**The Heart and Cardiac Cycle**

**Name: ............................................. Mark: .........../ 36 Grade: ..............**

**1.** The graph below shows the main stages of the cardiac cycle.



(a) During which stage in the cardiac cycle:

(i) does the blood flow into the atria?

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(1)

(ii) are the atrioventricular valves closed?

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(1)

(b) (i) How would you expect the pressure in the right ventricle to differ from the pressure in the left ventricle?

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(1)

(ii) Explain what produces this difference in pressure.

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(1)

(Total 4 marks)

**2.** The diagrams show the left side of the heart at two stages in a cardiac cycle.



(a) Name the structure labelled **X.**

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(1)

(b) Describe **two** pieces of evidence in Diagram **B** which indicate that the ventricle is emptying.

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2 .................................................................................................................................

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(2)

(c) The cardiac output is the volume of blood that one ventricle pumps out per minute. The resting heart rate of an athlete often decreases as a result of training, even though the cardiac output remains the same. Suggest an explanation for this.

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(1)

(d) During exercise the rate of blood flow to heart muscle increases from 270 cm3 per minute to 750 cm3 per minute.

(i) Calculate the percentage increase in rate of blood flow to heart muscle during exercise. Show your working.

Answer ............................... %

(2)

(ii) Explain the advantage of the increase in the rate of blood flow to heart muscle during exercise.

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(2)

(Total 8 marks)

**3.** (a) The times taken in the various stages of a complete cardiac cycle are shown in the table.

|  |  |
| --- | --- |
| **Stage of cardiac cycle** | **Time taken / s** |
| Contraction of the atria | 0.1 |
| Contraction of the ventricles | 0.3 |
| Relaxation of both atria and ventricles | 0.4 |

1. Use the information in the table to calculate the heart rate in beats per minute.

Answer ................................ beats per minute

(1)

(ii) If the same rate of heartbeat were maintained throughout a twelve-hour period, for how many hours would the ventricular muscle be contracting? Show your working.

Answer ...................................... hours

(2)

(b) An interventricular septal defect is an opening in the wall (septum) that separates the left and right ventricles. Suggest and explain the effect of this defect on blood flow through the heart.

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(2)

(Total 5 marks)

**4.** The diagram shows the circulatory system of a human in a simplified way.



(a) In the blood vessels in the diagram, add arrows next to the letters, **A**, **B**, **C** and **D** to show the direction of blood flow at each position.

(2)

(b) Which of the blood vessels, **A** to **F**,

(i) carries blood with the highest concentration of oxygen; ..........

(ii) contains the carotid bodies? ..........

(2)

(c) The valve, **V**, helps to maintain blood flow through the heart. Describe how it carries out this function.

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(2)

(Total 6 marks)

**5.** The graph shows changes in pressure in the aorta, left ventricle and left atrium during one heart beat.



(a) The maximum pressure in the left atrium is lower than the maximum pressure in the left ventricle. What causes this difference in maximum pressure?

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(1)

(b) A stethoscope can be used to listen to the sounds made by the heart.

(i) What is the evidence from the graph that the first heart sound is caused by the atrioventricular valve closing?

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(1)

(ii) What causes the second heart sound? Give the reason for your answer.

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(2)

(Total 4 marks)

**6.** (a) The table shows the blood pressure in the left atrium, the left ventricle and the aorta at   
 different times during part of a cardiac cycle.

|  |  |  |
| --- | --- | --- |
| **Blood pressure / kPa** | | |
| **Time / s** | **Left atrium** | **Left ventricle** | **Aorta** |
| 0.0 | 0.5 | 0.4 | 10.6 |
| 0.1 | 1.2 | 0.7 | 10.6 |
| 0.2 | 0.3 | 6.7 | 10.6 |
| 0.3 | 0.4 | 17.3 | 16.0 |
| 0.4 | 0.8 | 8.0 | 12.0 |

(i) At which time is blood flowing into the aorta?

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(1)

(ii) Between which times are the atrioventricular valves closed?

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(1)

(d) The maximum pressure in the left ventricle is higher than the maximum pressure in the right ventricle. What causes this difference in pressure?

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(1)

(e) The information below compares some features of different blood vessels.



Use the information to explain how the structures of the walls of arteries, veins and capillaries are related to their functions.

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(6)

(Total 9 marks)