

The Heart

Question Paper 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Transport in mammals
Sub Topic	The Heart
Booklet	Theory
Paper Type	Question Paper 1

Time Allowed : 66 minutes

Score : / 55

Percentage : /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	77.5%	70%	62.5%	57.5%	45%	<45%

1 An autosomal gene controlling fur colour in cats has three alleles:

- allele C^B codes for black fur
- allele C^{CH} codes for chocolate fur
- allele C^{CM} codes for cinnamon (orange-brown) fur.

Allele C^B is dominant to both C^{CH} and C^{CM} .

Allele C^{CH} is dominant to C^{CM} .

(a) (i) State the name given to the position of a gene on a chromosome.

..... [1]

(ii) A cinnamon-coloured cat must be homozygous.

Explain what is meant by the term *homozygous*.

.....
.....
..... [1]

(b) Two black cats were crossed. Most of their offspring had black fur and a few had chocolate fur. When they were mature, one of the black offspring was crossed with one of the chocolate offspring. Some of the cats in the second generation had cinnamon fur.

Draw a genetic diagram to show how cats with cinnamon-coloured fur were produced in the second generation.

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- 2 Fig. 5.1 shows a vertical section of the left side of the heart of a mammal.

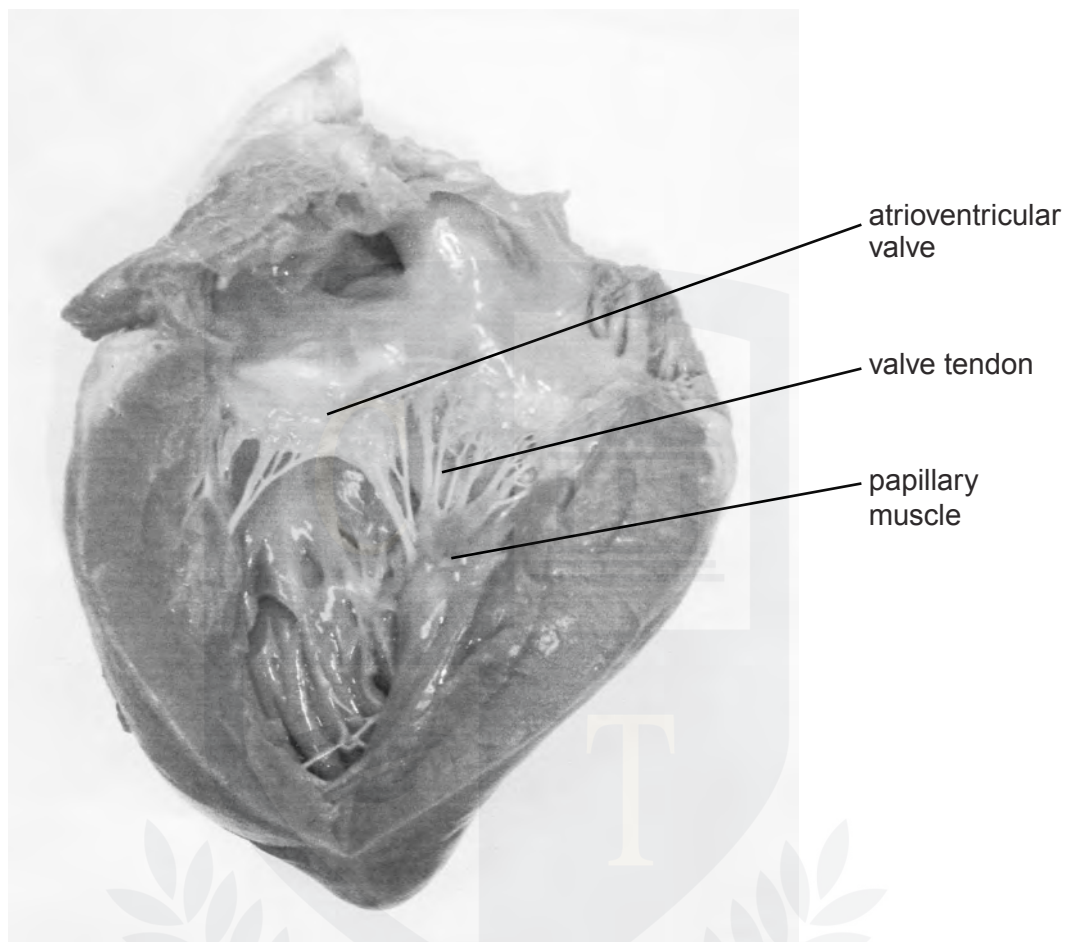


Fig. 5.1

- (a) Explain the difference in the thickness of the left ventricle and the left atrium.

