Name	Date started	Target end date

GCE AS / A LEVEL — BIOLOGY UNIT 2 QUESTION PACK

1072-01 (Legacy BY2) · New spec Unit 2 Topic 8 · AS unit, first sat 2016, 80 marks, 1h 30min paper

REVISE
.wales

BIOLOGY — UNIT 2 · TRANSPORT IN ANIMALS &MDASH; HEART & CARDIAC CYCLE

BY2.2.5 Adaptations for transport in animals — the mammalian heart and the cardiac cycle

Mammalian heart anatomy, the cardiac cycle (atrial and ventricular pressure traces, valve action), myogenic conduction via the SAN, AVN, bundle of His and Purkyne fibres, plus interpretation of cardiac cycle graphs.

LEGACY 2008 SPECIFICATION

Estimated time for entire question pack: ~1 h 26 min

Derived from the legacy BY2 paper's pace of ~1.1 min/mark, padded for long-prose answers (54 marks over 5 questions).

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **comprehensive practice question pack**, not a single mock paper. It contains every question from the legacy WJEC BY2 papers (2008 modular spec, 2011–2017) that maps onto new-spec AS Unit 2 Topic 8 (2.5).

Questions are ordered by source paper date.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — quality of written communication will affect marks. A calculator is allowed. Diagrams included in answers must be fully annotated.

For Examiner's use only

Q	Source	Max	Mark
1	Jun 11 Q6	11	
2	Jun 12 Q4	8	
3	Jan 14 Q2	12	

Q	Source	Max	Mark
4	Jun 15 Q6	12	
5	Jun 17 Q5	11	
Total		**54**	

Transport in Animals — Heart & Cardiac Cycle — what the new spec asks

WJEC GCE AS / A Level Biology (from 2015) · Unit 2: Biodiversity & Physiology of Body Systems · Topic 2.5.

Heart anatomy

- Four chambers: left and right atria + ventricles.
- AV valves (tricuspid R, bicuspid L); semilunar valves at aorta and pulmonary artery.
- Left ventricle wall thickest — pumps to systemic circulation.

Cardiac cycle

- Atrial systole → ventricular systole → diastole.
- Valves open / close passively along pressure gradients.
- Heart sounds ('lub', 'dub') = AV then semilunar valves closing.

Myogenic conduction

- SAN in right atrium initiates depolarisation.
- Wave spreads across atria → AVN (delay) → bundle of His → Purkyne fibres.
- Ventricles contract from the apex upwards.

Cardiac cycle graphs

- Read ventricular vs aortic pressure curves to locate valve events.
- ECG waves: P (atrial), QRS (ventricular), T (repolarisation).
- Cardiac output = stroke volume × heart rate.

Crib sheet »

Transport in Animals — Heart & Cardiac Cycle in one page

Quick-reference notes — revisit before each question.

Heart chambers

4 chambers: right atrium / ventricle, left atrium / ventricle.

Left ventricle has thickest wall — pumps to whole body.

Right ventricle pumps to lungs only.

Valves

AV valves: tricuspid (R), bicuspid/mitral (L).

Tendinous cords + papillary muscles — stop inversion.

Semilunar valves at aorta and pulmonary artery.

Cardiac cycle

Atrial systole (~0.1 s) → ventricular systole (~0.3 s) → diastole (~0.4 s).

AV valves close when ventricular pressure > atrial.

Semilunar close when aortic > ventricular.

Pressure-volume graphs

X-axis: time (s) within one cycle.

Aortic curve highest; left ventricle peaks then falls.

Atrium has small pressure bump during atrial systole.

Conducting system

SAN (right atrium) — pacemaker.

Wave → AVN (slight delay) → bundle of His → Purkyne fibres.

Ventricular contraction starts at apex, pushes blood up.

