

Mark schemes

1

- (a)
1. Elastic tissue to allow stretching / recoil / smoothes out flow of blood / maintains pressure;
 2. (Elastic tissue) stretches when ventricles contract
OR
Recoils when ventricle relaxes;
 3. Muscle for contraction / vasoconstriction;
 4. Thick wall withstands pressure **OR** stop bursting;
 5. Smooth endothelium reduces friction;
 6. Aortic valve / semi-lunar valve prevents backflow.

4 max

- (b)
1. Curve to the right so lower affinity / % saturation (of haemoglobin);
 2. Haemoglobin unloads / dissociates more readily;
 3. More oxygen to cells / tissues / muscles;
 4. For greater / more / faster respiration; *Idea of a higher rate of respiration*

4

- (c) 16.5–18 (cm³ minute⁻¹);

Allow 1 mark if heart rate wrongly calculated but then multiplied by 0.03

2

[10] (a) 1. (Overall) outward pressure of 3.2 kPa;

2

2. Forces small molecules out of capillary.

2

- (b) Loss of water / loss of fluid / friction (against capillary lining).

1

- (c)
1. High blood pressure = high hydrostatic pressure;
 2. Increases outward pressure from (arterial) end of capillary / reduces inward pressure at (venule) end of capillary;
 3. (So) more tissue fluid formed / less tissue fluid is reabsorbed. *Allow lymph system not able to drain tissues fast enough*

3

- (d) 1. Water has left the capillary;

2. Proteins (in blood) too large to leave capillary;
3. Increasing / giving higher concentration of blood proteins (and thus wp).

3

[9]

3

1. Pulse counted for 15/30 seconds;
2. Beats counted were multiplied by 2 or 4;

1

max 1. Obtain pulse rates for a large number of students;

4

Accept this idea for carrying out the investigation or for collecting data from other scientists work / published data

2. (belonging to) a range of different sexes / ethnic groups/from different parts of the country /employment groups;

Accept suitable alternative variables but the idea of a range must be included

Reject generic references to controlling these variables

3. Calculate mean and standard deviation (of students their age);

Allow 'calculate standard error / 95% confidence limits / t test / statistical test'

4. See if their mean lies within the standard deviation;

Accept 'see if my mean lies within the 95% confidence limits'

If statistical test used, accept 'see if there is a significant difference between means'

[3]

max] (a) 1. Length of time of exercise;

5

2. Difficulty of exercise;
3. An environmental factor;

Answers about variables relating to the subjects themselves are not valid.

2. E.g. speed of treadmill / running, incline on treadmill.

3. E.g. temperature / humidity / clothing worn.

2 max

(b) 0.89;

Ranges correct – level 3 range of 40 and level 1 range of 45 = 1 mark;

If value of 1.125 (level 1: level 3) is calculated award 1 mark

Accept any number significant figures as long as rounding is correct

2

[4]



6

(a) Any **two** from:

- People outside age range
- Women
- Those unable to exercise;

***Two** of these categories needed to gain **one** mark.*

Accept examples for outside age range e.g. those under 25 or those over 54

Accept examples of those unable to exercise (e.g. those in wheelchairs, those with non-heart related issues).

1

(b) 1. (Stop because) medication could affect heart rate;

Accept descriptions of how the heart rate may be affected e.g. stopping medication could cause the heart rate to speed up

2. (Continue because) stopping could put the patient at too great a risk;
Accept '(continue because) stopping could result in the patient dying'

2

[3]



7

- (a) 1. (Because) same water potential (as valve);
2. (So) prevents loss or gain of water by osmosis / down waterpotential gradient;
Loss or gain and method of loss or gain must both be in the answer
3. (So) cells / tissues in the valves aren't damaged;
- 2 max

- (b) 1. Kills / stops growth of bacteria that could cause infection /disease (in patient);
2. Kills / stops growth of bacteria that could damage the valve;
'Kill / stop growth of bacteria' is insufficient without further explanation.
- 1 max

- (c) (After surgery) valve closes fully / correctly / works so preventing blood flowing back into the heart;

OR

(After surgery) valve closes fully / correctly / works so preventing blood flowing out of the artery;

