8. Transport in Mammals

8.3 The heart

Paper 1

Question Paper

1 The following tissues carry an electrical impulse during the cardiac cycle.

1 atrioventricular node

2 muscle wall of atria

3 Purkyne tissue

4 sinoatrial node

In which order does the electrical impulse travel during the cardiac cycle?

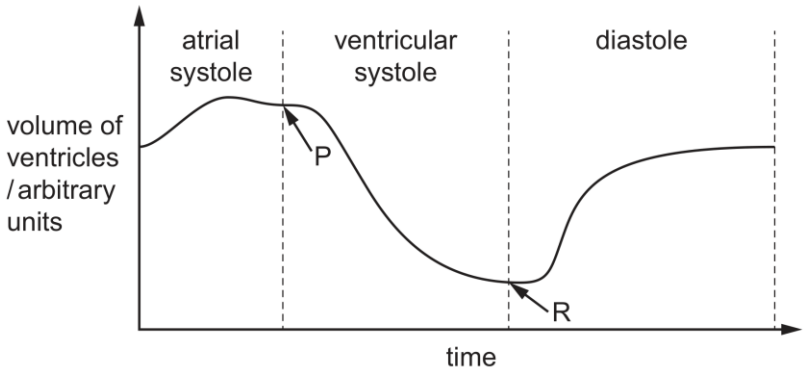
A $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$

B $1 \rightarrow 4 \rightarrow 2 \rightarrow 3$

C $4 \rightarrow 2 \rightarrow 1 \rightarrow 3$

D $4 \rightarrow 2 \rightarrow 3 \rightarrow 1$

2 The graph shows changes in the volume of the ventricles during a single cardiac cycle.

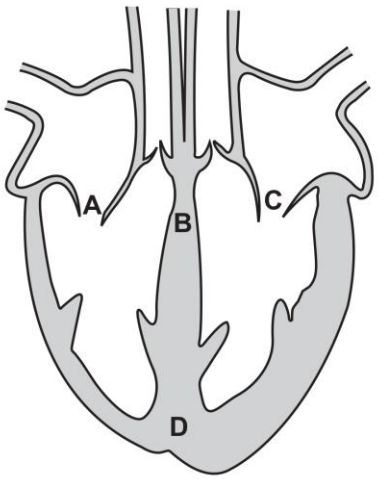


Which row is correct for the atrioventricular valve at P and for the semilunar valve at R?

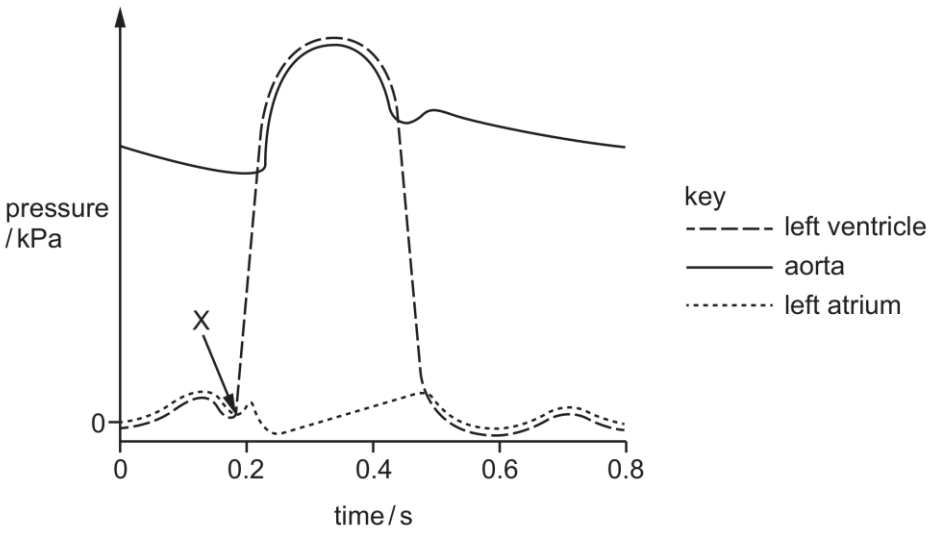
	atrioventricular valve at P	semilunar valve at R
A	closes	closes
B	closes	opens
C	opens	closes
D	opens	opens

3 The diagram shows the internal structure of the mammalian heart.

Which letter identifies the location of the atrioventricular node?



4 The diagram shows pressure changes in the left side of the heart during the cardiac cycle.



What happens in the heart at X?

A The atrioventricular valves close.

B The atrioventricular valves open.

C The semilunar valves close.

D The semilunar valves open.

5 'Heart block' is a disease which can result in a lower than normal heart rate. A doctor treating a person with heart block found that electrical impulses were initiated as normal but were not correctly conducted to the ventricles, so the rate of ventricular contraction was slowed.

Which parts may **not** be functioning correctly in the person with heart block?

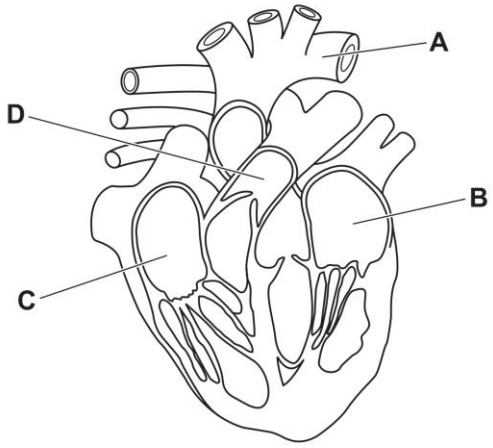
1 atrioventricular node (AVN)

2 Purkyne tissue

3 sinoatrial node (SAN)

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

6 The diagram shows a section through the human heart.



Which label is correct?

