Mark schemes

1

(a) (i) Left ventricle;

1

(ii) Thick muscle / thick walls;

Accept more muscle / more muscular.

Ignore stronger muscle.

1

(b) (i) 85.7 / 86;

Accept 85

Ignore additional decimal places.

1

(ii) Two marks for correct answer of 7905 - 7998;

Accept either formula or illustration with figures from table.

One mark for incorrect answer in which candidate provides evidence of multiplying heart rate by stroke volume;

2

(c) 1. Closed open;

2. Open closed;

2

[7]

2

(a) Amino acid / amino acids ;

If anything else is given as well do not award mark.

1

(b) (i) 1. Affects one monomer / amino acid;

i.e. What is affected

2. Not found in all active sites;

i.e. Where it is found.

2. Must relate to active site. Enzyme is insufficient.

2

(ii) 1. **X**;

2. Enzyme in both pathways;

2. Award independently

2

(c) 1. Occupies / blocks / binds to active site;

i.e. What it does in terms of the active site.

2. Substrate will not fit / does not bind / no longer complementary to / enzymesubstrate complex not formed;

1. Ignore references to change in shape and shape of aspirin molecule.

Ignore reference to competitive inhibitor i.e. Consequence required

2

[7] (a) 1. Haemoglobin carries oxygen / has a high affinity for oxygen / oxyhaemoglobin;

3

2. Loading / uptake / association in lungs;

3. at high $p.O_2$;

4. Unloads / dissociates / releases to respiring cells / tissues;

5. at low $p.O_2$;

6. Unloading linked to higher carbon dioxide (concentration);

6. Ignore reference to incorrect pH in relation to effect of higher carbon dioxide concentrations for marking point

6

(b) 1. Allows comparison;

Do not credit 'temperature affects results' on its own;

2. (Different temperature) affects enzymes;

2. Allow reference to denaturation of enzymes.

3. (Different temperature) affects respiration / metabolism;

4. (Different temperature) affects amount of dissolved oxygen;

2 **max**

(c) 1. Increases then levels out / stops increasing / fluctuates slightly;

2. At 5 ($cm^3\ dm^{-3}$) / 320 ($cm^3\ g^{-1}h^{-1}$);

Allow description of 'fluctuates slightly' in terms of candidate quoting figures after 320.

2

(d) 1. *Chronimus longistylus* has higher uptake at low (oxygen) concentrations;

Chronimus longistylus has higher uptake to (oxygen concentration of) 2 / lower uptake after 2; (= 2 marks)

2. (Higher uptake) up to 2 $cm^3\ dm^{-3}$;

2. Award mark if candidate uses figures from table e.g. higher at concentration 1 (220) or concentration 2 (285). Higher uptake at concentration 1 or 2 = 2 marks.

2

(e) (i) More (than in African) lost via gills in Australian lungfish / less (than African) lostvia lungs in Australian lungfish;

1

(ii) 1. More / most exchange is via lungs (in African lungfish);

1. Allow converse for first point.

2. Gills will not function / function less efficiently (in air);*2. Allow water is required for gills to function.*

2

[15] (a) 0.1 and 0.5;

4

Pressure in ventricle greater (than pressure in atrium);

Both figures must be correct.

Comparison needed.

2

(b) 1. (Ventricle has) thick wall / more muscle;

2. So <u>contractions</u> are stronger / harder;

Neutral: Contracts to produce more pressure.

Neutral: Pump harder.

Neutral: Reference to a need to pump blood further / round the body.

2

(c) 85 / 86 / 85.7;

Ignore additional decimal places

1

[5] (a) (i) <u>Protein</u> on (surface of) <u>chlamydia</u>;

5

That initiates an immune response (in mice) / causes antibody production;

Neutral "foreign protein"

Do not accept glycoprotein.

2. Accept description of initiating immune response.

2

(ii) 1. Antibodies / memory cells against chlamydia (protein / antigen) are present;

2. Protein on heart (muscle) similar to chlamydia protein / antigen so T cells / antibodies (attack heart muscle cells); *2. Look for idea that both proteins are similar*

2. Detail of what is attacking the heart muscle cells

2

(b) **FOR**

1. Prevents / reduces heart disease / attacks;

2. Cheaper to vaccinate than treat heart disease;

AGAINST

3. Vaccination costly;

4. Don't know frequency of chlamydia infection;

5. Research in mice might not be replicated in humans / humans might have adifferent protein;

6. Vaccine could cause heart disease or immune response against heart (muscle);

2 max for arguments against

Accept other valid answers

3 **max**

[7]

(a) High(er) affinity for oxygen / absorbs / loads more oxygen;

6

At lower partial pressure (of oxygen) / lower pO_2;

Accept: Loads oxygen 'quicker', 'more readily', 'higher saturation', use of figures from graph for first point.