Do not credit the converse here

1

- (d) 1. (For maximum) mean decreases, to within the normal range;
2. (For minimum) mean increases to within normal range;
3. No overlap in the (means \pm) standard deviation for minimum pressure so there is a real difference;
Ignore references to the differences in maximum pressure
Accept idea of significant difference for 'real difference'
4. Includes wide range of ages of patients;
- 3 max

- (e) 1. Standard deviation shows that some of the patients will be outside normal pressure range (after surgery);
Accept this as a general statement or in relation to maximum or minimum pressures
2. Small group;
3. Short follow up times;
4. No comparison with other treatments;
- 2 max



(f) Don't know the range;

1

[10]

8

1. Pressure gradient / moves from high to low pressure;

2. Valves stop backflow;

Accept 'valves close when pressure gradient is 'the wrong way' for 2 marks

2. Accept 'one way valves'

2. 'Valves' on its own is insufficient

[2] (a) (Simple) diffusion;

9

Reject: facilitated diffusion.

1

(b) 1. Thin/small **so** short diffusion pathway;

Reject: thin membrane/wall/cells.

2. Flat/long/small/thin **so** large surface area to volume ratio/surface area : volume;

Accept: small volume to surface area ratio.

2

(c) 1. High/50% saturation (with oxygen) below (pO_2 of) 0.2 kPa;

*Accept: fully saturated **or** above 50% saturation below 0.2kPa.*

Accept: any number between 0.08 and 0.2 kPa

2. (Oxygen) for respiration;

2

(d) 1. Water potential higher in worm

OR

Lower water potential in seawater;

Accept: correct reference to water potential gradient if direction of water movement is given.

Accept: ψ for water potential.

2. Water leaves by osmosis (and worm dies); *Reject: worm/cells burst.*

2

[7] (a) 66.7;

10

1

(b) 70;

1

- (c) 1. More fluid forced/filtered out of capillary/blood (due to high pressure); *Accept: water for fluid.*

Must convey idea of 'more'.

Reject: more tissue fluid is forced out.

Do not credit 'more plasma forced out'.

2. Less return of fluid (into capillary/blood) due to pressure
OR
 Lymph(atic) (system) cannot drain away all excess fluid;
Accept: water for fluid.

2

- (d) 1. Larger lumen/volume (of blood vessels);
Accept: more 'space' or more 'room' (in blood vessels).
Accept: more blood flow (in blood vessels).
Accept: reduces stroke volume or less blood in ventricle.
2. Reduces (blood) pressure (in blood vessels);
3. Less friction/resistance (in blood vessels);

2

[6] (a) (i) C;

11

Ignore name of vessel

1

- (ii) A;

Ignore name of vessel

1

- (b) Strongest/stronger contractions;
Accept most muscle in wall / thickest/thicker muscular wall
A comparative statement is needed
Answer must be in context of producing force and not resisting it

1

- (c) 1. Blood flows from left ventricle to right ventricle/ mixing of oxygenated and deoxygenated blood;
2. Lower volume of (oxygenated) blood leaves left ventricle/flows into aorta/C
OR
 Lower pressure in blood leaving left ventricle/flowing into aorta/C
OR
 Less oxygen in blood leaving left ventricle/aorta/C;

2

[5]

- (a) Quaternary (structure);

12

Accept phonetic spelling eg quarternary/quarternery /4°
Award no mark for quaternary as part of a list

1

(b) 423;

1

(c) 1. Oxyhaemoglobin formed/ haemoglobin is loaded/uptakes/associates/binds with oxygen in area of higher ppO_2 / in gas exchange surface/lungs/gills;

Reference to "react with" = max 1

Accept: reversible interaction with oxygen

Ignore: haemoglobin is carried / contained in red blood cells

2. (oxygen) unloaded/dissociates from/released (in area of lower ppO_2 / in capillaries/to cells/tissues);

2

(d) (i) 56(%)

Accept responses in the range 54-58(%)

1

(ii) 1. (Anaemia curve shifted to right) haemoglobin has lower affinity for oxygen / binds less tightly;

