 3 marks

(b) Describe how oncotic pressure is established.

.....

.....

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

Questions, mark schemes and examiners' report extracts © OCR.

Question 11 · AS Paper 2 · June 2018 · Q4(a)(ii) · 2 marks

(ii) Dissolved ions diffuse between blood plasma and tissue fluid.

Pressure differences at the arterial and venous ends of capillaries are responsible for the formation of tissue fluid. The following measurements were made in one capillary:

- Net hydrostatic pressure at the arterial end was 4.6 KPa
- Net oncotic pressure was −3.0 KPa
- Net hydrostatic pressure at the venous end was 2.3 KPa.

Use this information to explain the movement of fluid in and out of a capillary.

.....

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.....

.....

.....

.....

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

Turn over

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Question 12 · A level Paper 1 · June 2018 · Q21(a)(iii) · 3 marks

(iii) TTX is also known to reduce the speed of conduction in the Purkyne fibres of the heart.

Suggest and explain what effect this would have on the heart rate.

.....

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.....

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.....

.....

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

Questions, mark schemes and examiners' report extracts © OCR.

Question 13 · AS Paper 2 · June 2022 · Q3(c) · 3 marks

(c) **Fig. 3.4** shows the changes in pressure in the left side of the heart and aorta during one cardiac cycle.

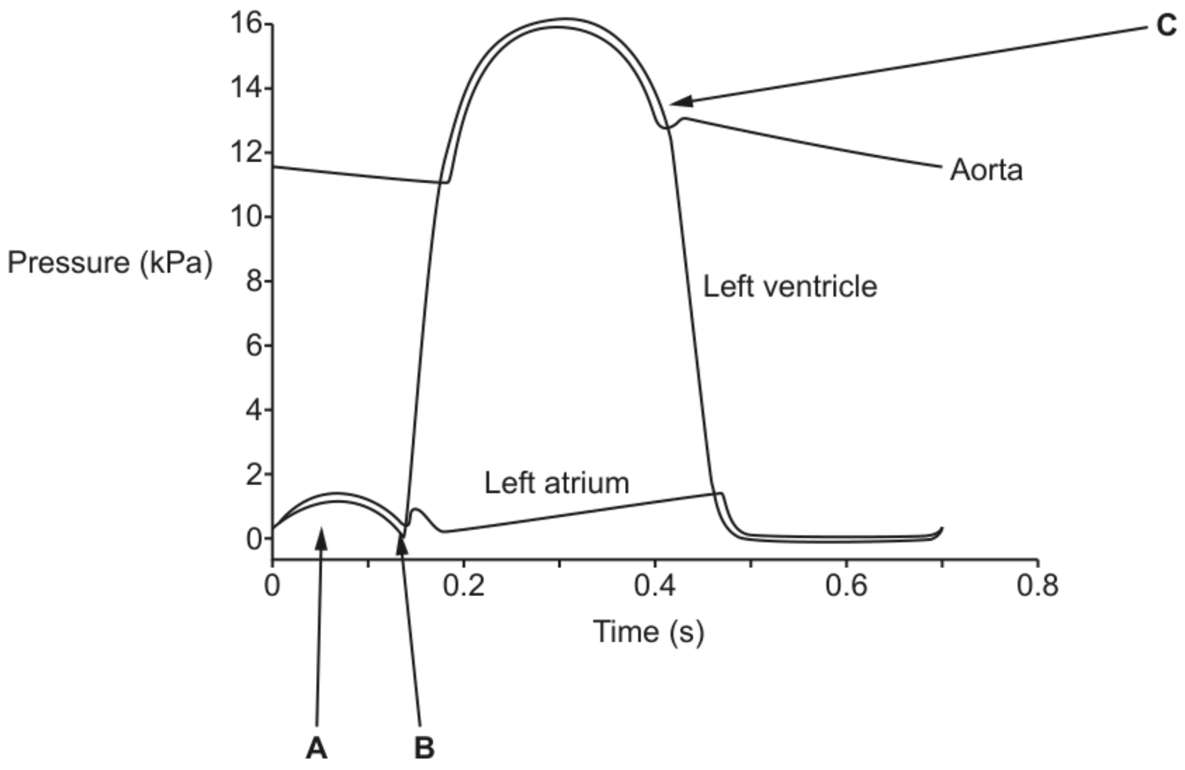


Fig. 3.4

A student described the events shown in **Fig. 3.4**.

