

Past-paper walk-through

The heart ■ 8.3

eXercise

Questions in this set

- 9700/11 N25 Q32 ■ 1 mark
- 9700/12 N25 Q35 ■ 1 mark
- 9700/13 N25 Q33 ■ 1 mark
- 9700/14 N25 Q34 ■ 1 mark
- 9700/23 N25 Q6 ■ 20 marks

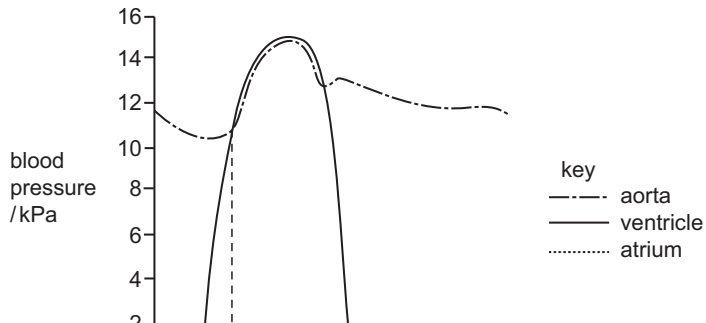
Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

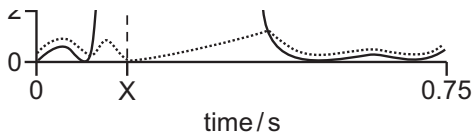
Question 32

9700/11 N25 ■ Q32 ■ 1 mark

32 The graph shows changes in blood pressure during one cardiac cycle.



Question 32



What is happening at time X?

	aortic semilunar valve	atrium
A	closing	emptying
B	closing	filling
C	opening	emptying

Question 32

D	opening	filling
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Solution 32

Answer: **D**

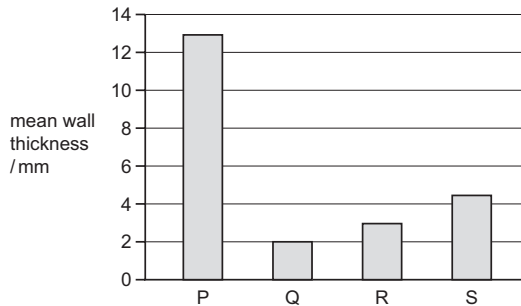
Why

- Read the graph where the ventricle pressure curve crosses the aorta curve.
- The aortic semilunar valve opens when ventricular pressure rises *above* aortic pressure.
- While the ventricle is contracting the atrium is relaxed and filling with blood.

Question 35

9700/12 N25 ■ Q35 ■ 1 mark

- 35** The bar chart shows the mean thickness of the walls of the main chambers in a mammalian heart.



Question 35

heart chamber

Which row correctly identifies the heart chambers?

	right atrium	left atrium	right ventricle	left ventricle
A	R	Q	S	P
B	Q	S	R	P
C	R	Q	P	S
D	Q	R	S	P

Solution 35

Answer: **D**

Why

- Wall thickness follows how far the chamber must pump blood.
- The left ventricle is much the thickest, pumping to the whole body.
- The right ventricle is thinner (lungs only) and both atria are thinnest of all.

Question 33

9700/13 N25 ■ Q33 ■ 1 mark

33 A person has a small hole in the septum between the ventricles. This is called a ventricular septal defect (VSD). The person has no other heart defects.

What is the direction of the net flow of blood during ventricular systole in the heart of this person?

- A** left ventricle to left atrium
- B** right ventricle to right atrium
- C** left ventricle to right ventricle
- D** right ventricle to left ventricle

Solution 33

Answer: **C**

Why

- During ventricular systole both ventricles contract at once.
- The left ventricle generates a much higher pressure than the right.
- So blood is pushed through the hole from left ventricle to right ventricle.

Question 34

9700/14 N25 ■ Q34 ■ 1 mark

34 Which row correctly describes the features for two of the heart chambers?

	left atrium	left ventricle
A	large force of contraction to allow blood to travel a long distance	large force of contraction to allow blood to travel a long distance
B	small force of contraction as blood only needs to travel a short distance	large force of contraction to allow blood to travel a long distance
C	small force of contraction as blood only needs to travel a short distance	small force of contraction as blood only needs to travel a short distance
D	large force of contraction to allow blood to travel a long distance	small force of contraction as blood only needs to travel a short distance

Question 34

Solution 34

Answer: **B**

Why

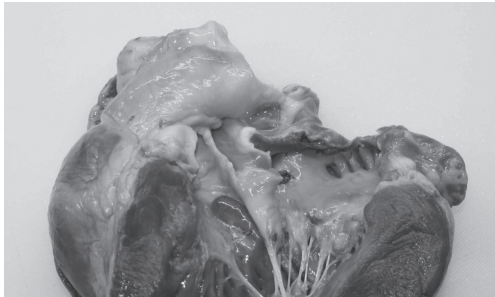
- An atrium only pumps blood into the ventricle below it, so it needs little force and has a thin wall.
- The left ventricle pumps to the whole body, so it needs a thick muscular wall.
- The distance the blood must travel is what sets the wall thickness.

