1. Fig.16.1 shows an ECG trace and the changes in **left ventricular volume** that occur during the cardiac cycle.

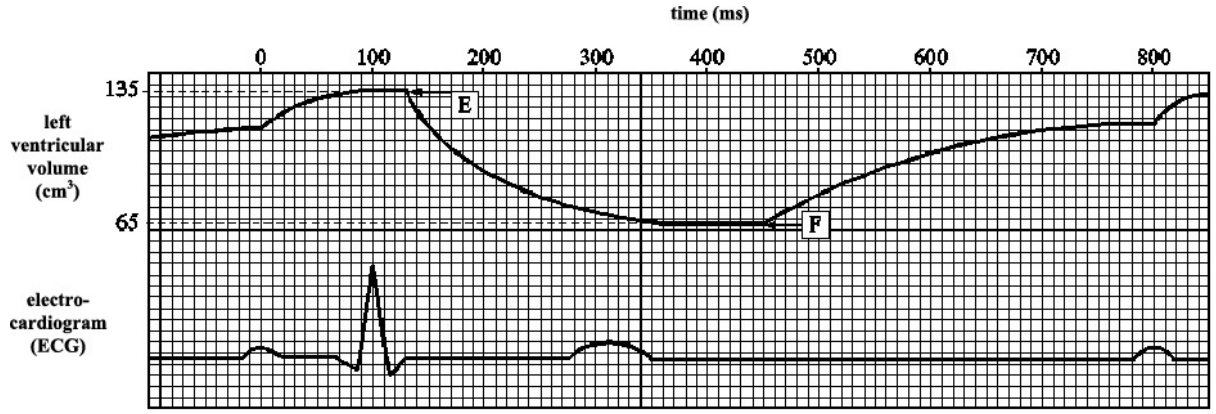

Fig. 16.1

Which of the following statements is correct?

A The heart rate is 80 bpm and it takes 2.2 seconds for the ventricle to empty.
B The heart rate is 75 bpm and it takes 0.22 seconds for the ventricle to empty.
C The heart rate is 75 bpm and it takes 2.2 seconds for the ventricle to empty.
D The heart rate is 80 bpm and it takes 0.22 seconds for the ventricle to empty.

Your answer ☐

[1]

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2. Fig.16.1 shows an ECG trace and the changes in **left ventricular volume** that occur during the cardiac cycle.

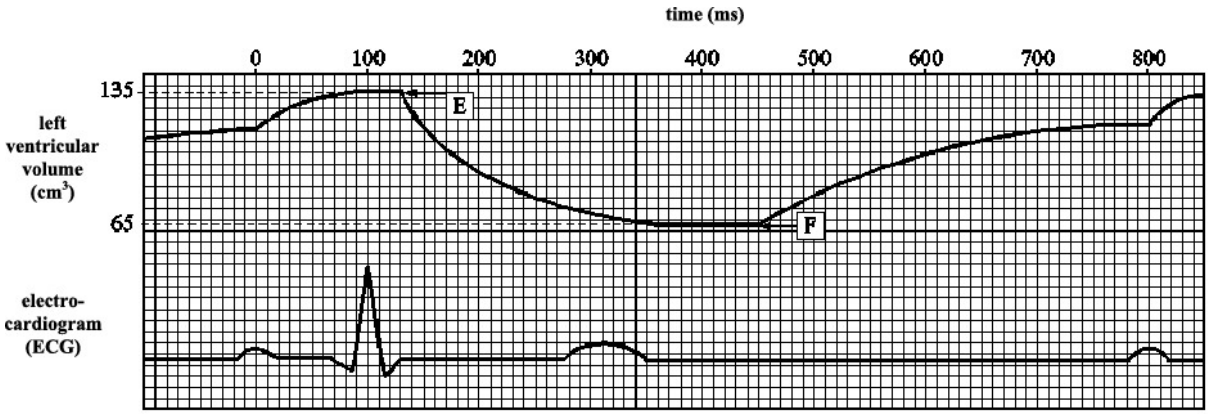

Fig. 16.1

Which statement is correct about the events in the cardiac cycle at points **E** and **F**?