'At **A**, the muscles in the wall of the atrium are contracting. This is caused by a wave of electrical excitation that starts at the atrio ventricular node (AVN).

At **B**, the muscles in the wall of the ventricle are contracting. The atrioventricular valve opens and the pressure in the aorta falls. The ventricular pressure rises above that of the aorta.

At **C**, the muscles in the walls of the ventricle are relaxing. The semilunar valve opens. The pressure in the ventricle drops.'

17

Identify **three** errors in the student's description and write the correction for each error.

Error and correction 1

....

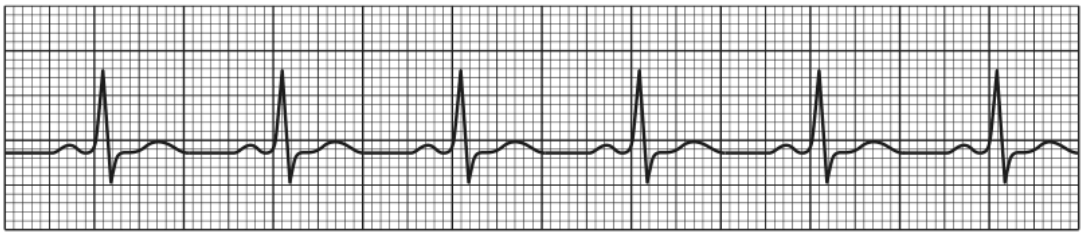
....

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Error and correction 2

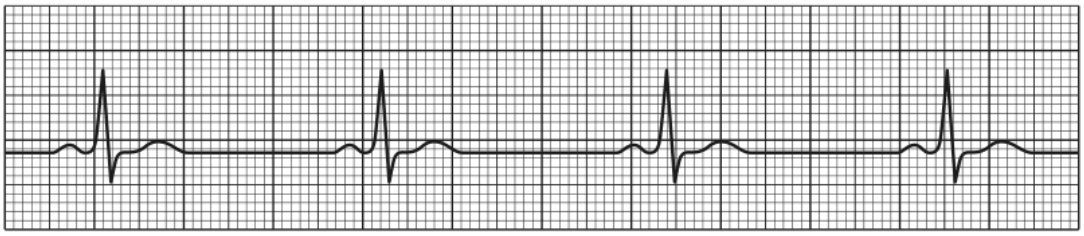
(e) **Fig. 20.1** shows a normal ECG trace.

Fig. 20.1



(i) **Fig. 20.2** shows an ECG trace from a patient with abnormal heart activity.

Fig. 20.2



Identify this abnormality.

Give a reason for your identification.

Abnormality .....

Reason .....

.....

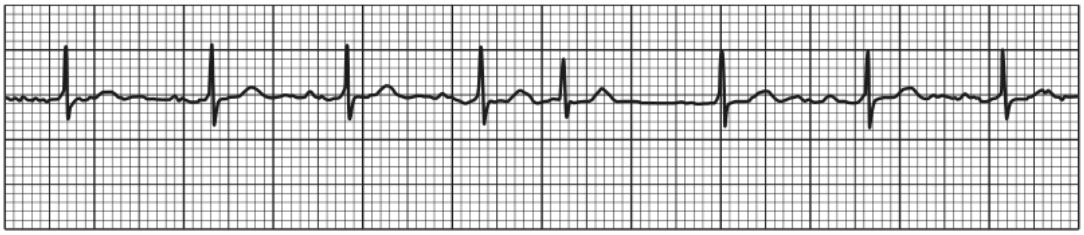
[1]

Questions, mark schemes and examiners' report extracts © OCR.