Assume reference is to haemoglobin of anaemia unless stated

2. releases more oxygen / oxygen is released quicker / oxygen dissociates/unloads more readily to muscles/tissues/cells;

3. (For) respiration;

Accept: even with a lower haemoglobin concentration / meet demand for ATP/energy;

3

[8]

(a) 1. Time taken to reach maximum blood flow varied widely/significantly;

13

Must be emphasis on idea of 'widely'. Mention only of 'vary' is insufficient. Ignore use of numbers unless a comparison is given

Ignore any mention of a correlation between maximum percentage increase in blood flow and time taken to reach maximum increase in blood flow

2. Quickest after a carbohydrate-only meal;

OR

Slowest after a protein-only meal;

2

(b) 1. More blood flows to (skeletal) muscles (during exercise);

2. (supplying) more oxygen / glucose / removing more carbon dioxide/lactic acid/ heat;

1 and 2. Idea of 'more' is needed

More blood to muscles delivering oxygen = 2 marks

3. For high (rate of) respiration / to meet increased demand for energy/ATP;

OR

Prevents anaerobic respiration/lactic acid build up;

Accept: reduces/delays for prevent

3

- (c) **Immediate effect of exercise after meal**
1. Meal increases blood flow in (mesenteric) artery AND exercise decreases blood flow in (mesenteric) artery;
 1. *Will relate to information given in the tables*

Overall effect on blood circulation

2. Insufficient blood (flow to small intestines / muscles);
2. *Accept: blood diverted away/shunted*
Ignore references to 'strain on heart', 'heart disease', 'cardiovascular diseases'
Ignore references to controlling variables and reliability

Effect on blood flow of type of meal

3. Carbohydrate meal quick(er) / during exercise;
OR
Protein/fat meal slow(er) / after exercise;

Effect of reduced blood flow on cells

4. (More) anaerobic (respiration) / lactic acid produced;
OR
less aerobic respiration;

Consequence for person of changed blood flow

5. Less absorption (of digested food) / faeces contains digested food;
6. Cramp / indigestion / discomfort / fatigue;
*Look for **ideas** in each of 5 areas*
MP1 might be spread throughout the answer
6. Ignore references to digestion

Max 4

- (c)
1. (blood flows from kidney along) renal vein to vena cava;
 2. (along) vena cava to right atrium/side of heart;
 3. (along) pulmonary artery to lungs;
 4. (along) capillaries to pulmonary vein;
 5. (along) pulmonary vein to left atrium/side of heart;
 6. (along) aorta to renal artery (to kidney);
 7. Blood may pass through several complete circuits before returning to kidney;
Reject: 'blood vessel pumps' only once
Ignore references to valves
Ignore references to heart action/cardiac cycle
Accept labelled diagram must include directional arrows

Max 6

[15]

- (a) 53–70 / 70-53 / 17 (beats per minute).

14

1

(b) 13.6 / 13.58 / 14;

If answer is incorrect, 1 mark for the principle of difference (11) divided by initial heart rate (81).

$$\frac{70 - 81}{81} \text{ or } \frac{81 - 70}{81} \quad \text{for 1 mark}$$

Ignore + or - signs

2

(c) 1. Allows comparison;

2. (Initial / resting) heart rates different (between males and females).

2

(d) 1. Cardiac output = stroke volume × heart rate

1. *Accept* $CO = SV \times HR$

2. (So) stroke volume increases / increased size or volume of ventricles.

2. *Neutral: more blood leaves heart*

2. *If the term stroke volume is not used, it must be defined*

2 max

[7] (a) 1. (Carry) oxygen / glucose;

15

Accept: oxygenated blood

Ignore references to removing waste products

Ignore references to arteries 'pumping' blood

2. (To) heart muscle / tissue / cells / myocytes.

Must be supply to heart or cardiac

2

(b) (i) **A**;

Accept: A on its own even if outside box

Reject if two (or more) letters given

1

(ii) **H**;

Accept: H on its own even if outside box

Reject if two (or more) letters given

1

(c) (Aorta)

1. (is) close / directly linked to the heart / ventricle / pressure is higher / is veryhigh;

2. (Aorta has) elastic tissue;

Accept elasticity
Ignore reference to muscle

3. (Aorta has) stretch / recoil.