A pulmonary artery

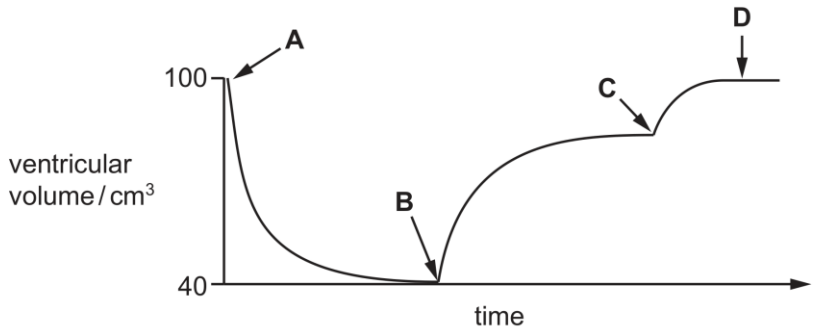
B left ventricle

C right atrium

D aorta

7 The graph shows how the volume of the left ventricle changes during one cardiac cycle.

Which point on the graph represents the start of atrial systole?



8 Which sequence of letters correctly identifies the order of events during the cardiac cycle?

T atrial walls contract

U impulse is delayed by a fraction of a second

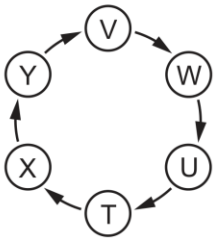
V wave of excitation enters the atrioventricular node

W wave of excitation passes down the Purkyne tissue

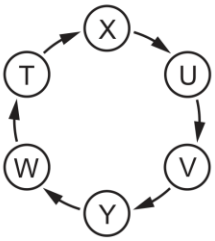
X wave of excitation spreads from the sinoatrial node

Y ventricles contract

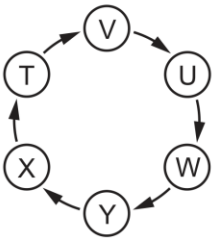
A



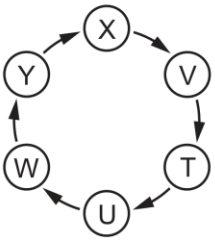
B



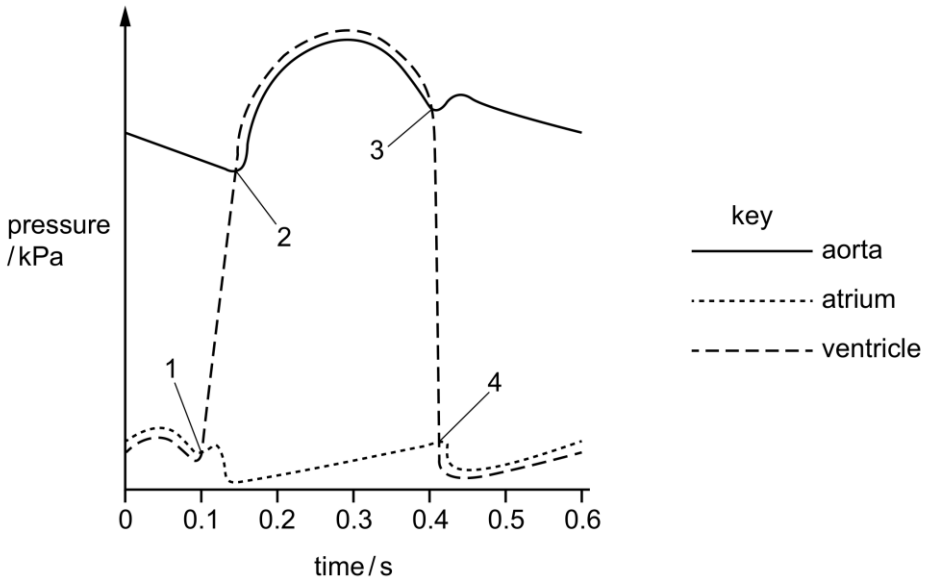
C



D



9 The diagram gives information about blood pressure in the left side of the heart during the cardiac cycle.



Valves open and close at the points numbered.

Which row identifies the valves opening or closing at the points numbered?

	atrioventricular valve opens	semilunar valve opens	atrioventricular valve closes	semilunar valve closes
A	1	3	4	2
B	2	4	3	1
C	3	1	2	4
D	4	2	1	3

10 The diagrams show the valves in the heart when viewed in cross-section from above at different stages in the cardiac cycle.

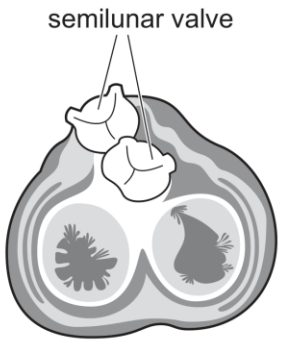


diagram 1

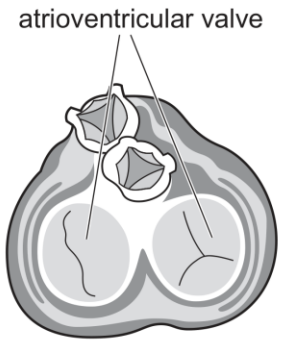


diagram 2

Which stages in the cardiac cycle are shown?

	diagram 1	diagram 2
A	diastole	ventricular systole
B	atrial systole	diastole
C	ventricular systole	diastole
D	diastole	atrial systole

11 Some of the events during a cardiac cycle are listed.

1 Left and right atria contract.

2 Left and right ventricles contract.

3 A wave of electrical activity is conducted by the Purkyne tissue.

4 A wave of electrical activity passes through the atrioventricular node.

What is the correct sequence of events after the sinoatrial node sends out a wave of electrical activity?