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.....[2]

(b) Explain how the structures labelled on Fig. 5.1 ensure that blood flows in the correct direction.



[3]

(c) During one cardiac cycle, blood is pumped from the heart into the pulmonary and systemic circulations.

Explain how the contraction of the four chambers of the heart are coordinated and controlled to enable blood to be pumped simultaneously into both the pulmonary and systemic circulations.


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[4]

[Total: 9]

- 3 (a) The statements below are some of the events that occur in the initiation and control of heart action during one cardiac cycle.

Place the events in the correct sequence, using 1 as the first event in the sequence.

event	correct sequence
Purkyne tissue conducts the wave of excitation	
atrioventricular node sends out a wave of excitation	
atria contract	
ventricles contract	
sinoatrial node sends out a wave of excitation	

[3]

- (b) The wall of the left ventricle contains more cardiac muscle than the wall of the right ventricle.

Explain the difference in the thickness of the walls of the left and right ventricles of the heart, in terms of their functions.

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..... [2]

[Total: 5]

- 4 (a) Fig. 3.1 shows a cross-section of the heart at the level of the valves.

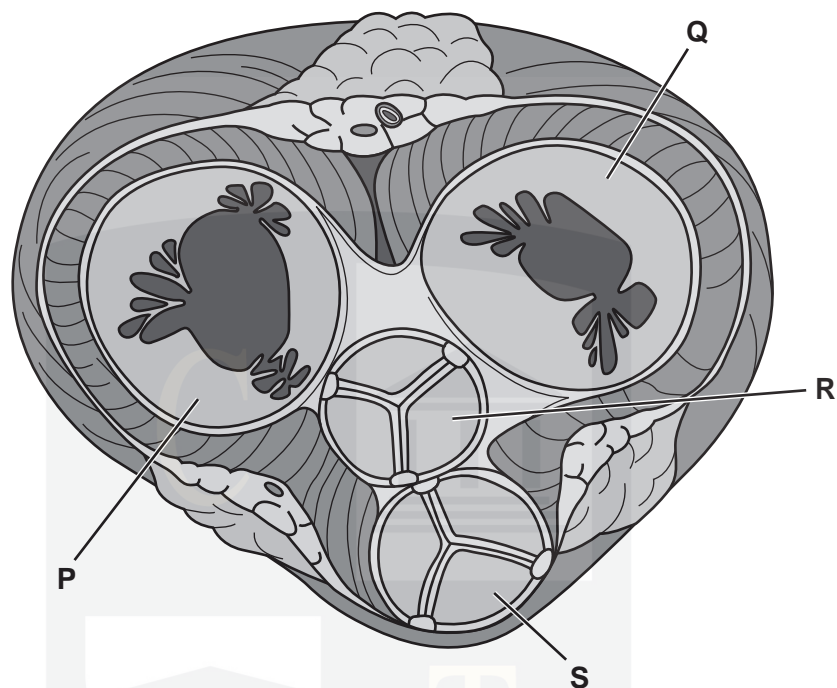
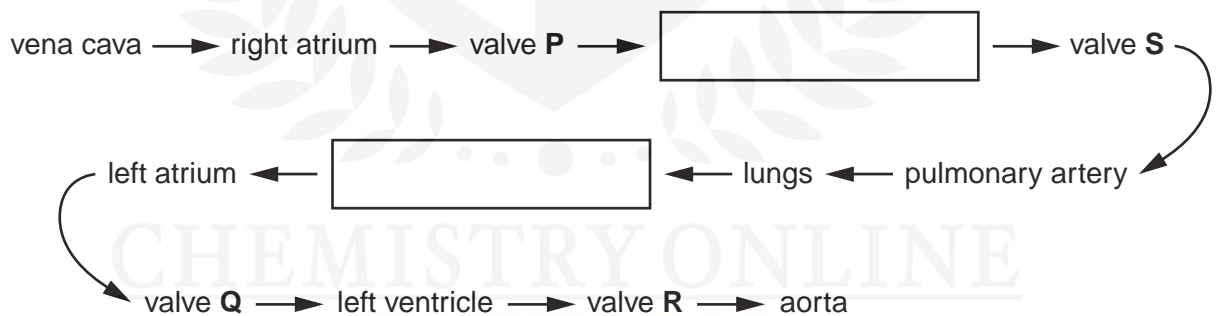