Q *Reject: contracts / relaxes / pumps*

Accept: for mp 2 and mp 3, converse for small arteries if qualified by little / less

3

[7]

16

- (a) 1. Many / more capillaries (than arterioles);
2. (Cross-sectional) area of capillaries (much) greater (than of arterioles).

Note: maximum of 1 mark for this question

1 max

- (b) 1. Short pathway / short distance between blood and outside of capillary; *Reference to blood and cells required*

2. Large surface area (of blood) in contact with walls of capillaries; *Idea is per unit volume of blood but candidates need not say this*

3. Fast exchange / fast diffusion / fast osmosis.

Must relate to increased speed

2 max

- (c) Width / size / diameter of blood cell.

Accept named blood cell

Reject platelet

Accept idea that below a certain diameter friction becomes too great for blood to flow

1

- (d) (Fluid) in tissue fluid / (fluid) in lymph.

1

[5]

(Maintaining constant pH to avoid)

17

1. Named protein / enzyme (in blood) sensitive to / affected by change in pH;

Accept converse for MP2 and MP3.

Named example should be a protein that might be affected (by change in pH) eg haemoglobin, carrier protein in plasma membrane.

Accept 'change in H⁺ concentration' for 'change in pH'.

2. (Resultant) change of charge / shape / tertiary structure;
The change in charge idea relates to the enzyme / protein and not the blood (plasma) or red blood cells.
'Denaturation' alone is insufficient.
3. Described effect on named protein or enzyme.
 e.g. less oxygen binds with haemoglobin / less transport across membranes / fewer substrates can fit active site / fewer enzyme-substrate complexes.
Idea of 'less' or 'fewer' required. Ignore suggestion of 'no' or 'none'.

[3]

- (a) 1. Ventricle pressure rises **then** blood starts to flow into aorta because pressure causes

18

(aortic / semilunar) valve to open;

Accept times, eg ventricle pressure rises at 0.3 (25) seconds, followed by blood flow into aorta at 0.35 / 0.4 seconds

Idea of sequence is essential

Accept times

2. Ventricle pressure starts to fall **so** blood flow falls;

Idea of sequence is essential

2

- (b) 1. Thickness of wall increases **because** ventricle (wall) contracts;
Must be idea that increase in thickness is linked to contraction
Accept muscle for ventricle and systole for muscle contraction

2. Contraction **causes** the increase in pressure;

Accept thickening of wall

2

- (c) *2 marks for correct answer*

1. Between 120 ± 5 ;

Length of cycles varies slightly

2. Length of cardiac cycle correct but final answer wrong;

Length of cardiac cycle = 0.45 - 0.52

2

[6]



19

- (a) 1. Lower affinity for oxygen / releases more oxygen / oxygen is released quicker /

oxygen dissociates / unloads more readily;

Q Neutral: the organism / body has a lower affinity for oxygen / releases more oxygen

2. (To) muscles / tissues / cells

3. (For) high / rapid respiration;

Q Reject: '**produces** more energy' on its own

Neutral: reference to partial pressure

Accept: (for) respiration to produce more energy in the form of ATP / release more energy

3

- (b) (i) 1. Small SA:VOL;

Neutral: small limbs / small ears / extremities

Neutral: small SA

Accept: large VOL:SA

Neutral: reference to fat / blubber / insulation

2. (So) reduces heat loss / (more) heat retained;

Note: MP2 is independent of MP1

2

- (ii) 1. Brain is the same, others fall;

Note: 1. might not be given in the same sentence

Assume that 'other organs fall' = all three organ categories fall

Accept: 'blood flow is reduced to all organs except for the brain'

2. Brain controls other organs / remains active / needs constant supply of oxygen;

Accept: 'seal would die' = brain remains active

3. Lungs not used / are used less / seal is not breathing / heart rate decreases / heart pumps less / blood diverted to muscles;

Reject: seal is not respiring

3

[8]

20

- (a) 1. (Curve for) dog falls rapidly at the start but (curve for) sheep falls slowly at first;