Question 6

9700/23 N25 ■ Q6 ■ 20 marks

- 6 (a) A student studied the structure of a mammalian heart.

The student took a photograph of the left side of a dissected heart as shown in Fig. 6.1.



Question 6

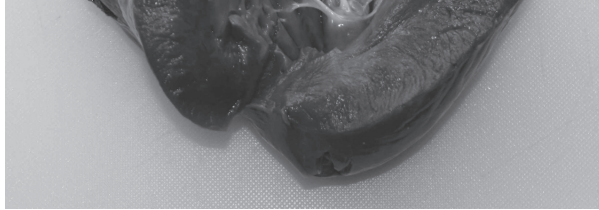


Fig. 6.1

Identify **two** features of the left side of the heart visible in Fig. 6.1 **and** explain how each feature is adapted to the function of the heart.

Question 6

[4]

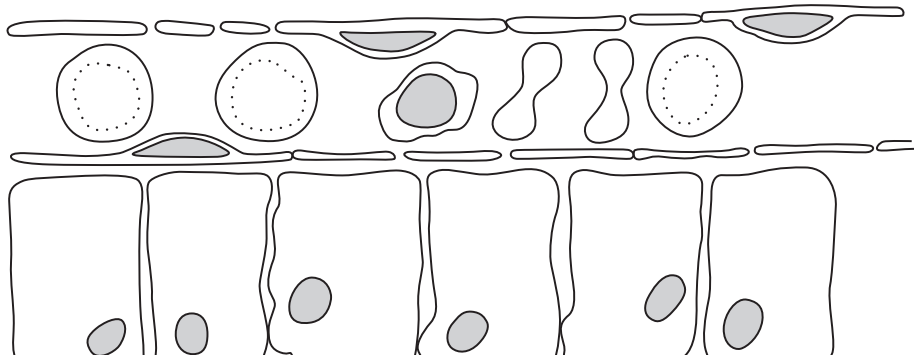
- (b)** Cardiac muscle is described as myogenic. This means the electrical activity controlling the rhythm of a regular heartbeat begins within the muscle tissue of the heart.

Describe how electrical activity within the heart controls each heartbeat.

Question 6

(c) Tissue fluid is formed from blood plasma as it flows through capillaries.

Fig. 6.2 is a diagram of a capillary and some adjacent tissue cells in a capillary network.



Question 6

Question 6



Fig. 6.2

- (i) Describe **two** functions of tissue fluid.

Question 6

- (ii) With reference to Fig. 6.2, describe how tissue fluid is formed.

Question 6

(d) Measles is a common disease caused by a virus. Vaccination to prevent the disease has been very successful.

(i) A child receives a vaccine for measles.

Explain why only some of the T-lymphocytes in the child respond to the measles vaccine.

Question 6

- (ii) Describe the events that occur in an immune response to a vaccine that result in lymphocytes that provide long-term immunity to measles.

Question 6

[Total: 20]

Solution 6

(a) Mark scheme

- any two of these pairs, feature and explanation
- 1
- thick wall of (left) ventricle ; R if right
- 2
- pumps blood at high pressure to, reach (all of) systemic circulation / overcome resistance in systemic circulation /
- over a long distance / AW ;
- A if thick wall unqualified A generate high force

Solution 6

- R 'withstands high pressure'
- 3
- thin wall of (left) atrium ;
- 4
- pumps blood at low pressure, into ventricle / over a short distance ;
- either
- 5
- (named) valves ; R tricuspid / pulmonary
- 6
- prevent, backflow of blood / maintains one-way flow of blood (through heart) ;

Solution 6

- ecf if right atrioventricular / tricuspid
- or
- 5
- (left) atrioventricular / mitral / bicuspid, valve ; R right
- 6
- prevents, backflow of blood / blood flowing from ventricle to atrium ;
- A maintains one-way flow of blood (through heart)
- or
- 5
- (left) semi-lunar, valve ;

Solution 6

- 6
- prevents, backflow of blood / blood flowing from, aorta / artery, to ventricle ;
- A maintains one-way flow of blood (through heart)
- 7
- chordae tendinae / tendons / tendinous cords / AW ; I ligaments
- 8
- hold the valve in position, during systole / when ventricle contracts / AW ;
- A prevents blowback / turning inside out
- I high tensile strength unqualified
- 9,10