A The AV valve opens at **E** and closes at **F**.

B The aortic (semi-lunar) valve opens at **E** and the AV valve opens at **F**.

C The aortic (semi-lunar) valve opens at **E** and closes at **F**.

D The AV valve opens at **E** and the aortic (semi-lunar) valve opens at **F**.

Your answer ☐

[1]

3. The average heart rate at rest is 72 beats per minute and the average stroke volume is 70 cm^3.

Assuming a total blood volume of 5 dm^3, what is the shortest time it would take for the heart to pump the total volume of blood in the body?

A between 10 and 20 seconds
B between 30 and 40 seconds
C between 50 and 60 seconds
D between 60 and 70 seconds

Your answer ☐

[1]

4. The total blood volume of a human adult is 4.8 dm^3. The heart rate for this adult during intense exercise was 200 bpm.

At this heart rate, the blood completed **six** full circulations of the body in one minute.

Which of the options, **A** to **D**, is the correctly calculated stroke volume of the left ventricle for this adult?

A 24 cm^3
B 82 cm^3
C 144 cm^3
D 184 cm^3

Your answer ☐

[1]

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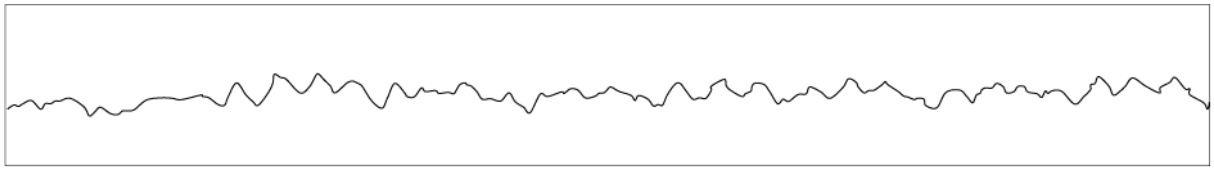
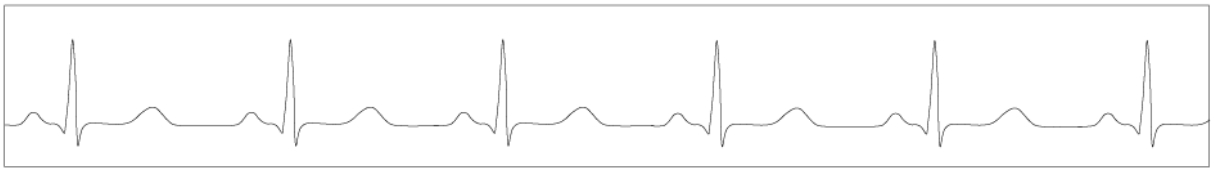
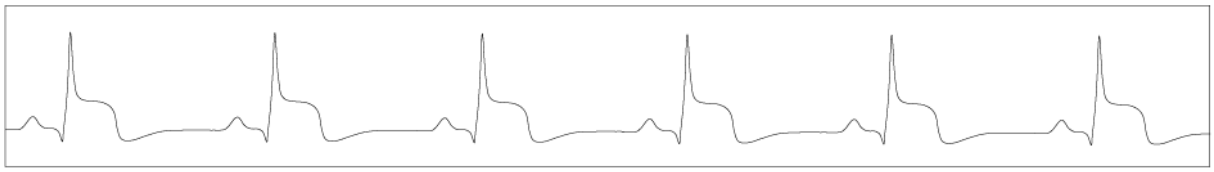
5. Four electrocardiogram (ECG) traces labelled **A** to **D** are shown below.