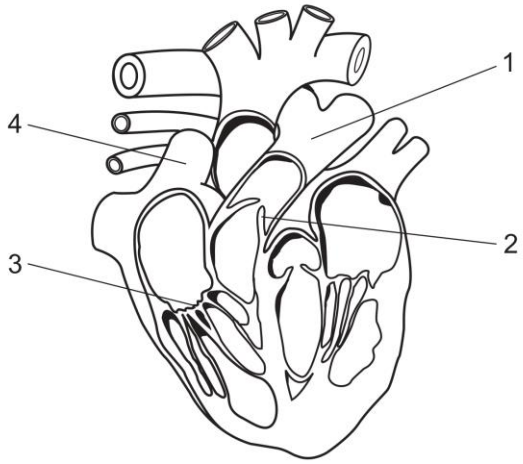
A $1 \rightarrow 3 \rightarrow 4 \rightarrow 2$

B $1 \rightarrow 4 \rightarrow 3 \rightarrow 2$

C $2 \rightarrow 4 \rightarrow 3 \rightarrow 1$

D $4 \rightarrow 1 \rightarrow 3 \rightarrow 2$

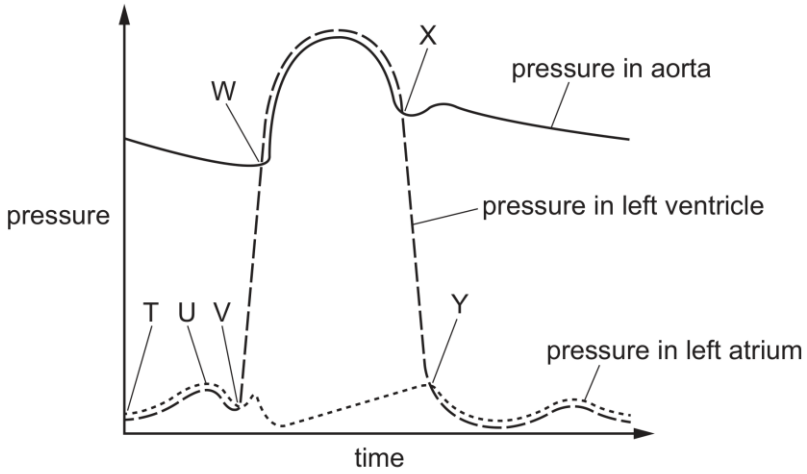
12 The diagram shows an anterior view of a vertical section through the human heart.



Which row shows the correct labels for the diagram?

	1	2	3	4
A	aorta	atrioventricular valve	semilunar valve	pulmonary artery
B	pulmonary vein	semilunar valve	atrioventricular valve	pulmonary vein
C	pulmonary artery	semilunar valve	atrioventricular valve	vena cava
D	pulmonary vein	atrioventricular valve	semilunar valve	vena cava

13 The graph shows some blood pressure changes that occur in a human during one cardiac cycle.



When does systole start and end in the right atrium and in the right ventricle?

	in right atrium		in right ventricle	
	systole starts	systole ends	systole starts	systole ends
A	T	V	V	X
B	T	U	V	Y
C	U	V	W	X
D	V	W	W	Y

14 What is systolic blood pressure?

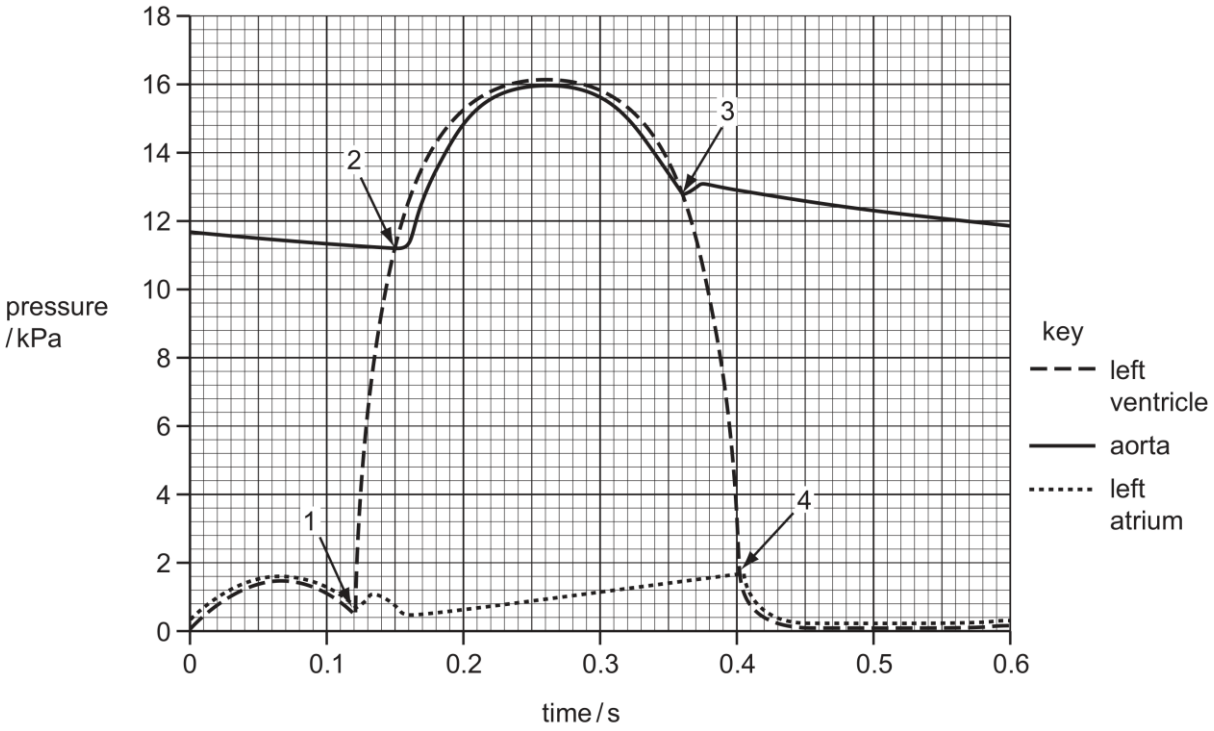
A the blood pressure in the arteries when the heart is relaxing

