

Cardiac Cycle and Ventilation - Questions by Topic

Q1.

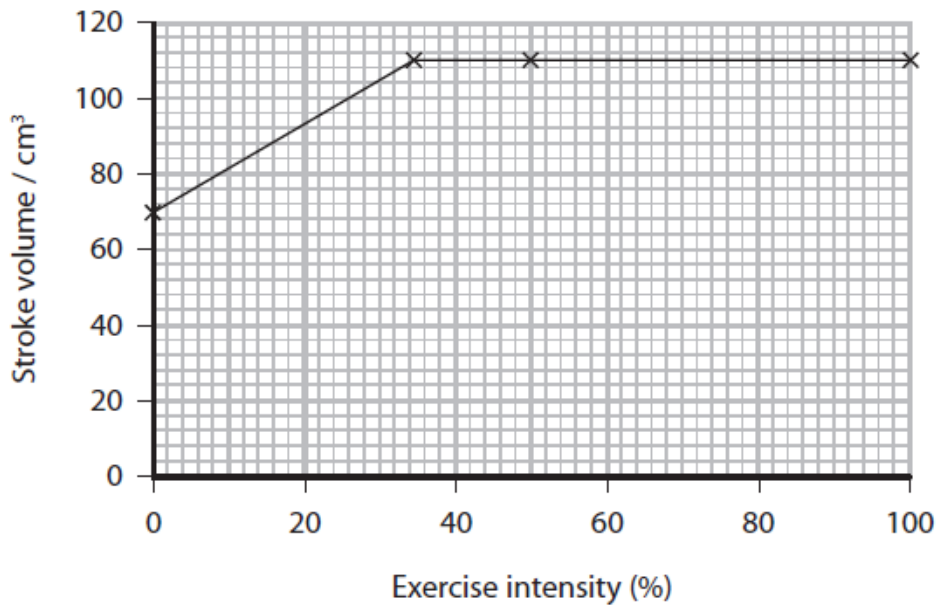
Athletic competitions often take place during the summer months when ambient temperatures are high.

High ambient temperatures affect marathon runners.

Heat stress occurs when the core body temperature rises above 40 °C.

When running a marathon, both heart rate and stroke volume increase.

The graph shows the effect of exercise intensity on stroke volume for marathon runners.



(i) Cardiac output is the product of stroke volume and heart rate.

During a race, a marathon runner's exercise intensity increased from 0 to 100%. The table shows the effect on the runner's heart rate.

Exercise intensity (%)	Heart rate / bpm
0	55
100	160

Calculate the increase in cardiac output for a marathon runner during a race.

Give your answer in $\text{dm}^3 \text{min}^{-1}$.

(2)

..... $\text{dm}^3 \text{min}^{-1}$

(ii) Explain why it is necessary for the cardiac output of marathon runners to increase during a race.

(2)

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(Total for question = 4 marks)

Q2.

Physiological changes occur when a person carries out a period of exercise, such as running 800 metres.

(a) One physiological change will be an increase in cardiac output.

One physiological change will be an increase in cardiac output.

(4)

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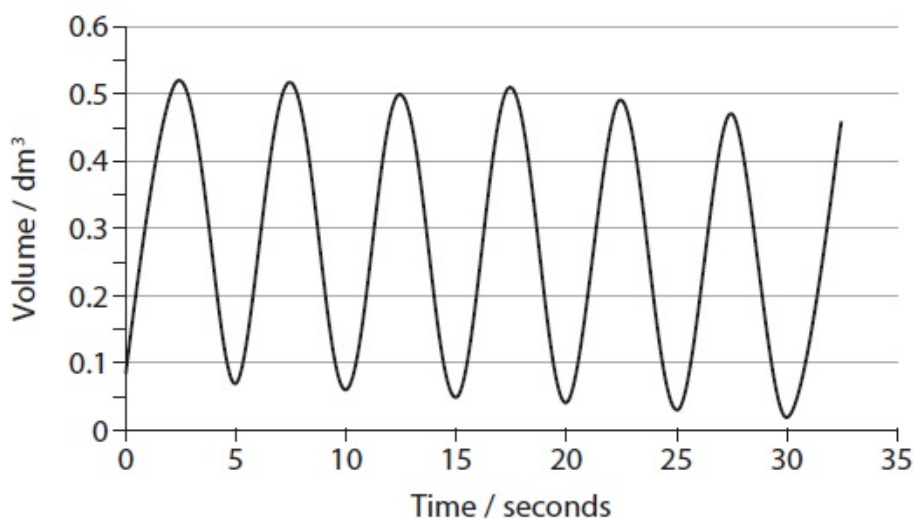
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(b) The respiratory system will also undergo physiological changes during a period of exercise.