A



B



C

D

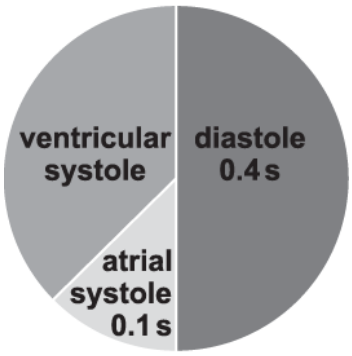
Which of the traces, **A** to **D**, shows evidence of S-T elevation?

Your answer ☐

[1]

6. The chart shows the main stages that occur during one cardiac cycle for an adult at rest.

Timings are shown for some of the stages.



Which of the options, **A** to **D**, shows the correctly calculated heart rate for this adult?

A 48 beats per minute
B 72 beats per minute
C 75 beats per minute
D 80 beats per minute

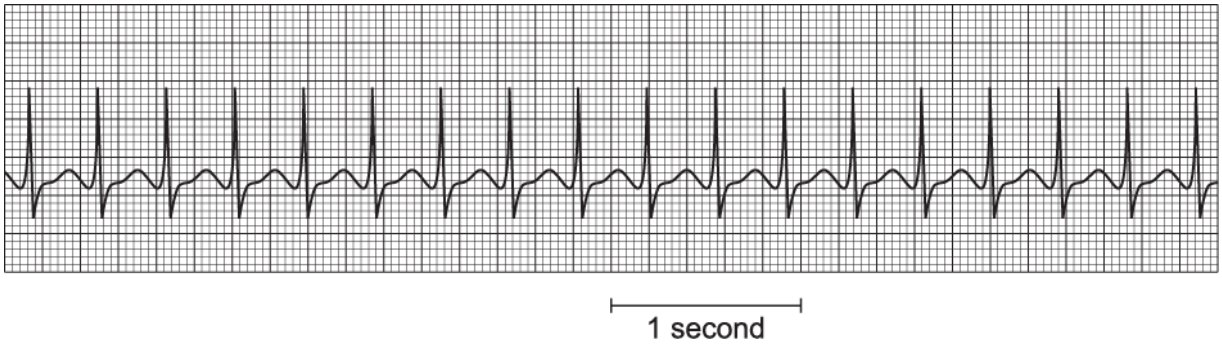
Your answer

[1]

7. A patient was admitted to hospital complaining of chest pains.

An ECG (electrocardiogram) was taken on arrival.

A copy of the patient's ECG trace is shown below.



Which of the conditions, **A** to **D**, would result in the ECG trace shown above?

A bradycardia
B atrial fibrillation
C ventricular fibrillation
D tachycardia

Your answer

[1]

8. The action of valves is vital to the function of the heart.

Which of the options, **A** to **D**, is an event that occurs immediately before opening of the semilunar valves?

A emptying of the atria
B stimulation of the atrioventricular node
C stimulation of the sinoatrial node
D start of ventricular systole

Your answer

[1]