B the blood pressure in the left ventricle at the start of a contraction

C the maximum blood pressure in the arteries

D the maximum blood pressure in the right ventricle

15 The diagram shows pressure changes in the left side of the heart and aorta over time. The length of this cardiac cycle is 0.6 s. Points 1, 2, 3 and 4 indicate when atrioventricular valves and semilunar valves either open or close.



What is the total time during one cardiac cycle that the atrioventricular valves and the semilunar valves are both closed at the same time?

A 0.03 s **B** 0.04 s **C** 0.07 s **D** 0.21 s

16 What occurs during ventricular systole in a mammalian heart?

1 Aortic pressure increases.

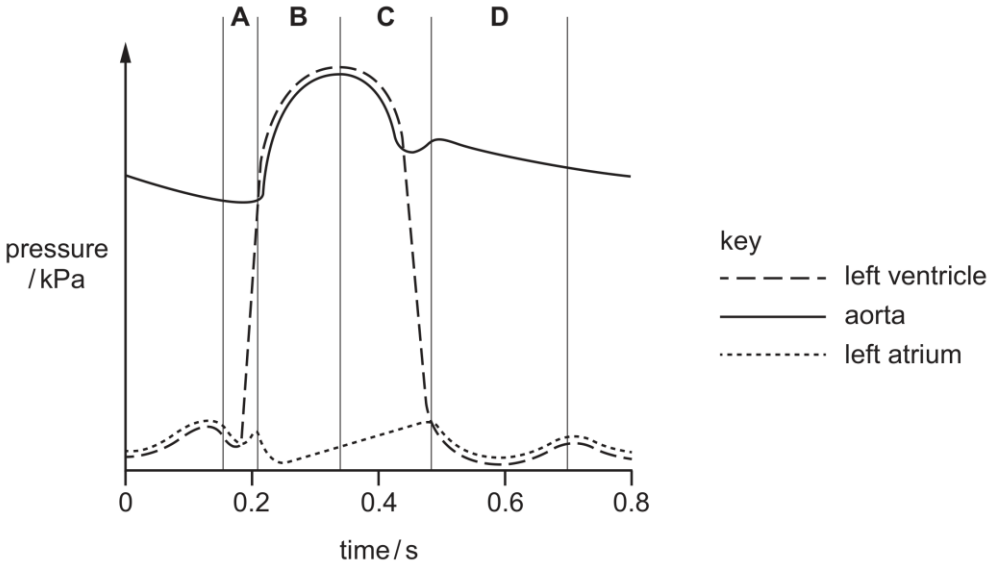
2 Atrial pressure does not change.

3 Ventricular pressure increases.

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 only

17 The diagram shows the pressure changes in various structures of the left side of the heart during the cardiac cycle.

At the end of which period is the ventricle full of blood?



18 What happens during ventricular systole in a mammalian heart?

1 The atrioventricular node transmits an electrical signal to the apex of the heart.

2 The pressure in the ventricles drops below the pressure in the atria.

3 The atrioventricular valves close and the semilunar valves open.

A 1 and 2 **B** 1 and 3 **C** 2 only **D** 3 only

19 Ventricular septal defect (VSD) is a heart defect that people can have from birth. People with VSD have a hole in the wall (septum) that separates the left and right ventricles.

What could happen in a person with VSD?

1 Blood will leak through the hole, mostly from right to left.

2 The volume of blood circulating through the lungs will be higher than in a person without VSD.

3 Less oxygen will be delivered to the body tissues.

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

20 Which statement about the structure of the heart is correct?

A The semilunar valves close when the pressure in the ventricles falls lower than the pressure in the arteries.

B A muscle called the septum separates the atria from the ventricles.

C There is a small patch of tissue in the right atrium that acts to delay the electrical impulse.

D Closure of valves in the veins prevents backflow of blood into the ventricles.

21 The statements list some of the events in a cardiac cycle. The statements are not in the correct order.

Which statement describes the fourth of these events to occur in the cardiac cycle?