Cardiac output

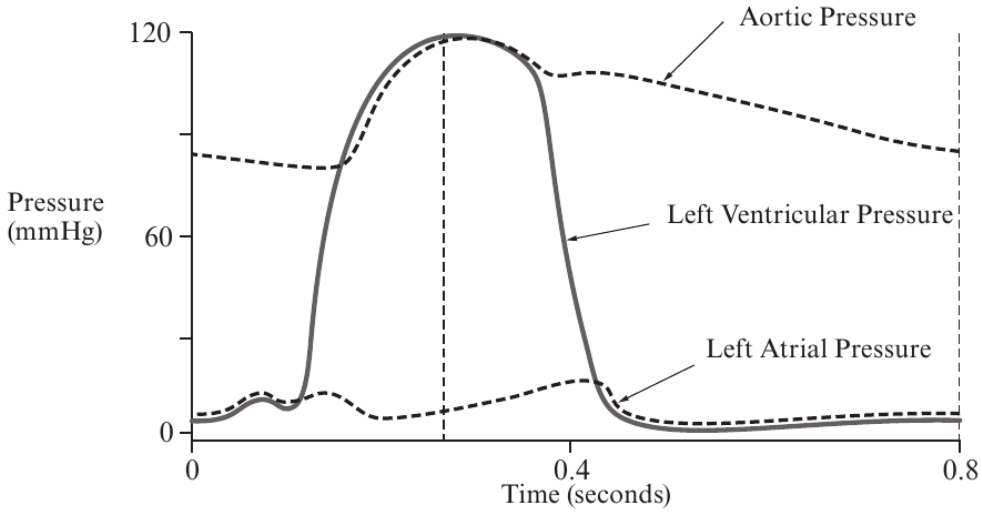
CO = stroke volume × heart rate (cm^3 min^{-1}).

Resting ~5 L min^{-1}; exercise can ×5.

Controlled by medulla via sympathetic & parasympathetic nerves.

Examiner only

6. The cardiac cycle diagram below depicts changes in aortic pressure, left ventricular pressure, left atrial pressure during a single cycle of cardiac contraction and relaxation.



(a) On the diagram above:

(i) Indicate with a letter **A** where the aortic semi lunar valve opens and with a **B** where it closes. [2]

(ii) Indicate with a letter **C** where the left atrioventricular (bicuspid) valve opens and with a **D** where it closes. [2]

(b) Why does the ventricular pressure fall to zero, whilst the aortic pressure does not fall below 80 mmHg? [2]

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(c) Using the information in the diagram above, calculate the rate of heartbeat for one minute. Show your working. [2]

Answer .....

Examiner only

The table below shows the pressure in different areas of the heart.

Region of heart	***Maximum** Pressure (mmHg)*
Right Atrium	4
Right Ventricle	25
Pulmonary Artery	25
Left Atrium	10
Left Ventricle	120
Aorta	120

(d) Using the information in the table above, explain the difference in pressures between the **left atrium**, **left ventricle** and **right ventricle**. [3]