Question 15 · A level Paper 1 · June 2025 · Q20(e)(ii) · 1 mark

(ii) **Fig. 20.3** shows an ECG trace from another patient with abnormal heart activity.

Fig. 20.3



Identify this abnormality.

Give a reason for your identification.

Abnormality .....

Reason .....

.....

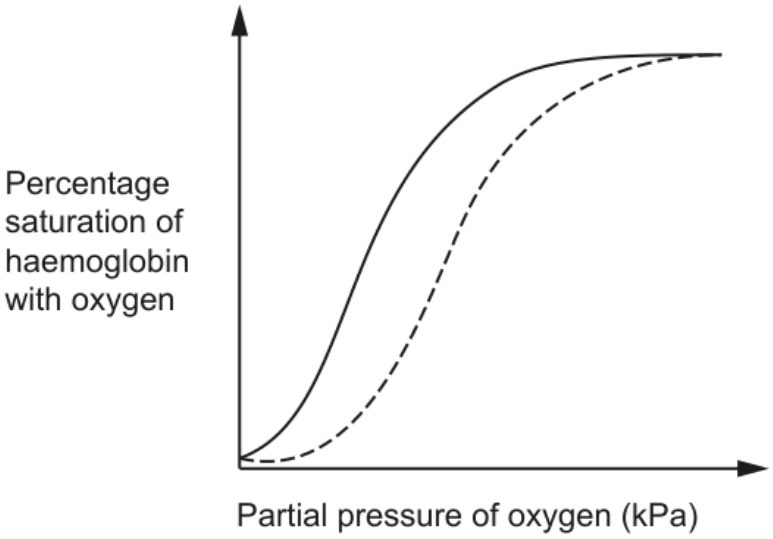
[1]

Turn over

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(ii) **Fig. 4.2** shows the shape of oxygen dissociation curves for haemoglobin for a person at rest and during exercise.

The changes to the dissociation curve at different carbon dioxide concentrations is known as the Bohr effect.



KEY

——— At rest

– – – – During exercise

Fig. 4.2

With reference to **Fig. 4.2** explain why the Bohr effect is important during exercise.

.....

.....

.....

.....

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

Turn over

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26 (a) **Fig. 26.1** shows a dissected human heart.

Fig. 26.1



Draw a simple diagram of the front half of the heart shown in **Fig. 26.1** in the space below.

On your diagram, label the left ventricle.

[3]