Fig. 3.1

- (i) Complete the following flow chart to show the pathway of blood through the heart.



[2]

- (ii) Explain how the valves P and Q ensure one-way flow of blood through the heart.

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.....

.....[2]

(b) The cardiac cycle describes the events that occur during one heart beat.

Fig. 3.2 shows the changes in blood pressure that occur within the left atrium, left ventricle and aorta during one heart beat.

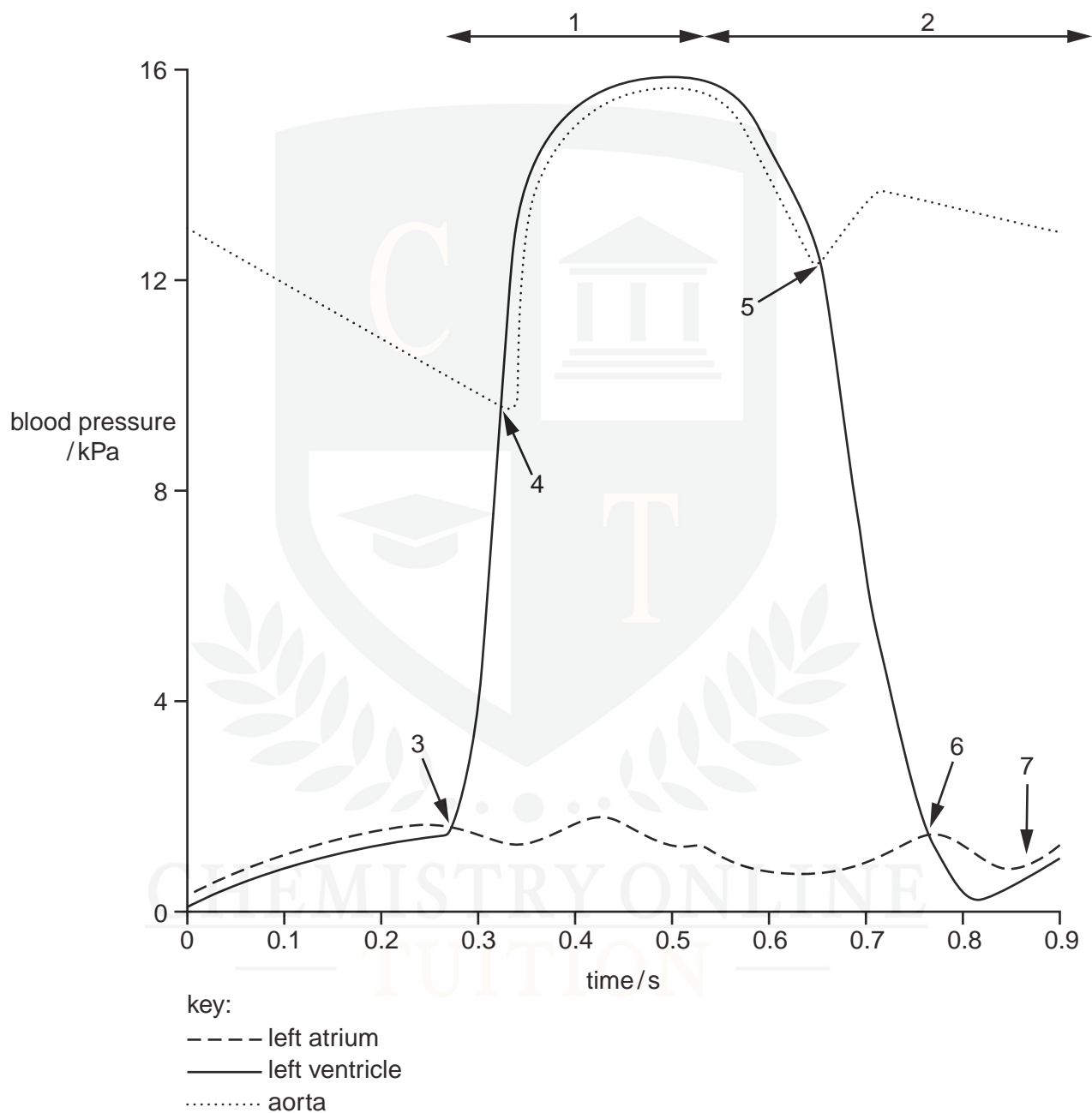


Fig. 3.2

You should put only one number in each box. You may use each number once, more than once or not at all.

event during the cardiac cycle	number
atrioventricular (bicuspid) valve opens	6