1 The impulse travels through Purkyne tissue.

2 A wave of excitation sweeps across the atria.

3 The atrioventricular node delays the impulse for a fraction of a second.

4 The sinoatrial node contracts.

5 The wave of excitation sweeps upwards from the base of the ventricles.

6 The ventricles contract.

7 The atria contract.

A 1 **B** 3 **C** 4 **D** 7

22 The sinoatrial node initiates the cardiac cycle.

What is the correct order in which the chambers of the heart contract?

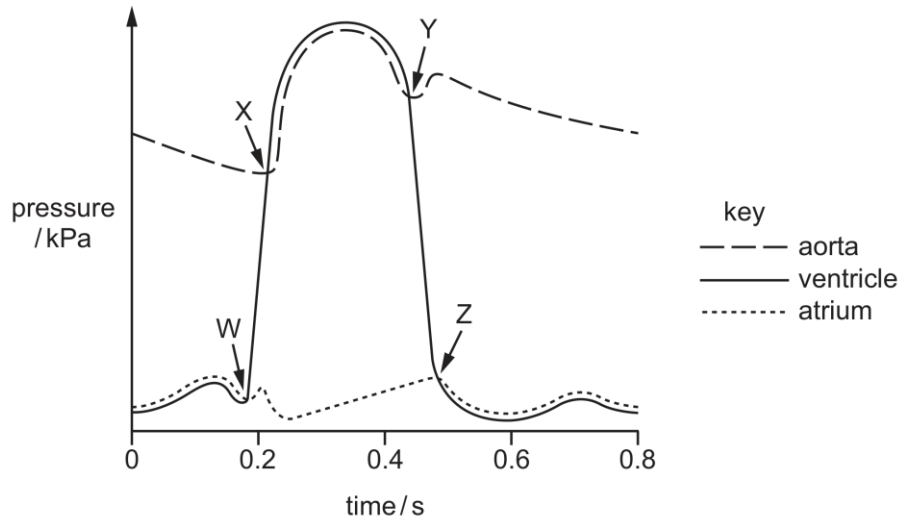
A atria and ventricles at the same time

B both atria then both ventricles

C left atrium, then left ventricle, then right atrium, then right ventricle

D right atrium, then right ventricle, then left atrium, then left ventricle

23 The graph shows pressure changes in different parts of the heart during a mammalian cardiac cycle. W, X, Y and Z indicate when a valve opens or closes.



Which row is correct?

	W	X	Y	Z
A	opens	closes	closes	opens
B	opens	opens	closes	opens
C	closes	opens	closes	opens
D	closes	closes	opens	opens

24 The parts of the heart that control heart action are listed.

- sinoatrial node (SAN)
- atrioventricular node (AVN)
- Purkyne tissue

Which row is correct for atrial contraction and ventricular contraction?

	atrial contraction	ventricular contraction
A	AVN produces waves of excitation	SAN produces waves of excitation
B	Purkyne tissue carries waves of excitation	AVN produces waves of excitation
C	SAN and AVN produce waves of excitation	Purkyne tissue carries waves of excitation
D	SAN produces waves of excitation	Purkyne tissue carries waves of excitation

25 What will happen as a result of the blood pressure in the right ventricle becoming higher than the blood pressure in the right atrium?

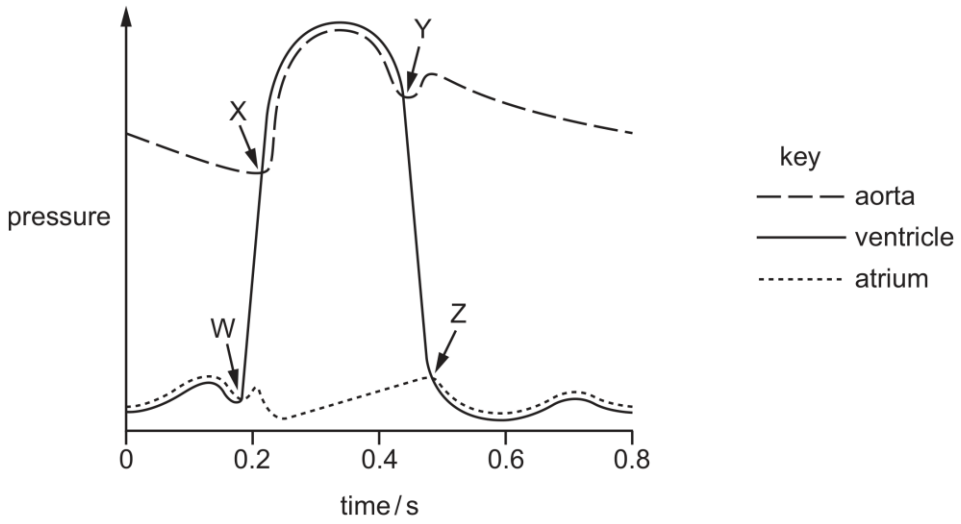
A The semilunar valve in the aorta will close.

B The semilunar valve in the pulmonary artery will close.

C The left atrioventricular valve will close.

D The right atrioventricular valve will close.

26 The graph shows pressure changes in different parts of the heart during a mammalian cardiac cycle. W, X, Y and Z indicate when a valve opens or closes.



Which row correctly identifies W, X, Y and Z?

	W	X	Y	Z
A	atrioventricular valve opens	atrioventricular valve closes	semilunar valve opens	semilunar valve closes
B	atrioventricular valve closes	semilunar valve opens	semilunar valve closes	atrioventricular valve opens
C	semilunar valve opens	semilunar valve closes	atrioventricular valve opens	atrioventricular valve closes
D	semilunar valve closes	atrioventricular valve opens	atrioventricular valve closes	semilunar valve opens

27 What explains why the left and right sides of the heart contract simultaneously?

A Both atria have a sinoatrial node.