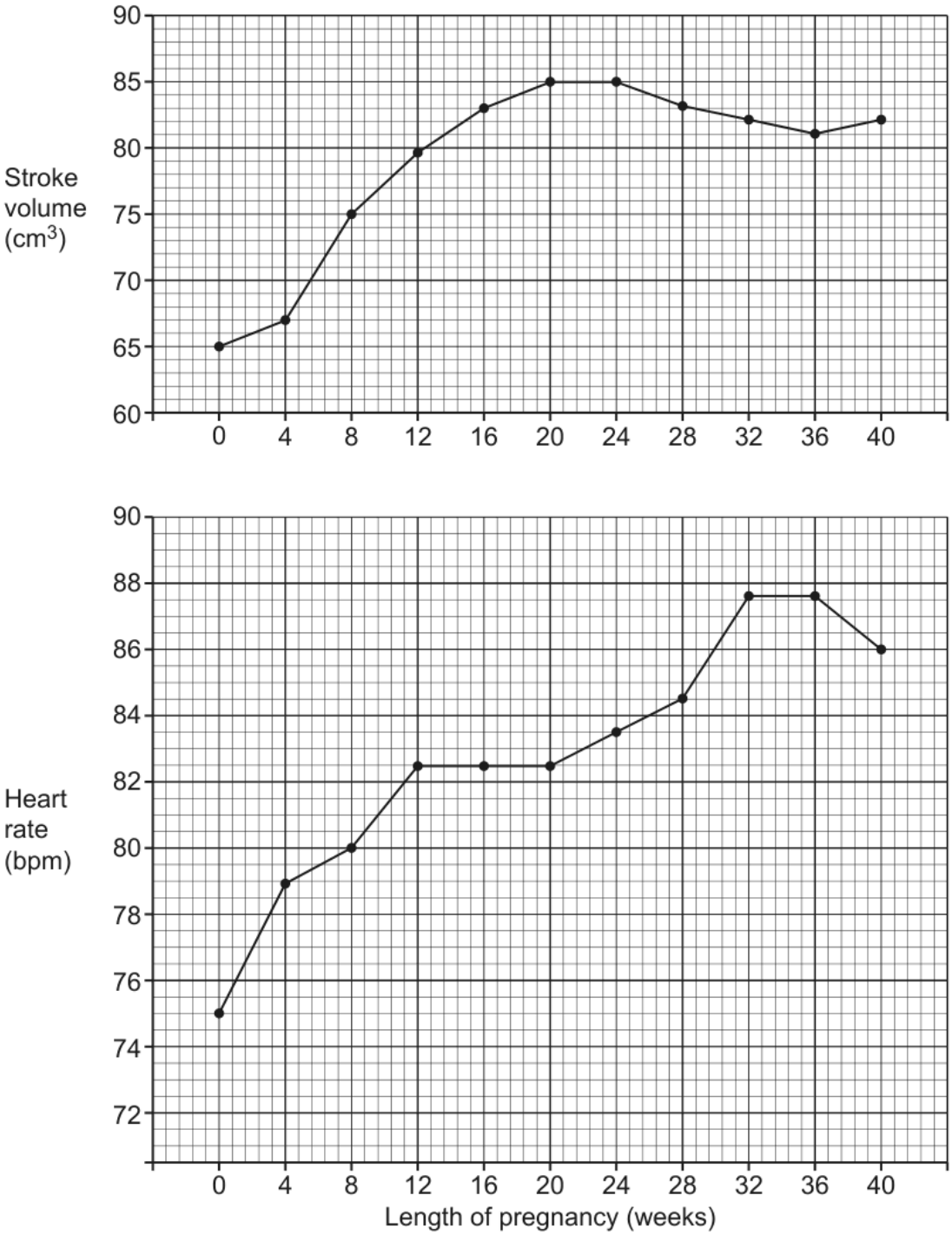
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16 During pregnancy the mother's body undergoes several physiological changes to support the developing fetus. These changes affect every organ system in the body.

(a) Changes to the heart and circulatory system begin in the first few weeks of pregnancy.

Fig. 16.1 shows the changes in stroke volume and heart rate that occur during pregnancy.