The spirometer trace shown below was recorded when an adult was at rest. This trace can be used to calculate the resting breathing rate and tidal volume of the adult.



(i) Place a cross in the box (☒) that correctly identifies the approximate value for resting breathing rate and tidal volume for this adult.

(2)

Approximate value for	0.1 dm ³	0.5 dm ³	6 dm ³ min ⁻¹	6 breaths min ⁻¹	12 breaths min ⁻¹
Resting breathing rate	☒	☒	☒	☒	☒
Resting tidal volume	☒	☒	☒	☒	☒

(ii) The light conditions experienced by group B were similar to those found near ground level in woodland.

Describe how a spirometer trace recorded immediately after a short period of exercise would differ from this trace.

(2)

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(c) A student used a spirometer to compare the resting breathing rate of musicians who play trumpets with musicians who play violins.

Suggest **two** variables the student should have considered when selecting the musicians, to make the study valid.

(2)

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(Total for question = 10 marks)

Q3.

A human heart can work effectively for over a hundred years but many people throughout the world have heart problems.

Explain how the sinoatrial node (SAN) ensures that oxygenated blood enters the aorta.

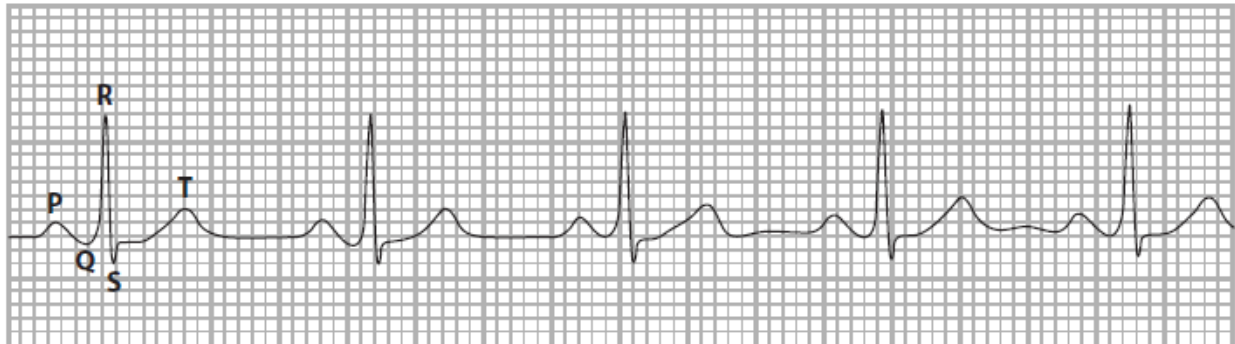
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Q4.

Electrocardiograms can aid the diagnosis of heart conditions.

A doctor recorded the following electrocardiogram for a patient with a healthy heart.



State what is measured along the x-axis and y-axis of this electrocardiogram.

(1)

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Which part of an electrocardiogram indicates the depolarisation of the atria?

(1)

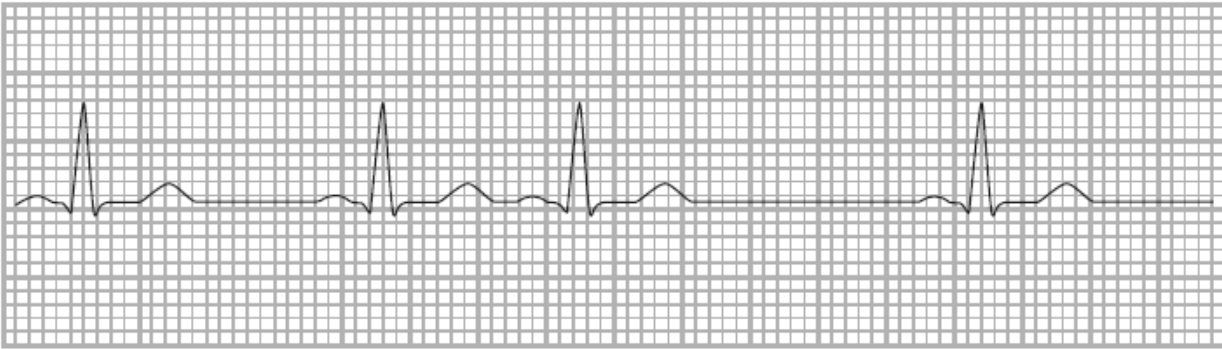
- A P
- B Q
- C R
- D S

Which part of the electrocardiogram indicates when the atrioventricular valves would close?