Solution 6

- AVP ;; e.g
- papillary muscle ;
- contracts to hold, tendons / valve, when heart contracts / during systole ; ora
- 4
- 9700/23
- October/November 2025

Solution 6

(b) Mark scheme

- any four from:
- if AVN used penalise once and then use ECF
- 1
- sinoatrial node releases, waves of excitation / waves of depolarisation / (electrical) impulses / action potential(s) ; AW
- 2
- impulses / AW, stimulate, (both) atria to contract / atrial systole ;
- 3

Solution 6

- impulses / AW, prevented from reaching ventricles by, fibrous ring / non-conducting tissue / insulating tissue /
- (between atria and ventricles) ; A annulus fibrosus
- 4
- atrioventricular node, delays impulse (by 0.1 s) ;
- 5
- atrioventricular node, sends impulse to, Purkyne tissue (in septum) ; A bundle of His
- allow ecf for abbreviating AVN
- 6

Solution 6

- Purkyne tissue conducts impulse to, base of ventricles / apex of heart, so they contract ;
- 4

Solution 6

(c)(i) Mark scheme

- any two from: if transport is used in MP2 to MP8, penalise once and mark to a max of 1 for those MPs
- provides, aqueous / watery, (external) environment / surroundings, for cells
- 1
- to maintain correct water potential
- to prevent, cell dehydration / excessive water loss from cells ;
- idea that provides medium for exchange of substances
- 2

Solution 6

- supply of oxygen / oxygen diffuses from blood into tissue fluid ;
- 3
- removal of carbon dioxide / carbon dioxide diffuses from tissue fluid into blood ;
- A exchange of (respiratory) gases as alternative to MP2 and MP3
- 4
- supply of named nutrient e.g. glucose, amino acids, (named) ion(s) ;
- 5
- removal of, metabolic / toxic, waste or urea ;
- 6

Solution 6

- location / movement, of (tissue) macrophages / neutrophils / phagocytes (for defence) ; 1 white blood cell
- 7
- allows movement of / medium for passage of, (named) cell signalling molecules / hormones / ligands ;
- A ref. to cells signalling nearby cells / paracrine signalling
- 8
- AVP ; e.g. contributes to formation of lymph / contains antibodies
- e.g. allows movement of lymphocytes into lymph
- 2
- 9700/23

Solution 6

- October/November 2025

Solution 6

(c)(ii) Mark scheme

- any three from:
- 1
- (at arteriole end of capillary) high, hydrostatic / blood, pressure ;
- 2
- (ultra)filtration / described ;
- e.g. fluid / plasma / water and solutes, forced / comes, out of, capillaries / blood
- 3

Solution 6

- glucose / amino acids / ions, leave blood R if stated, red blood cells / platelets, leave
- or
- (large) plasma proteins remain in blood ;
- 4
- through, fenestrations / fenestrae / endothelial pores
- or
- through, pores / gaps / spaces, in, capillary wall / endothelium / between cells ;
- 5
- AVP ; e.g. ref. to hydrostatic pressure gradient

Solution 6

- hydrostatic pressure of blood is greater than hydrostatic pressure of tissue fluid
- 3

Solution 6

(d)(i) Mark scheme

- I pathogen A epitope for antigen
- any two from:
 - some (T-lymphocyte) have (T-cell) receptors, specific / complementary, to a particular antigen ; ora
 - antigen (in vaccine) binds to these T-lymphocytes ;
 - idea that only these T-lymphocytes are, activated / stimulated / selected ; I respond
- AVP ; e.g. some T-lymphocytes do not become exposed to limited quantity of antigen in vaccine

Solution 6

- 2
- 9700/23
- October/November 2025

Solution 6

(d)(ii) Mark scheme

- max four if no correct ref. within response to, memory cells / immunological memory
- any five from:
 - context of primary immune response
 - 1
 - antigen presentation by macrophages ;
 - 2

Solution 6

- (T- / B-) lymphocyte, binding / recognition / clonal selection / activation / described in terms of receptor ;
- 3
- clonal expansion / cell divides by mitosis many times (to produce a clone) / AW ;
- 4
- cytokines released by T-helper, cells / lymphocytes ;
- 5
- (stimulate) formation of memory, (T- / B-) lymphocytes / cells ;
- 6
- (memory cells) remain in, circulation / body, for a long time / AW ; A remain in lymph nodes

Solution 6

- or
- memory cells are long-lived ;
- context of secondary immune response
- 7
- large numbers of (specific), memory cells / lymphocytes ; I more memory cells
- A memory cells have a higher chance of encountering antigen
- 5