Fig. 16.1



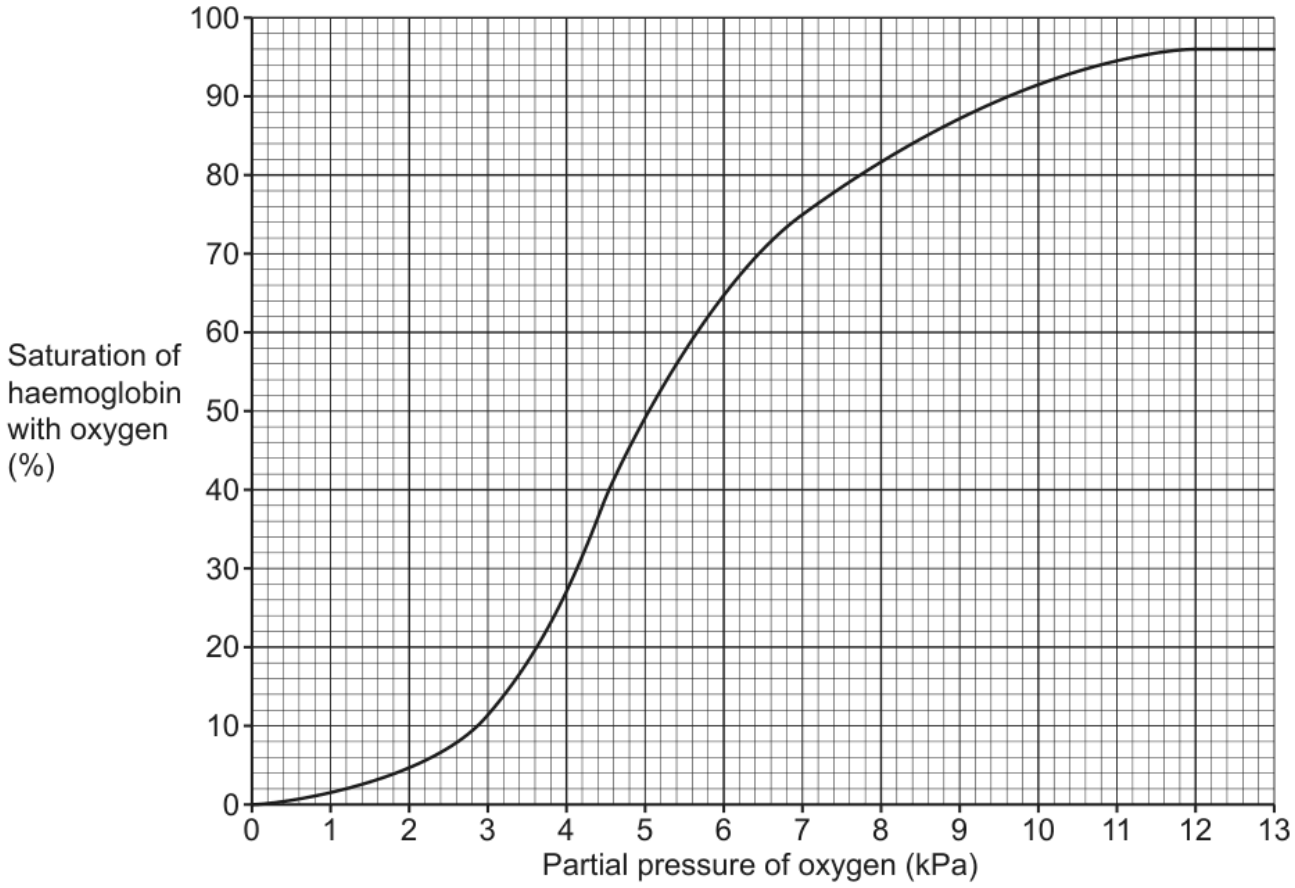
(i) Use the data in **Fig. 16.1** to calculate the cardiac output in week 20.

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(c) Another change that occurs in pregnancy is an increase in oxygen uptake by the mother. This is partly due to an increase in the mother's metabolic rate and partly to supply the developing fetus.

Fig. 16.3 shows the oxygen dissociation curve for the mother's haemoglobin.

Fig. 16.3



(i) Sketch the oxygen dissociation curve for fetal haemoglobin.

Answer on **Fig. 16.3**. **[1]**

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Question 20 · A level Paper 1 · June 2023 · Q16(c)(ii) · 3 marks

(ii) Explain how the different affinities of maternal and fetal haemoglobin enable transfer of oxygen from the maternal circulation to the fetus.

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.....

.....

.....

.....

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

Questions, mark schemes and examiners' report extracts © OCR.