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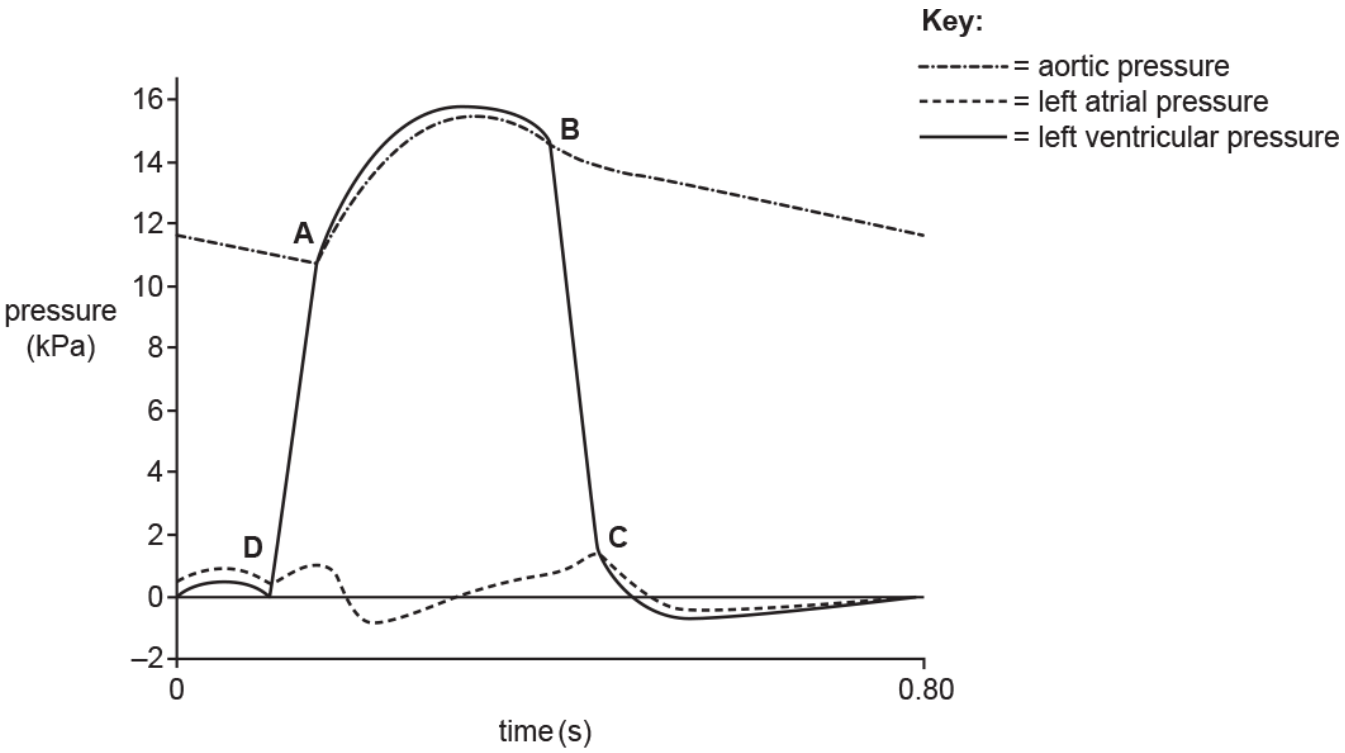
9. The graph below shows pressure changes in the left side of the heart during the cardiac cycle.

Four points on the graph are labelled **A** to **D**.



Which of the points, **A** to **D**, corresponds to closing of the semilunar valve?

Your answer ☐ [1]

10. A patient was admitted to hospital with a resting heart rate of 40 bpm. Their electrocardiogram (ECG) trace showed that the distance between the QRS peaks was longer than that of a normal trace.

Which of the options, **A** to **D**, is the heart condition being described?

A tachycardia
B bradycardia
C myocardial infarction
D ventricular fibrillation

Your answer ☐ [1]

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11. A group of students investigated the effects of ethanol on the heart rate of the water flea, *Daphnia pulex*, and then analysed their results using a paired Student's *t*-test.

- Ten water fleas were used in the investigation.
- A value for *t* was calculated as 25.8.
- The critical value for a significance level of 5% is 2.23.

Which of the following statements, **A** to **D**, is correct?

A The number of degrees of freedom is 10 and the null hypothesis can be rejected.