ventricular systole	
semilunar (aortic) valve closes	
left ventricle and left atrium both relaxing	
semilunar (aortic) valve opens	

(c) Explain the roles of the sinoatrial node (SAN), atrioventricular node (AVN) and the Purkyne tissue during one heart beat.



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5 Fig. 2.1 is a diagram of a vertical section through a healthy mammalian heart.

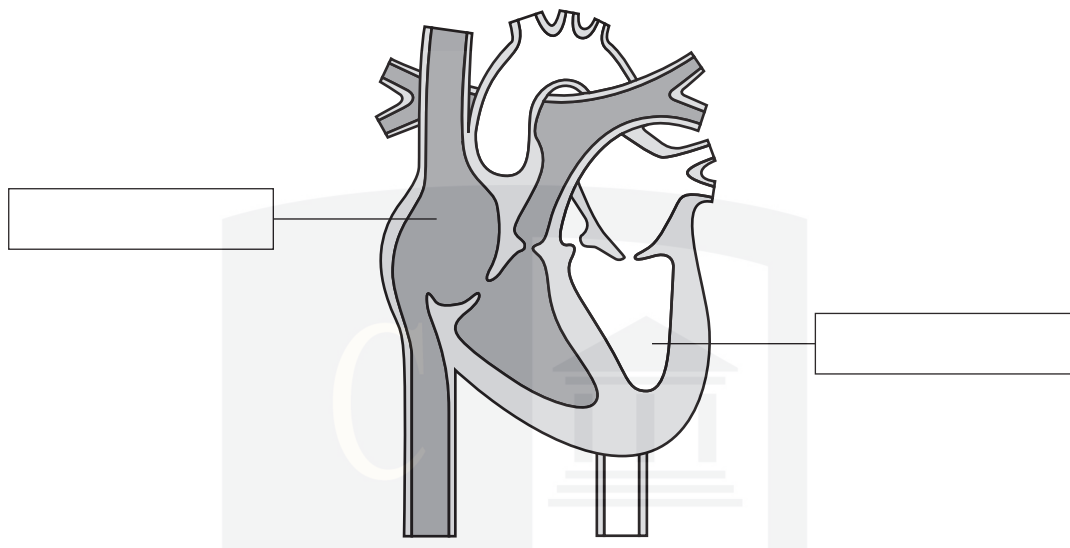


Fig. 2.1

(a) (i) Label the **two** chambers of the heart by writing in the boxes provided on Fig. 2.1. [1]

(ii) State two ways in which the **composition** of blood entering the right atrium is different to blood entering the left atrium.