B Both sides of the heart are supplied by the same coronary artery.

C Purkyne tissue links the two sides of the heart.

D There is no barrier to electrical excitation between two sides of the heart.

28 The statements list some of the events in the cardiac cycle. They are not in the correct order.

1 The impulse travels through Purkyne tissue.

2 A wave of excitation sweeps across the atria.

3 The atrioventricular node delays the impulse for a fraction of a second.

4 The sinoatrial node contracts.

5 The wave of excitation sweeps upwards from the base of the ventricles.

6 The ventricles contract.

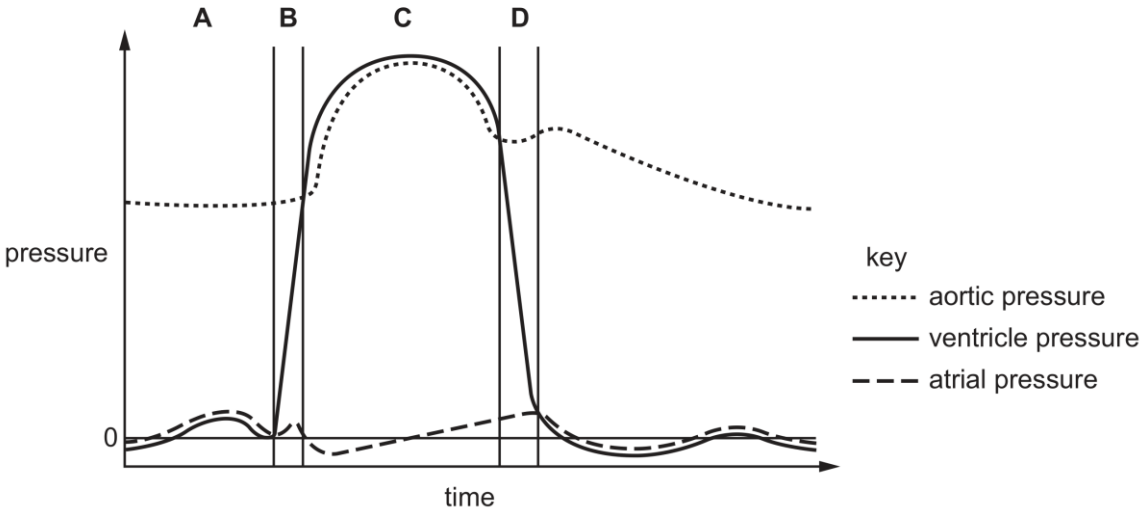
7 The atria contract.

Which statement describes the third of these events to occur in the cardiac cycle?

A 1 **B** 3 **C** 4 **D** 7

29 The diagram shows pressure changes in different parts of the heart during one cardiac cycle.

During which period are the semilunar valves open and the atrioventricular valves closed?



30 Which sequence of letters correctly identifies the order of events during the cardiac cycle?

T atrial walls contract

U impulse is delayed a fraction of a second

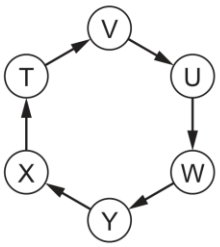
V wave of excitation enters the atrioventricular node

W wave of excitation passes down the Purkyne tissue

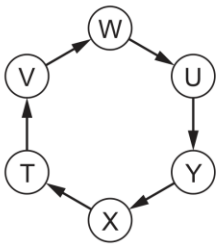
X wave of excitation spreads from the sinoatrial node

Y ventricles contract

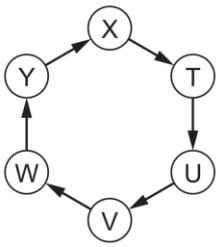
A



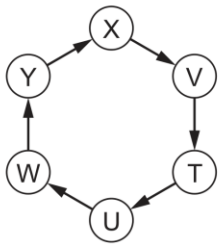
B



C



D



31 Which sequence of letters correctly identifies the order of events during the cardiac cycle?

T atrial walls contract

U impulse is delayed a fraction of a second

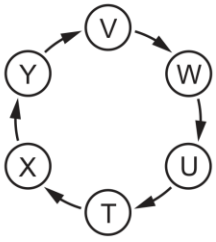
V wave of excitation enters the atrioventricular node

W wave of excitation passes down the Purkyne tissue

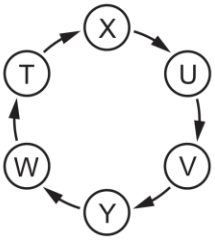
X wave of excitation spreads from the sinoatrial node