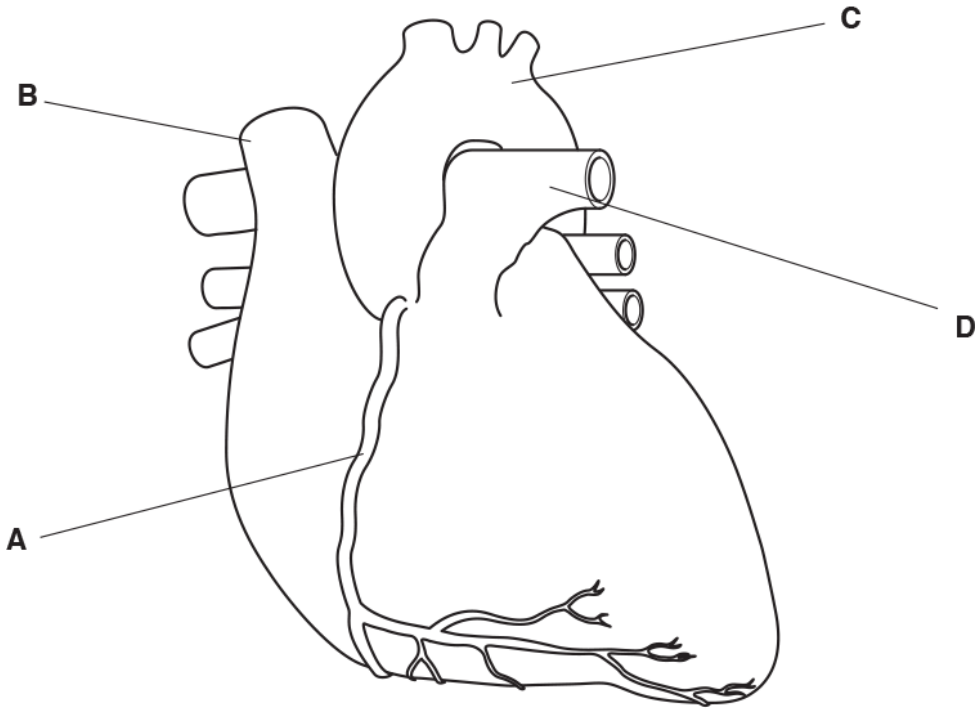
B The number of degrees of freedom is 9 and the null hypothesis can be accepted.

C The number of degrees of freedom is 9 and the null hypothesis can be rejected.

D The number of degrees of freedom is 1 and the null hypothesis can be accepted.

Your answer ☐ **[1]**

12. The diagram shows the external structure of the mammalian heart.



Which of the blood vessels, **A** to **D**, carry oxygenated blood to the heart muscle?

Your answer [1]

13. Which of the options, **A** to **D**, is the heart chamber in which electrical activity is initiated?

A left atrium

B left ventricle

C right atrium

D right ventricle

Your answer [1]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1			B	1	
			Total	**1**	
2			B	1	
			Total	**1**	
3			C	1	
			Total	**1**	
4			C	1	
			Total	**1**	
5			C	1	
			Total	**1**	
6			C	1	**Examiner's Comments** There was a requirement to apply a mathematical equation in this question to calculate heart rate. Some candidates found this difficult and it is possible that the missing value in the pie chart distracted them from the simple manipulation of the formula for the calculation
			Total	**1**	
7			D	1	**Examiner's Comments** Many candidates correctly read the ECG trace and spotted the timescale leading them to option **D** as the correct response.
			Total	**1**	
8			D ✓	1	
			Total	**1**	
9			B ✓	1	**Examiner's Comments** Candidates should be very familiar with this graph showing pressure changes in the heart, yet the correct response was only achieved by just over 50% of the candidates.

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Question			Answer/Indicative content	Marks	Guidance
			Total	1	
10			B	1	Examiner's Comments It was pleasing to see candidates able to process information rather than simply recalling visual traces for ECGs with many offering option **B** as the correct response.
			Total	1	
11			C	1	Examiner's Comments No calculations were required to obtain a response for this question. Higher ability candidates were able to analyse the information and choose the correct statement. Some candidates found this difficult.
			Total	1	
12			A	1	Examiner's Comments Across the ability range there still appears to be some misconception of the fact that it is the coronary artery, i.e. option A, that supplies oxygenated blood to heart muscle. Some candidates opted for D, the pulmonary artery (a common misconception) that carries de-oxygenated blood to the lungs.
			Total	1	
13			C	1	
			Total	1	

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