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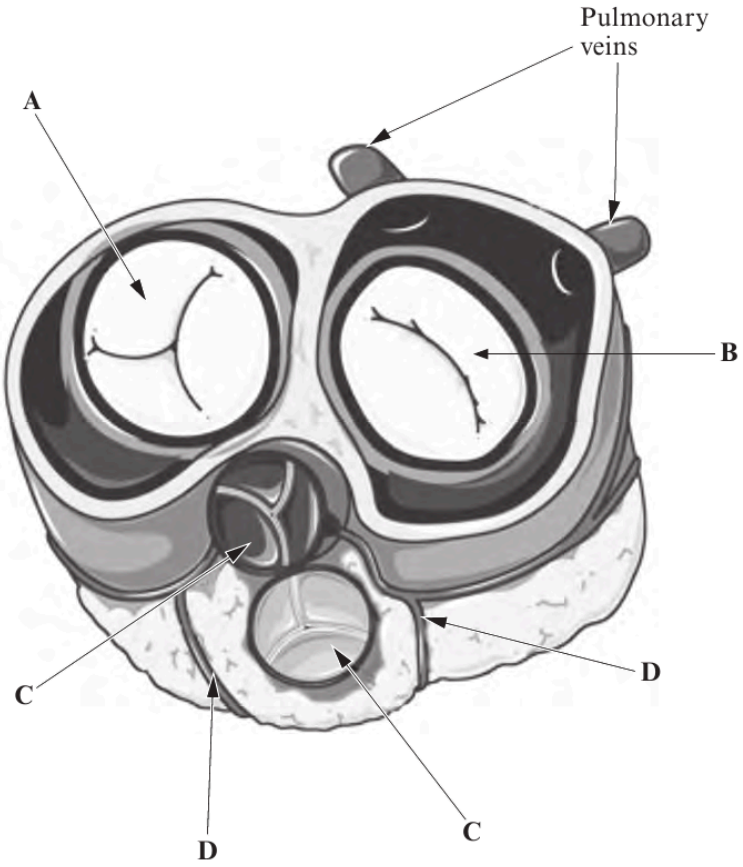
(Total 11 marks)

Examiner only

4. The diagram below shows a section of a human heart, cut just above the heart valves, as seen from above.



(a) Name valves **A**, **B** and **C**. [3]

A .....

B .....

C .....

(b) Name blood vessels **D** which are found on the surface of the heart and explain their function. [2]

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Examiner only

(c) (i) Explain why valve **B** often has to be replaced because it ceases to work effectively and why valve **A** rarely needs replacing. [1]

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(ii) What would happen to the flow of blood if the valve is damaged? [1]

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(iii) Suggest **one** symptom a person with a failing valve **B** may have. [1]

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(Total 8 marks)

Examiner only

1. The table below shows certain characteristics of four kingdoms. If the characteristic is present in members of the kingdom this is shown with a tick (✓). If the characteristic is not present this is shown with a cross (**X**).

Complete the table below by giving the name of each kingdom. [4]

		Kingdom			
		.....	.....	.....	.....
Characteristic	Eukaryotic	✓	✓	**X**	✓
	Chloroplast	✓	**X**	**X**	some species
	Cell wall	✓	**X**	✓	some species
	Nucleus	✓	✓	**X**	✓

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2. The atrio-ventricular node (AVN), bundle of His and Purkyne (Purkinje) fibres are specialised cardiac muscle tissues which are involved in the control of heartbeat.

(a) State the function of the following structures in the functioning of the heart.

(i) atrio-ventricular node (AVN); [2]

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(ii) bundle of His and Purkyne fibres. [2]

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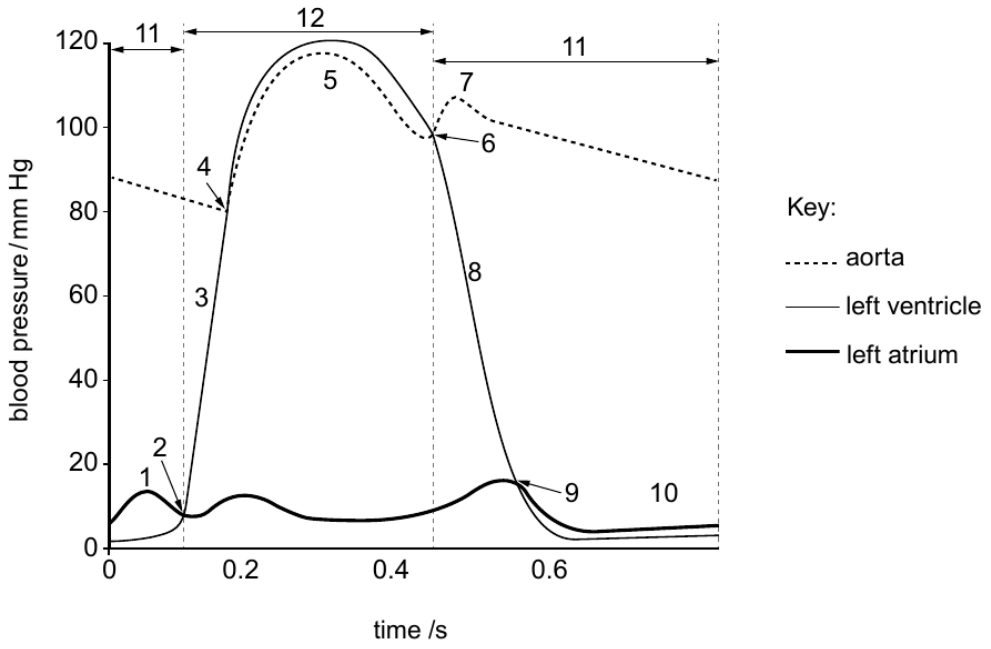
Examiner only