(1)

- A P to Q
- B Q to R
- C S to T
- D T to P

The doctor recorded this electrocardiogram for another patient.



Explain why the electrocardiogram indicates that this patient has a heart condition.

(2)

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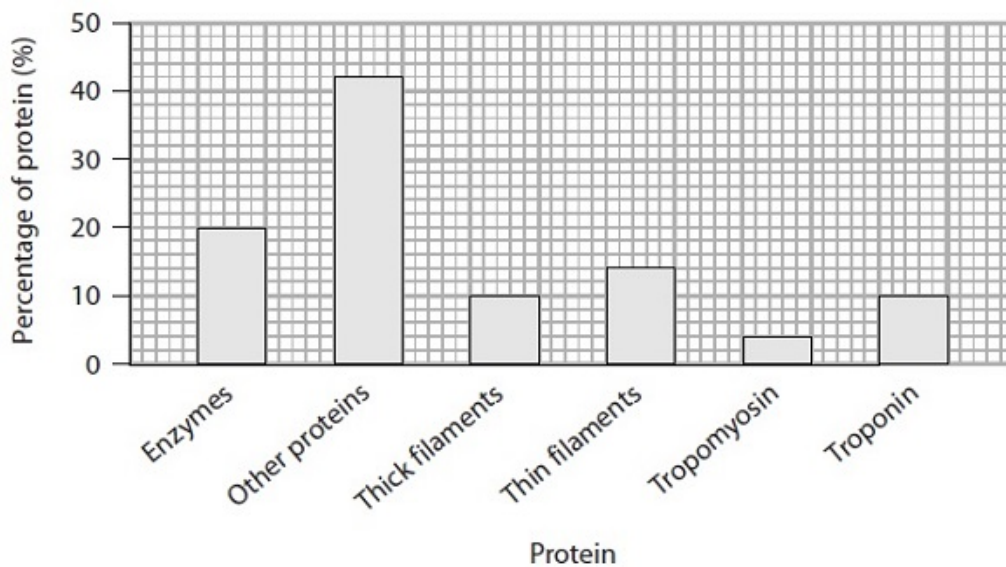
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Q5. Skeletal muscle and cardiac muscle have some of the same proteins.

(a) The percentage of the proteins found in cardiac muscle are shown in the bar chart below.



(i) Using the information in the bar chart, give the percentage of protein that is actin and the percentage that is myosin. (2)

Actin:
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%

Myosin:
.....%

(ii) Describe how calcium ions affect troponin as a skeletal muscle fibre contracts. (2)

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(iii) Some of the 'other proteins' shown in the bar chart are found in the sinoatrial node (SAN).
State the location of the SAN in the heart. (1)

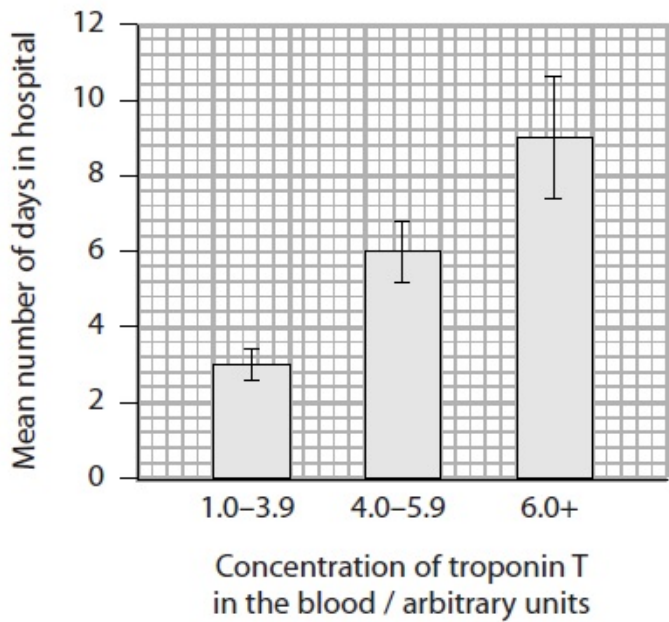
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(b) Troponin T is found in cardiac muscle cells. It can leak into the blood if the heart is damaged as a result of cardiovascular disease (CVD).

Testing for troponin T in blood can be used to study patients with CVD.

The graph below shows the concentration of troponin T in the blood of patients with CVD.

The graph also shows the mean number of days and the range of time spent in hospital.



(i) Suggest a conclusion that a doctor could draw from these data.

(1)

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(ii) Comment on the validity of the doctor's conclusion.

(2)

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(Total for Question = 8 marks)