

1. (a) (i) Filling time stays constant / increases very little / as heart rate increases;
Decrease in contraction time as heart rate increases;
Allow maximum of 1 mark if no reference to heart rate. 2
- (ii) Work out time for one heart beat / one heart beat takes 1 second;
Subtract filling time / 0.38s;
Credit these basic points however determined. If the calculation has been done, credit any point in method clearly explained.
OR
Plot contraction time against heart rate;
Read off value for 60 beats per minute; 2
- (iii) Stroke volume / volume of blood pumped out at each beat; 1
- (b) (i) 2
- | Valve located between | Open | Closed |
|--------------------------------------|------|--------|
| Left atrium and left ventricle | | ✓ |
| Left ventricle and aorta | ✓; | |
| Right atrium and right ventricle | | ✓ |
| Right ventricle and pulmonary artery | ✓; | |
- (ii) Pressure constant / smooth in vein / only have pressure surges in artery; 1
- (iii) Contraction of ventricle / systole / entry of blood into aorta; 1
2. (a) (i) B/aorta; 1
- (ii) D/pulmonary vein; 1
- (b) Filling because valve between artery and ventricle closed;
Valve between atrium and ventricle/ cuspid valve open; 2
*[Note: All answers must be in context of filling.
Answers specifically relating to left side are incorrect.]*
- (c) Pressure increases and volume stays constant; 1
- (d) Pressure in ventricle (becomes) higher than pressure in aorta;
[Or converse] 1

[9]

- (e) ventricle contracts;
 Produces increase in pressure;
 Blood leaves ventricle/ goes into aorta (and volume falls);
 Through open valve; max 3 [9]
3. (a) (i) Higher pressure in ventricle; 1
 (ii) Diagram showing closed valve drawn in appropriate position; 1
- (b) Allows blood to leave atria/pass into ventricle;
 Before ventricle contracts/empties; 2
- (c) Impulses;
 Along parasympathetic/vagus;
 OR Fewer impulses;
 Along sympathetic/(cardiac)accelerator;
 Slows activity from SAN/pacemaker; 3
 [Reject: decelerator nerve] [7]
4. (a) Contain different/more than one tissue/type of cell; 1
 (b) 0.8 (s) 1
 (c) 0.4 (s) as events in right ventricle same as in left; 1
- (d) (i) 0 - 0.1/0.4 - 0.9 because the volume increasing/ventricle filling/blood entering; 1
 (ii) from 0.9/0.1 – 0.4 because volume decreasing/ventricle emptying/blood leaving; 1
In part (d) Accept any two figures from within the range.
- (e) Correct answer of $15.75/15.8/16 = 2$ marks
 Incorrect answer but clear understanding that 45cm^3 is 100% = 1 mark 2 [7]
5. (a) 0.1 – 0.6 seconds;
 Volume (in left ventricle) increasing / ventricle filling; 2
- (b) (i) 2 marks for correct answer of 75 (beats) per minute;
 1 mark if heart beat correctly identified as lasting 0.8 seconds; 2

- (ii) 70 cm ; 1
- (c) Multiply them; 1
- (d) 750; 1
Accept a small increase – up to 800 cm
- (e) (i) 4 : 1 / 4; 1
Ratio must be expressed in simplest terms
- (ii) 18 cm ; 1
- [9]**
- 6.** (a) (i) Fatty substances/foam cells in artery wall/under endothelium; 1
- (ii) Narrows artery;
Turbulence / uneven flow;
Damage to endothelium;
Thromboplastins released; max 2
- (b) (i) Correct area shaded (i.e. part supplied by vessels); 1
- (ii) Area deprived of oxygen; *Accept glucose* 1
- (c) Muscle in artery walls becomes thicker;
Aneurysm / ballooning of artery walls may occur;
Damage to endothelium (so foam cells enter); max 2
- [7]**
- 7.** (a) (i) **C and D;** 1
- (ii) left ventricle with thicker wall/more muscle / (muscle in) left ventricle contracts more forcefully/beats more strongly; 1
- (b) higher in atria/lower in ventricles;
atrioventricular valves/valves between atria and ventricles open; 2
(position of valves must be identified. Do not accept an unqualified reference to valves. Assume pronouns refer to atria.)
- (c) (i) allows blood to pass into ventricles/from atria/so that atria can empty;

- before ventricles contract; 2
- (ii) ventricle contracts from base /upwards;
blood pushed through **B** and **C**/arteries/all blood ejected; 2

[8]

8. (a)

Location of valve	Valve open or closed
between chamber C and chamber B	closed
between chamber D and chamber A	closed
between chamber C and blood vessel Y	open

All three correct = 2 marks

Two correct = 1 mark 2

- (b) (i) Blood surges/pulsatile;
elastic tissue recoils;
and evens out pressure; Max 2
- (ii) Enables one way flow/prevents backflow; 1

[5]

9. (a) correct position of AVN; (at the top of Purkyne tissue) 1
- (b) (i) pressure in ventricles increasing (so ventricle contracting);
QRS occurs before pressure increase/ventricle contraction/
contracts after S / 0.14s; 2
- (ii) corresponds to time when heart is relaxed/filling with blood/
diastole / not contracting; 1
- (c) (i) 0.2s ; 1
- (ii) line below left ventricle;
in phase with left ventricle; 2

[7]

10. (a) (i) $60 \div 0.72 - 0.76$;
 $79 - 83$; (*Correct answer = 2 marks*) 2
- (ii) Ventricular pressure increases above pressure in atrium ; 1

	(b)	<u>Left ventricle</u> has thicker / more <u>muscle</u> ;	1	
				[4]
11.	(a)	(i)	0.3 s;	1
		(ii)	0.2 - 0.4 s;	1
	(b)	thicker / more muscle in the left ventricle;	1	
	(c)	Artery		
		1. thickest wall, enabling it to carry blood at high pressure / withstand pressure surges;		
		2. most elastic tissue, which smoothes out flow / maintains pressure;		
		3. most muscle which maintains pressure;		
		4. muscle in wall to control blood flow;		
		Vein		
		5. thin wall does not have to withstand high pressure;		
		Capillary		
		6. thin wall, allowing diffusion/exchange;		
		7. only endothelium present, allowing short diffusion pathway;		
		All vessels		
		8. have endothelium that reduces friction;	6 max	
				[9]
				QWC 1