The graph below shows the pressure changes in the left ventricle, left atrium and aorta during one cardiac cycle.



(b) The following statements list events or phases that occur during a cardiac cycle. State the numbers indicated on the graph above that correspond to **each** of the following statements. [8]

(i) ventricular diastole (ventricles are relaxing) .....

(ii) recoil of aorta .....

(iii) atrial systole .....

(iv) closing of semi-lunar valves .....

(v) opening of semi-lunar valves .....

(vi) atrio-ventricular valves close .....

(vii) ventricular systole (ventricles are contracting) .....

(viii) passive filling of atrium by venous return .....

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Examiner only

6. *(a)* Cardiac muscle is said to be myogenic (spontaneously active). What does this term mean? [1]

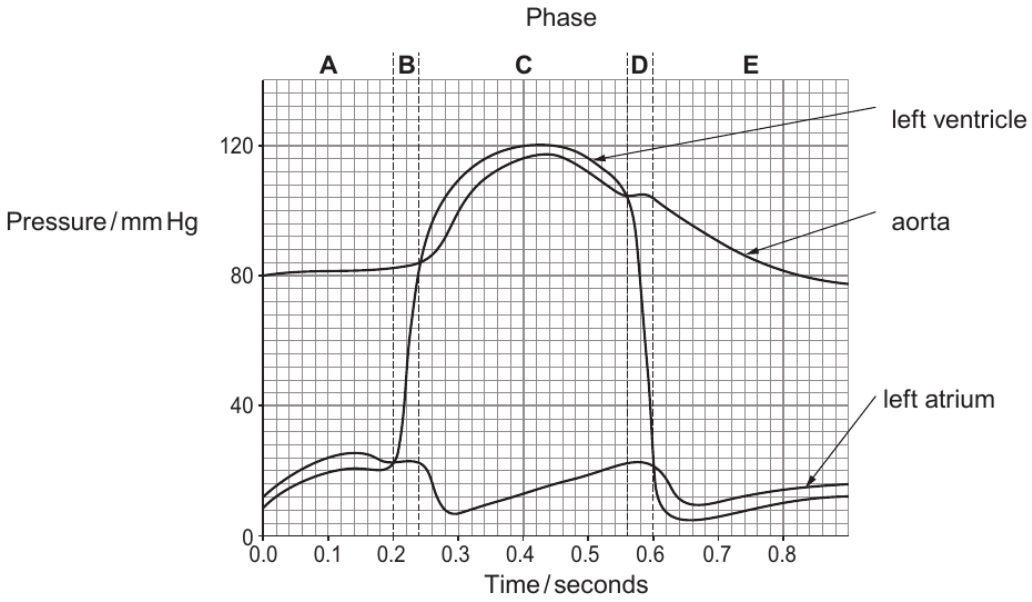
(b) Describe the role of the following in the cardiac cycle:

(i) the sino-atrial node; [2]

(ii) the Purkyne (Purkinje) fibres. [2]

Examiner only

(c) Below is a graph showing the pressure changes in the left side of the heart during one cardiac cycle.