Y ventricles contract

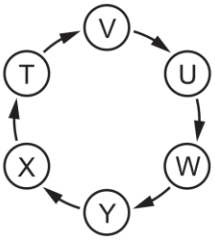
A



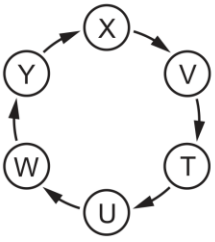
B



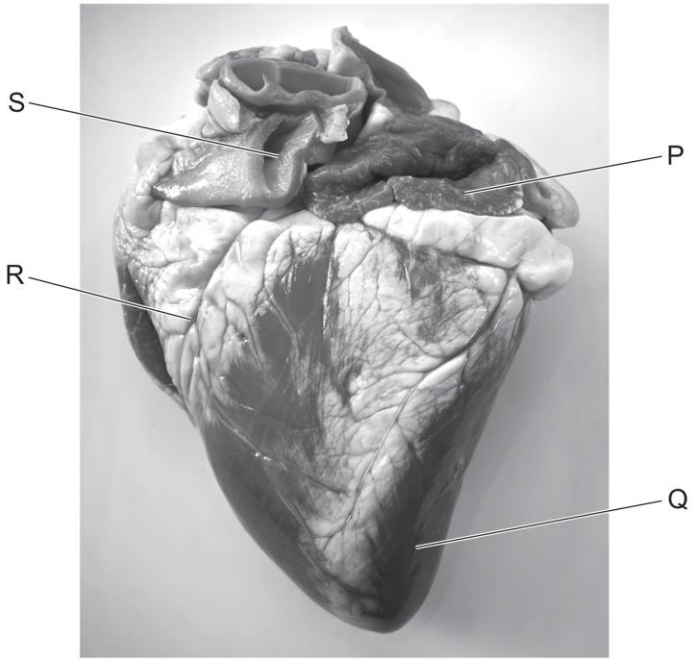
C



D



32 The photograph shows an external view of the front of a mammalian heart.



Which row identifies the position of the structures labelled P, Q, R and S?

	P	Q	R	S
A	left atrium	cardiac muscle	Purkyne tissue	pulmonary vein
B	left atrium	left ventricle	coronary artery	vena cava
C	right atrium	cardiac muscle	Purkyne tissue	aorta
D	right atrium	right ventricle	coronary artery	pulmonary artery

33 What happens during ventricular systole?

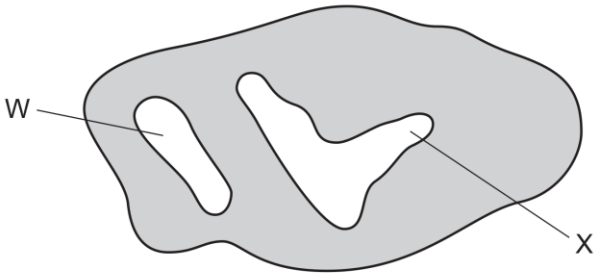
1 The atrioventricular node transmits an electrical signal to the apex of the heart.

2 The pressure in the ventricles drops below the pressure in the atria.

3 The atrioventricular valves close and the semilunar valves open.

A 1 and 2 only **B** 1 and 3 only **C** 2 only **D** 3 only

34 The diagram shows a cross-section through a mammalian heart.



Which chambers of the heart are represented by W and X?

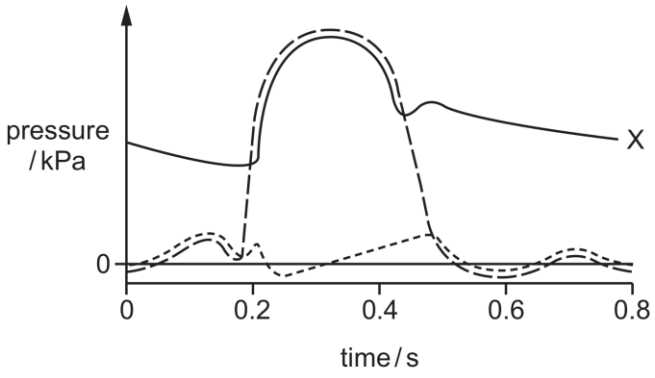
	W	X
A	left ventricle	right ventricle
B	right atrium	left atrium
C	right atrium	right ventricle
D	right ventricle	left ventricle

35 At a certain point in a cardiac cycle, the pressure in the right ventricle is lower than that in the right atrium and lower than that in the pulmonary artery.

Which row is correct?

	atrioventricular valve	semilunar valve
A	closed	closed
B	closed	open
C	open	closed
D	open	open

36 The diagram shows the pressure changes in some structures of the **right side** of the heart during the cardiac cycle.



Which structure is represented by X?

A pulmonary artery

B right atrium

C right ventricle

D vena cava

37 The statements list some of the events in the cardiac cycle. They are not in the correct order.

Which statement describes the fifth of these events to occur in the cardiac cycle?

1 The impulse travels through Purkyne tissue.

2 A wave of excitation sweeps across the atria.

3 The atrioventricular node delays the impulse for a fraction of a second.

4 The sinoatrial node contracts.

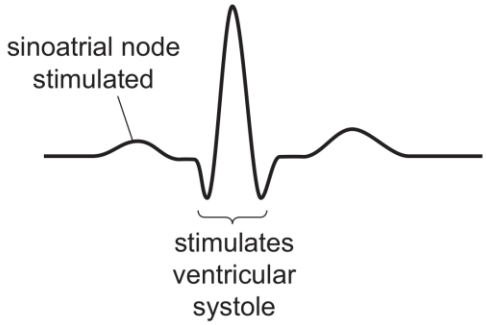
5 The wave of excitation sweeps upwards from the base of the ventricles.

6 The ventricles contract.

7 The atria contract.

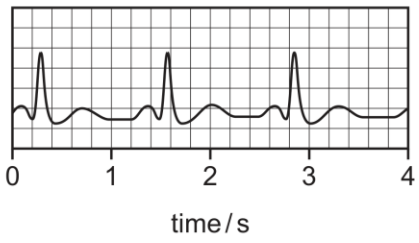
A 1 **B** 3 **C** 4 **D** 7

38 The diagram shows the changes in electrical activity in the heart muscle during one cardiac cycle. This is called an electrocardiograph (ECG).