Do not allow curve for dog falls more steeply (since from 0.5% NaCl fall in sheep is just as steep as fall in dog)

2. Sheep doesn't fall rapidly until 0.5 (but dog falls rapidly from 0);



3. (Trend shows that) for any concentration of sodium chloride haemolysis is lower in the dog;

The idea of a trend is required. Statement of individual values alone is insufficient, eg 'at 0.2, 34% in dog and 98% in sheep' is insufficient
Accept dog reaches 0 at lower concentration of sodium chloride than for sheep / dog reaches 0 at 0.38% compared to 0.84 % in sheep;

2 max

- (b) 74 to 76;

Accept a value within this range

1

- (c) 1. (Red) colour is due to haemoglobin;

Note: a correct response to marking point 2 also scores marking point 1

2. The more haemoglobin released the more red the solution;
Need idea of haemoglobin release before giving credit

2

- (d) 1. (Use of 0.9%) will not cause haemolysis in any (of the mammals);

Full credit requires statement of marking point 1 and any approach from marking point 2

2. (So) will not kill any of the animals; or

Only need to use / store / buy one concentration of sodium chloride solution / cheaper to have one concentration of sodium chloride solution / can buy in bulk; or

Anyone can give it / no need to find out what concentration any animal requires;

Different approaches available for this marking point

2 max

[7]

21

- (a) 1. SAN sends wave of electrical activity / impulses (across atria) causing atrial contraction;

Accept excitation

2. Non-conducting tissue prevents immediate contraction of ventricles / prevents impulses reaching the ventricles;

3. AVN delays (impulse) whilst blood leaves atria / ventricles fill;

4. (AVN) sends wave of electrical activity / impulses down Bundle of His;



- 4. Allow Purkyne fibres / tissue
- 5. Causing ventricles to contract from base up;

5

- (b) 1. Atrium has higher pressure than ventricle (due to filling / contraction) causing atrioventricular valves to open;
- Start anywhere in sequence, but events must be in the correct order.*
1. Accept bicuspid, reject tricuspid
- 1. Allow: blood passes through the valve = valve open / blood stopped from passing through the valve = valve closed
 - 2. Ventricle has higher pressure than atrium (due to filling / contraction) causing atrioventricular valves to close;
 - 3. Ventricle has higher pressure than aorta causing semilunar valve to open;
- Points 1, 2 and 3 must be comparative: eg higher 3. Allow aortic valve*
- 4. Higher pressure in aorta than ventricle (as heart relaxes) causing semilunar valve to close;
- 4. Allow aortic valve
 - 5. (Muscle / atrial / ventricular) contraction causes increase in pressure;

5

[10]

22

(a)

Statement	Haemoglobin	Cellulose	Starch
Has a quaternary structure	✓		
Formed by condensation reactions	✓	✓	✓
Contains nitrogen	✓		

One mark for each correct row

3

(b) 16;



- 1
- (c) 1. Higher affinity / loads more oxygen at low / same / high partial pressure / pO₂;
2. (Therefore) oxygen moves from mother / to fetus; 2
- (d) 1. Low affinity / oxygen dissociates;
Assume 'it' is adult haemoglobin
1. *Accept: converse if 'fetal haemoglobin' is clearly stated*
2. (Oxygen) to respiring tissues / muscles / cells;
2. *Q: Neutral 'respire'* 2
- (e) Enough adult Hb produced / enough oxygen released / idea that curves / affinities / Hb are similar / more red blood cells produced;
Neutral: 'adult Hb is also produced' as in the question stem
Reject: curves / affinities / Hb are the same 1
- [9] (a)** Aorta;

23

- (b) 1. Left ventricle pumps to whole body (except lungs) / pumps blood further;
Accept converse for right ventricle
Reject 'push'
2. Left ventricle does most work / produces a greater pressure / produces a greater force; 2

- (c) 1. (Valve **A**) atrioventricular valve; *Accept bicuspid / mitral*
 2. Semi-lunar valve; *Accept aortic valve*
Ignore references to left and right

2

(d) **X** because (no mark)