(i) From the graph state the time when the following events occur. [2]

Event	Time / seconds
The atrio-ventricular (bicuspid) valve closes	
The aortic (semi lunar) valve closes	

(ii) Using the letters **A**-**E** from the top of the graph, state **a** phase when the following events occur. [3]

Event	Phase
Blood is flowing from the atria to the ventricles	
Blood is flowing from the ventricle to the aorta	
When there is no overall movement of blood through the heart	

Examiner only

(iii) Explain how blood is prevented from flowing from the left ventricle to the left atrium. [2]

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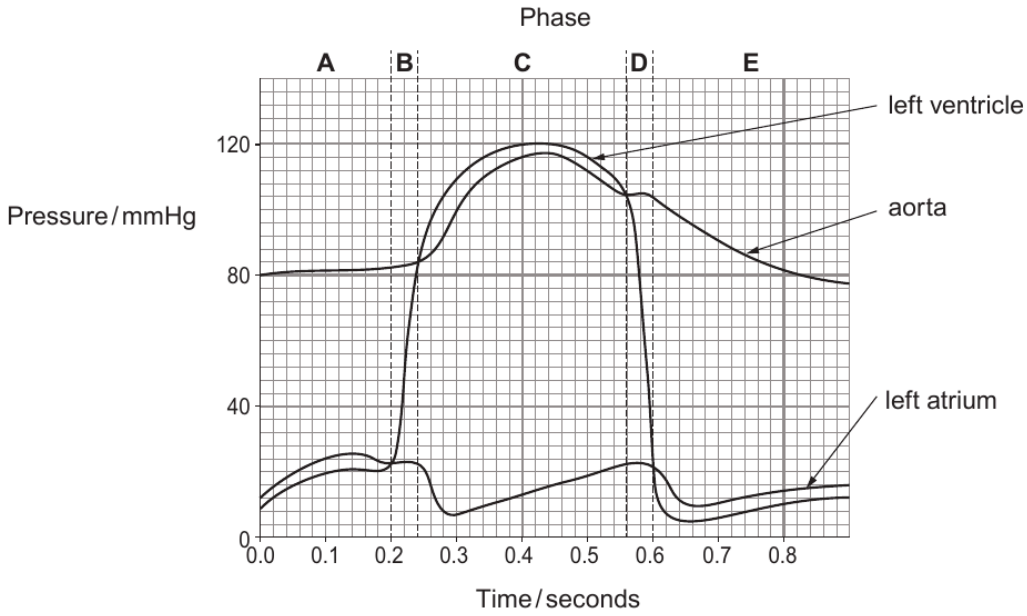
Examiner only

5. The graph below shows the changes in blood pressure that occur in the left side of the heart during a single cardiac cycle.



(a) (i) State the name given to the phase **A** on the graph. [1]

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(ii) Use the information on the graph to explain why the bicuspid valve is open during phase **A** on the graph. [2]

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(b) (i) During phase **B** on the graph there is an increase in ventricular pressure. Explain what causes this increase in pressure. [1]

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(ii) With reference to the different pressures shown in phase **B**, explain why the volume of blood in the left ventricle remains constant during this phase. [2]

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Examiner only

(c) When doctors use a stethoscope to listen to the heart, the sounds they hear, 'lub-dub', are due to the closure of valves. Use the information in the graph to identify the time at which the **second** heart sound 'dub' occurs. Explain how you arrived at your answer. [3]

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(d) How would a graph showing pressure changes in the right side of the heart differ from the graph opposite? Explain your answer. [2]

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END OF QUESTION PACK

5 questions · 54 marks · ~1 h 26 min
Source: WJEC BY2 (2008 modular spec, 2011–2017)
Curated for WJEC Biology 2015 spec AS Unit 2 — Topic 8 (2.5)