Mark schemes

Question 1 · AS Paper 1 · June 2025 · Q25(a) · 2 marks

25	**(a)**	**2**	2.1
		has a small(er) / low surface area to volume ratio ✓ has a high(er) <u>metabolic</u> , demand / rate / activity / need(s) ✓		

IGNORE diffusions rate too slow

ALLOW SA:V

IGNORE use more energy

Question 2 · A level Paper 3 · June 2022 · Q4(a)(ii) · 2 marks

4	**(a)**	**(ii)**	closed / described ✓ single / described ✓	**2**	2.1	

Question 3 · A level Paper 3 · June 2022 · Q2(d)(i) · 2 marks

2	**(d)**	**(i)**	*L = artery because* small(er), diameter / lumen ✓ thick(er) layer of, (smooth) muscle / elastic tissue / elastin ✓ *idea of* lumen is more open ✓ tunica intima / endothelium, folded ✓	**2 max**	2.1

DO NOT ALLOW mark points if L identified as vein or not identified at all

ALLOW narrow(er) lumen

ALLOW greater proportion of, muscle / elastic tissue /elastin (than veins)

ALLOW thick(er) tunica media / thick(er) wall

ALLOW 'less flattened' than veins

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Question 4 · AS Paper 2 · June 2024 · Q4(b)(i) · 2 marks

(b)	**(i)**	**1** stops backflow of blood due to low pressure ✓ **2** allows (one way) flow back to the heart ✓

2	**2 ALLOW** stops backflow of blood so blood goes to the heart

Question 5 · AS Paper 1 · June 2022 · Q23(a)(iii) · 1 mark

23	**(a)**	**(iii)**	arteriole ✓	1	**Mark first answer only**

Question 6 · A level Paper 1 · November 2021 · Q16(a)(i) · 5 marks

16	**(a)**	**(i)**	**A** = sinoatrial node / SA node / SAN ✓ **B** = right , atrium / atria ✓ **C** = (inferior) vena cava ✓ **D** = semilunar valve ✓ **E** = bicuspid / (left) atrioventricular / (left) AV , valve ✓

5	1.1	**DO NOT ALLOW** sinoarterial **ALLOW** aortic valve **ALLOW** mitral valve **DO NOT ALLOW** tricuspid

Question 7 · A level Paper 1 · June 2025 · Q20(c) · 4 marks

20	**(c)**	**J** = sino-atrial node / SAN ✓ **K** = atrio-ventricular node / AVN / AV node ✓ **L** = septum ✓ **M** = purkyne , fibres / tissue ✓	**4**	2.1

ALLOW L = bundle of His

ALLOW M = Purkinje fibres

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Question 8 · A level Paper 3 · June 2022 · Q6(b) · 3 marks

6 (b) — 3 — 1.1

Ion	Has a negative charge	Binds to haemoglobin	A product of the dissociation of carbonic acid	Involved in the chloride shift	
Hydrogen		✓	✓		✓
Hydrogencarbonate	✓		✓	✓	✓
Chloride	✓			✓	✓

AWARD one mark per correct row

Question 9 · A level Paper 1 · June 2025 · Q21(a)(ii) · 3 marks

21 (a) (ii) — 3 — 1.1

1. (Insect) tracheoles / trachea(e), for gas exchange / supplies oxygen / supplies gases (directly) ✓
2. circulatory system/ haemolymph, does not transport oxygen / separate from oxygen transport ✓
3. small size / short distances , in insects means a high (blood), flow rate/ pressure, is not needed ✓

1 ALLOW takes air (straight) to the tissues
1 ALLOW tracheal fluid for 'trachea'

2 ALLOW insect circulatory system transports, **only** nutrients

3 IGNORE ref to SA:V
3 IGNORE (insect) low metabolic rate

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Question 10 · AS Paper 1 · June 2022 · Q23(b) · 3 marks

23	**(b)**		(named) plasma proteins ✓ (are) too large to, leave the capillary / fit between gaps in the endothelium ✓ (so) creates a low water potential (in the capillary) ✓ water potential is lower than in tissue fluid ✓ water moves, by osmosis / down the water potential gradient, into capillary (causing pressure) ✓

Question	Answer
Max 3	**ALLOW** water potential is decreased **ALLOW** water potential in tissue fluid is higher than in blood **ALLOW** water moves from high WP to low WP into capillary **IGNORE** tissue fluid moves by osmosis into capillary

Mark	Guidance

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Question 11 · AS Paper 2 · June 2018 · Q4(a)(ii) · 2 marks

4(a)(ii)	at arterial end **AND** hydrostatic / 4.6, is great**er** than, oncotic / –3 **AND** (fluid / plasma) moves, **out** / from, (capillary) ✓ at venous end **AND** hydrostatic / 2.3, is low**er** than, oncotic / –3 **AND** (tissue fluid) moves **into** (capillary) ✓	2

Question	Answer	Mark

Statements must:

- **name the end** of the capillary
- make a **comparative** statement about the two pressures in the capillary (using name or number)
- state the **direction of movement** of fluid.