1.
.....

2.
..... [2]

Some people are born with structural defects of the heart and its associated blood vessels. This is known as congenital heart disease. The dotted circles labelled **A** to **G** on Fig. 2.2 show some areas that are affected by different types of congenital heart disease.

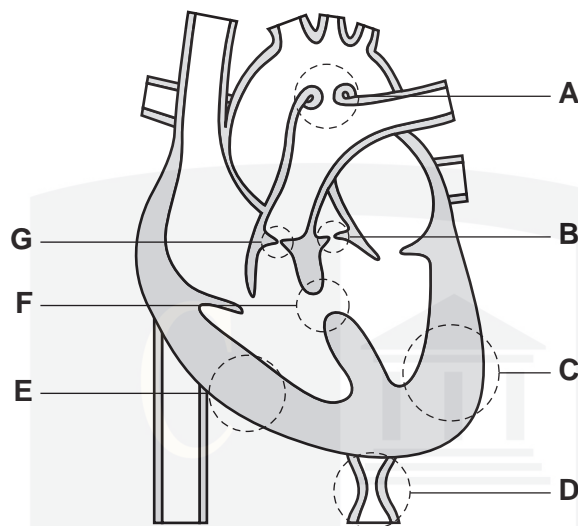


Fig. 2.2

The structural defects causing four types of congenital heart disease are described below:

- **patent ductus arteriosus** – a link between the pulmonary artery and aorta fails to close after birth
- **pulmonary stenosis** – a narrowing of the semilunar valve of the pulmonary artery
- **coarctation of the aorta** – a localised narrowing of the aorta
- **ventricular septal defect** – a hole in the septum between the ventricles.

(b) Match the **one** correct area from **A** to **G** on Fig. 2.2 with each of the congenital heart diseases.

The first one has been completed for you.

patent ductus arteriosus **A**

pulmonary stenosis

coarctation of the aorta

ventricular septal defect

[3]

- (c) Suggest and explain how the flow of blood in a person with patent ductus arteriosus differs from that of a person with a healthy heart.

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[3]

[Total: 9]



- 6 Fig. 2.1 shows a diagram of a section through a human heart.

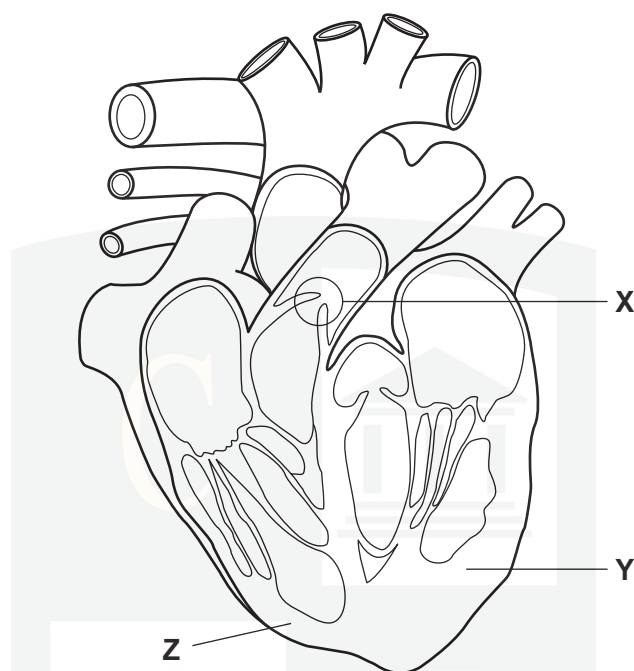


Fig. 2.1

- (a) State the name and function of the circled structure labelled X.

name

function

.....

.....[3]

- (b) Explain why the region labelled Y is thicker than the region labelled Z.

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.....

.....[3]

- 
- [5]



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