Accept other valid calculations - probabilities

1. 52.1% survived without replacement compared to 12.1% / difference of 40%; *If correct figures written in table, award marks*
 2. 10.9% required repair or replacement of artificial heart compared to 41.4% / difference of 30.5%;
Max 2 if incorrect rounding of values
 3. 37% died compared to 46.6% / difference of 9.6%;

OR

(X / Y = 119 divided by 58 = 2.05)

14.4; 49.2; 55.4;

Note that this ratio could be reversed i.e. 58 divided by 119 multiplied by numbers in top row

Accept rounded to 14; 49; and 55;

3

[8] (a) One suitable factor;

24

Not health or lifestyle

E.g. Age / no heart condition / not on medication;

Accept BMI / smokers / diet / fitness / race etc. – has to affect heart rate or blood pressure

1 max

(b) Patients were at rest / not moving / not using muscles / in standardised position / controlled conditions;

Accept same position as sleeping

Ignore relaxed

1

(c) 1. Caused by pressure / surge of blood;

Ignore pulse rate equals heart rate

2. From (one) contraction / beat of (left) ventricle / heart;

Reject right ventricle

Ignore pumps / pumping

- (d) 1. Monitor records heart rate over long period of time / all the time / more data collected;
Ignore reference to continuously as in stem
Ignore anomalies can be discarded
2. Anomalies in recording have less effect;
Ignore more accurate / reliable mean
3. Recording pulse rate for one minute only may give an anomalous / atypical result;
4. Errors when trying to count pulse for one minute / human error;
5. Monitor records HR over a range of activities during the day / pulse rate only records for a single set of conditions;

2 max

- (e) 1. Men with condition always have higher heart rates;
Accept blood pressure references for heart rate
2. But no direct measurements of blood pressure;
Accept – no stats analysis to show significance
3. Only one investigation / test / need more studies; *Ignore references to 'yes' and 'no' throughout*
4. Using different recording methods / conditions (in each case so cannot compare results);
5. Men without condition also have increased / higher heart rate in doctor's surgery;

2 max

[8]

By osmosis (no mark)

25

No mark awarded for naming terms e.g. osmosis, facilitated diffusion, active transport, co-transport etc.

1. From a high water potential to a low water potential / down a water potential gradient;
2. Through aquaporins / water channels;
QWC ignore large / small WP

By facilitated diffusion (no mark)

QWC ignore reference to high / low concentrations of water or high / low concentration of solution

3. Channel / carrier protein;
4. Down concentration gradient;

By active transport (no mark)

QWC ignore 'along' concentration gradients

5. Carrier protein / protein pumps;
6. Against concentration gradient;
7. Using ATP / energy (from respiration);

Co-transport subsumed into mark scheme for active transport and facilitated diffusion

By phagocytosis / endocytosis (no mark)

Can award MP2, 3, 5 for 3 marks with no context given

8. Engulfing by cell surface membrane to form vesicle / vacuole;
Ignore lipid diffusion as in stem of question

By exocytosis / role of Golgi vesicles (no mark)

9. Fusion of vesicle with cell surface membrane;

5 max

[5] (a) (i) Made of (different) tissues / more than one tissue;

26

1

(ii) 1. (Muscle) contracts;
Assume that 'they' or 'it' = muscle

2. (Arteriole) narrows / constricts / reduces size of lumen / vessel / vasoconstriction;

Ignore: references to pressure

Q *Correct context for muscle contracts, vessel constricts*

2

(b) (i) Short diffusion distance / pathway;
Accept: thin diffusion pathway

1

(ii) (More) time for exchange / diffusion (of substances);
Accept: example of more time for specific substance to be exchanged

1

(c) 1. Water potential (in capillary) not as low / is higher / less negative / water potential gradient is reduced;

Accept: 'blood or plasma' instead of 'capillary'

2. Less / no water removed (into capillary);

Accept converse: water remains in the tissue

3. By osmosis (into capillary);

Q Marking points 2. and 3. must be in the context of movement into the capillary

Neutral: reference to more tissue fluid being formed as in the question stem

Neutral: reference to lymphatic drainage

3

[8] (a) 1. (Risk) decreases, then increases;