ALLOW bigger / higher / more, for 'greater'
ALLOW ORA oncotic / –3, less than hydrostatic / 4.6

ALLOW ORA fluid moves into tissues
IGNORE osmosis

ALLOW smaller / less, for 'lower'
ALLOW ORA oncotic / –3, more than hydrostatic / 2.3

ALLOW ORA fluid moves, out of / from, tissues
IGNORE osmosis

Guidance

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Question 12 · A level Paper 1 · June 2018 · Q21(a)(iii) · 3 marks

(iii)	*suggestion:* slows / decreases , heart rate ✓ *explanation:* ***Any two from*** slows transmission of impulse from AVN to ventricles ✓ slows ventricular , systole / contraction ✓ longer delay before ventricular , systole / contraction , begins ✓ increases time (the heart is) in diastole / relaxation ✓

3 max	**ALLOW** bradycardia **ALLOW** prevents / stops for 'slows' for MP2 and MP3 'ventricular' must be mentioned once

Question 13 · AS Paper 2 · June 2022 · Q3(c) · 3 marks

3	**(c)**		**1 (A)** it is not atrioventricular node (AVN), it is sino-atrial node (SAN) ✓ **2 (B)** atrioventricular valve doesn't open, it closes ✓ **3 (B)** the pressure in the aorta doesn't fall, it rises ✓ **4 (C)** semilunar valve doesn't open, it closes ✓	**3 max**	AO 3.4	**ALLOW max 1 mark** for 2 errors identified without corrections **OR** for 2 corrections without errors **OR** for 1 error + 1 (different) correction **2 ALLOW in B** it is not the atrioventricular valve that opens it is the semi-lunar valve **4 ALLOW** it is not the semi-lunar valve that opens it is the, atrioventricular / bicuspid / mitral, valve

Question	Answer	Mark	AO	Guidance

Question 14 · A level Paper 1 · June 2025 · Q20(e)(i) · 1 mark

20	**(e)**	**(i)**	abnormality: bradycardia reason: because the, T wave and (next) P wave are far apart (than normal) ✓	**1**	2.1

both needed for mark **DO NOT ALLOW** brachycardia **ALLOW** because heart, rate/ beat, is slow (than normal) **ALLOW** distance between successive QRS complexes, is greater than normal / are further apart

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Question 15 · A level Paper 1 · June 2025 · Q20(e)(ii) · 1 mark

20	**(e)**	**(ii)**	abnormality: ectopic heartbeat reason: because the distance between the 4th and 5th beats is less than normal ✓ **OR** abnormality: (atrial) fibrillation reason: no (distinct) P wave ✓	**1**	2.1

both needed for mark

ALLOW because 5th heartbeat is early
ALLOW one heart beat is (too) early

Question 16 · AS Paper 2 · June 2022 · Q4(d)(ii) · 2 marks

	(d)	**(ii)**	**1** more CO_2 during exercise so curve shifts to right ✓ **2** at same $_PO_2$ Hb has a lower % saturation of oxygen ✓ **3** so oxygen, dissociates / is released, from Hb more readily ✓ **4** more oxygen (provided / needed) for, muscles / aerobic respiration ✓

Question	Answer	M
2 max	AO 1.2 AO 2.5	**2 ALLOW** haemoglobin's affinity for oxygen is decreased **4 ALLOW** to help supply sufficient oxygen to muscles