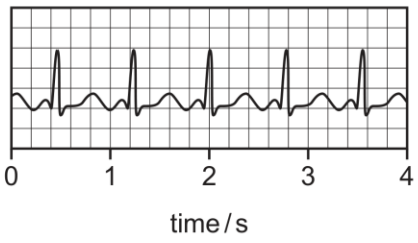


Which electrocardiogram shows a rate of 75 beats per minute?

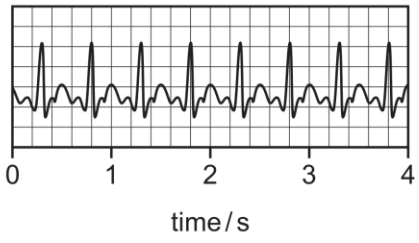
A



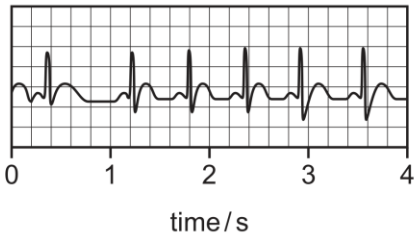
B



C



D



39 Which statement explains why the ventricles contract after the atria?

A The band of fibres between the atria and the ventricles conducts the excitation wave slowly.

B The excitation wave has to pass through a small area of conducting fibres in the septum.

C The excitation wave has to travel further to reach the base of the ventricles than to spread across the atria.

D The excitation wave travels slowly through the Purkyne tissue to reach the base of the septum.

40 If the left atrioventricular valve in the heart does not close completely it results in blood flowing back into the atrium during ventricular systole.

What would be the immediate effect of this back flow?

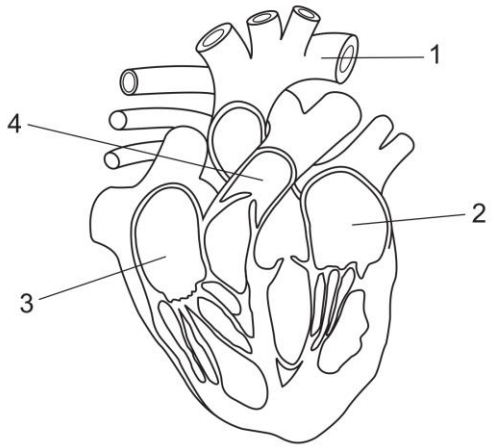
A blood flowing from the heart carries less oxygen because less blood enters the lungs

B diastolic pressure in the left ventricle falls because less blood enters the pulmonary artery

C lower systolic pressure in the left atrium and less blood enters the pulmonary artery

D raised pressure in the left atrium and less blood enters the aorta

41 The diagram shows a section through the heart and the associated blood vessels.



What is correct for the flow of blood through the heart?

A $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$

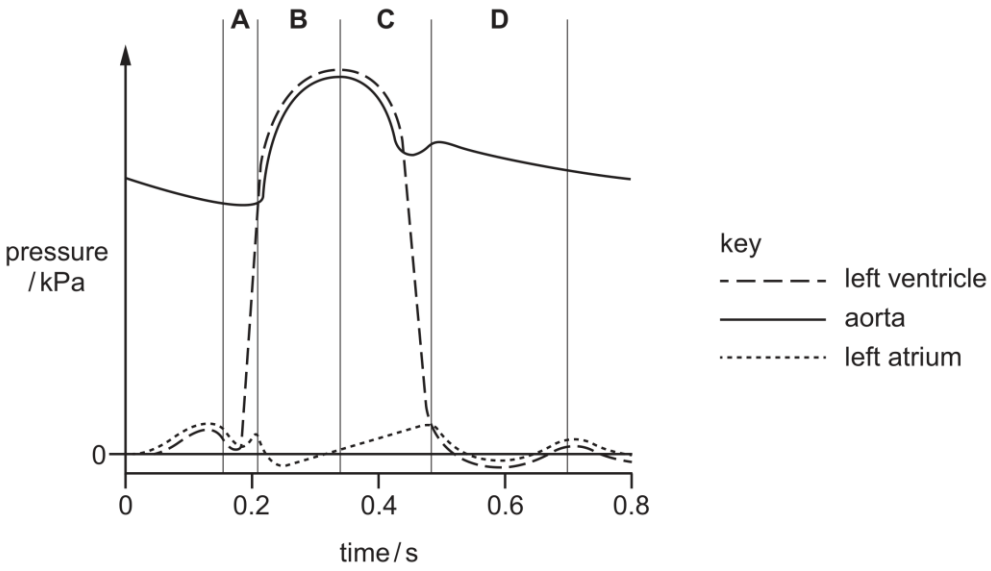
B $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$

C $3 \rightarrow 4 \rightarrow 1 \rightarrow 2$

D $4 \rightarrow 3 \rightarrow 2 \rightarrow 1$

42 The diagram shows the pressure changes in various structures of the left side of the heart during the cardiac cycle.

At the end of which period is the ventricle full of blood?



43 What describes the role of the atrio-ventricular node of the heart?

A It causes the muscles of the ventricles to contract from the apex upwards.

B It delays the transmission of a wave of electrical activity from the sinoatrial node.

C It initiates a new wave of electrical activity in the ventricles.

D It provides a non-conducting barrier between the atria and the ventricles.

44 The diagram shows pressure changes during the cardiac cycle.

Which arrow indicates ventricular systole?