27

2. (Risk) increases from 2 (drinks per day);

Accept increases risk above 3

2

(b) Age affects heart disease / age affects how alcohol affects the body;

Accept age affects results

Accept 'removes confounding variable'

Accept 'controlling a variable'

1

(c) *To gain 3 marks candidates must have mp1 and 2 from mps 2-5*

1. (True because) studies show decreased risk up to 3 drinks per day;

Accept any evidence from graph

1

2. (False because) eg all show an increased risk above 5 drinks / day, eg **A** and **B**, show increased risk (of heart disease) above 4 per day; *Accept any evidence from graph*

3. Data only about heart disease / alcohol causes other diseases / social problems;

4. Amount of alcohol per drink may vary;

5. May be due to other factor

2 max

[6] (a) (i) 1. Stomata open;

28

Allow converse

2. Transpiration highest around mid-day as middle of day warmer / lighter;

2. Allow 'Sun is at its hottest'

3. (Increased) tension / water potential gradient;

Ignore 'pull, suck'

3

(ii) (Inside xylem) lower than atmospheric pressure / (water is under) tension;

Accept cohesion tension. Ignore vacuum

1

- (b) (i) High pressure / smoothes out blood flow / artery wall contains more collagen /muscle / elastic (fibres) / connective tissue;

Accept converse for pulmonary vein

Incorrect function of artery disqualifies mark

1

- (ii) 1. (Aorta wall) stretches because ventricle / heart contracts / systole /pressure increases;

1. *Allow expand*

2. (Aorta wall) recoils because ventricle relaxes / heart relaxes / diastole /pressure falls; 2. *Allow spring back*

Reject any reference to contract / relax in MP1 and 2

3. Maintain smooth flow / pressure;

3

- (iii) Aorta 1.2 / largest SD;

Allow pulmonary vein provided candidate relates standard deviation to mean

1

- (c) Formation

1. High blood / hydrostatic pressure / pressure filtration;

2. Forces water / fluid out;

2. *Reject plasma, ignore tissue*

3. Large proteins remain in capillary;

Return

4. Low water potential in capillary / blood;

5. Due to (plasma) proteins;

6. Water enters capillary / blood;

7. (By) osmosis;

7. *Osmosis must be in correct context*

8. Correct reference to lymph;

6 max

[15]

- (a) (i) Identifies anomalies / minimises effect of anomalies / unusual results / results more

29

likely to be representative / more reliable mean;

Accept likely to see side effects

1

(ii) Minimises / avoids regional bias / effects;

This is the basic principle. Accept examples that make this basic point, e.g.

There may be factors that affect people living in different areas

1

(b) 1. Treated the same as those on ivabradine / experimental group;

2. Given dummy pill / placebo; *Do*

not accept: given no pill

2

(c) (i) Increases filling time;

1

(ii) 1. Maximum / large amount of blood leaves heart / ventricles / increases stroke volume / cardiac output;

Must be in context of blood leaving the heart

2. More blood / more oxygen to heart muscle / heart tissue; *Accept wall of heart*

3. Via coronary arteries;

3 max

[8]

(a) Records every heart beat / does not miss heart beats / gives more precise / accurate

30

measurements;

Qualified reference to human error e.g. in counting

1

(b) (i) 1. 67 / 69.2 / the same;

All that is required here is a connection to be established between heart rate and pulse rate

2. There is one surge in pressure / pulse each time the heart contracts / beats;

2

(ii) Two marks for correct answer in range 90.0 – 113.0;;

One mark for incorrect answer in which duration of one heart beat is clearly identified as between 0.53 and 0.66 seconds;

2

- (c) Allow two marks for quantitative statement: e.g. filling time decreases from 0.55 ± 0.1 to 0.30 ± 0.1 s;;

Allow one mark for qualitative statement: e.g. Filling time decreases;

Accept other quantitative statements such as those based on proportion of cardiac cycle

2

- (d) One mark for more general answer, e.g. increase exercise;

This is the general principle. Detail may vary if centre uses different exercise

Two marks for detailed answer, e.g. increase frequency / duration of exercise;;

Reject comments not related to method used

2

[9]