Mark	AO	Guidance

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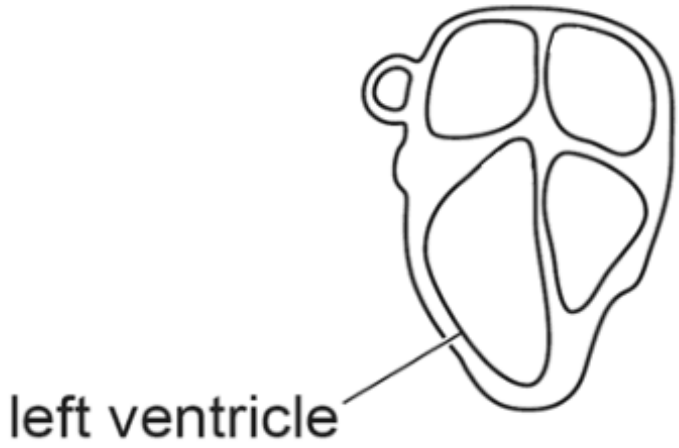
26	**(a)**	simple line drawing of the heart with continuous and non-overlapping lines ✓ no shading **and** covers at least half the box ✓ left ventricle labelled (left bottom chamber) ✓	**3**

Place three annotations in vertical column to left hand side of the diagram in order of marks in mark scheme

Note diagram should be at least half the vertical size of the space provided
IGNORE absence of the blood vessels shown in the photograph

DO NOT ALLOW if label line is not ruled or has arrowhead

e.g. 3 marks for this:



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Question 18 · A level Paper 1 · June 2023 · Q16(a)(i) · 3 marks

16	(a)	(i)	**FIRST CHECK THE ANSWER ON ANSWER LINE** **If answer = 7010 / 7012.5 / 7013 cm^3 min^{-1} award 3 marks** correct values from graph for stroke volume **and** heart rate at 20 weeks ✓ correct use of cardiac output = heart rate x stroke volume i.e. 82.5 x 85 = 7012.5 ✓ correct units = **cm^3 min^{-1}** ✓	**3**	2.2

ALLOW for 3 marks 7.01 / 7 / 7.0 dm^3 min^{-1}

ALLOW for numbers indicated on graphs or seen in response
SV = 85 (cm^3) **and** HR = 82.5 (bpm)

ALLOW max 2 ECF from incorrect values from graph **e.g. 83 x 85 = 7055 cm^3 min^{-1}**

ALLOW 1 mark for correct unit i.e. **cm^3 min^{-1}**
Answer must match unit
e.g. 7.01 cm^3 min^{-1} = 2 marks as correct answer but incorrect unit
ALLOW cm^3 / min for cm^3 min^{-1}
ALLOW L min^{-1} or dm^3 / min L / min or for dm^3 min^{-1}
DO NOT ALLOW m for mins

Question 19 · A level Paper 1 · June 2023 · Q16(c)(i) · 1 mark

16	(c)	(i)	sigmoid curve sketched to the left of the adult curve ✓	**1**	2.2

Curve must start and finish on same % as maternal and must not exceed 96% at any point

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Question 20 · A level Paper 1 · June 2023 · Q16(c)(ii) · 3 marks

16 (c) (ii)				**max 3**	1.1
	1	(at same pO_2) fetal haemoglobin has higher affinity (for oxygen) ✓			
	2	low pO_2 in placenta ✓			
	3	(so) oxygen dissociates from (maternal / adult) haemoglobin (in placenta) ✓			
	4	(so) oxygen diffuses from maternal to fetal , blood / circulation ✓			
	5	increased saturation of fetal haemoglobin at low(er) pO_2 ✓			

ALLOW Hb for haemoglobin throughout

MP1 ALLOW ORA i.e. maternal Hb has lower affinity

MP4 IGNORE to / diffuses across , placenta

MP5 ALLOW fetal Hb associates with / binds with oxygen at low(er) pO_2

e.g. **MP3** and **MP5** so oxygen dissociating from maternal Hb is uploaded by fetal Hb at low pO2

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