Neutral: References to unloading.

2

(b) 1. (Hydrostatic) pressure lower in capillary / blood / higher in tissues / tissue fluid;

2. Water (returns);

3. By osmosis;

4. Water potential lower / more negative in blood / capillary / higher / less negative water potential in tissues / via water potential gradient;

5. Due to protein (in blood);

6. (Returns) via lymph (system / vessels);

First marking point must be in context of between blood and tissue fluid.

Neutral: References to hydrostatic pressure and water potential at arteriole end of capillary.

3 max

[5]

(a) More red blood cells;

7

More haemoglobin;

2

(b) Given (only) salt solution;

(Otherwise) treated the same way;

Accept: 'Placebo' in salt solution.

Reference to salt solution is essential for first marking point.

2

(c) Allows comparison to be made;

Different masses / weights (of volunteers) / different weeks / lengths of treatment;

Accept: 'Both were different' for one mark.

Neutral: Size for second marking point.

2

(d) To determine (most effective) dose / length of treatment / to find the most costeffective treatment;
Investigate long term effect / toxicity / side effects;

Do not credit marks for descriptions of the information in the table in terms of dose and length of treatment.

2

(e) More haemoglobin / more red blood cells;

(More) oxygen can be absorbed / transported (for) respiration / to respiring tissues / cells;

(More) energy released / more ATP for muscle <u>contraction</u>;

Delays <u>anaerobic</u> respiration / delays build up of lactate / lactic acid;

Reject: 'Energy produced or made' but allow 'energy made in form of ATP'.

4

(f) Large sample / wide range (of individuals tested);
Random (sampling);

Tested at different times / more than once;

Mean / average value determined;

Idea of establishing a range for the normal concentration / reference to use of standard deviation;

2 max

(g) Blood thicker / denser / more viscous / more 'concentrated' / heart<u>contraction</u> greater / increases volume of blood;

Accept: More blood cells in same volume / 'space'.

Neutral: 'more red blood cells' / 'more blood' on its own.

Neutral: 'Heart pumps / beats more / harder'.

1

[15]

8 (a) (i) **G**;

Neutral: name of blood vessel

1

(ii) **E**;

Neutral: name of blood vessel

1

(b) Pressure is greater below valve / in ventricle than (artery);

Must be comparative

Reject: pressure is greater in ventricle than atrium

Neutral: pressure in ventricle increases

*Accept: **E** / **F** / named artery*

Accept: converse argument

1

(c) Allow atria to empty / contract / ventricles to fill;

Before ventricles contract;

OR

Delays contraction of ventricles;

Until after atria have contracted / ventricles have filled;

Neutral: 'to pump blood'

2

(d) (i) Two marks for correct answer of 91 / 90.9;;

One mark for incorrect answers which clearly show understanding of the relationship between SV = CO / HR;

Correct answer = 2 marks outright

5000 divided by 70, 55 or 15 = 1 mark for principle

2

(ii) Increase in size or volume of heart / ventricles / increased heart muscle / increased strength of contraction / hypertrophy;

Cardiac output is the same (before and after training) so must be increase in stroke volume / more blood leaves heart in each beat;

Accept: increased strength of heart muscle

Neutral: heart muscle contracts more

***Q** Do not allow 'heart is stronger'*

Neutral: more blood leaves the heart

If the term 'stroke volume' is not used, it must be defined

2

[9] (a) More that one polypeptide / chain;

9

Ignore references to haem / other groups

1

(b) (i) 141;

1

(ii) 1. Stop / start sequences;

2. Non coding DNA (in the gene) / introns / multiple repeats / junk DNA;*Do not credit "some bases repeated"*

3. Two chains / a non-coding strand / complementary base pairs;

4. Addition of base by mutation;

2 max

(c) Different primary structure / amino acids / different number of polypeptide chains;

Question is about haemoglobin so do not credit differences in DNA

1

(d) 1. Low partial pressure of oxygen in lungs;

2. (Llama) haemoglobin able to load more oxygen / (llama) haemoglobin saturated (at low / particular partial pressure of oxygen);

3. Higher affinity for oxygen;

The terms used in the graph (or near approximations) should be used in this answer.

Ignore references to unloading

The answer must relate to llamas

3

[8] (a) (i) 1. Removes water vapour / moisture / saturated air;

10

2. Increases water potential gradient / more diffusion / more evaporation;

2

(ii) 1. Increases kinetic energy so water molecules move faster;

2. Increases diffusion / evaporation;

2

(b) (i) Positive correlation / as light intensity increases so does rate of water movement / follows same pattern / directly proportional;

1

(ii) 1. Stomata open and photosynthesis increases / transpiration increases;

2. More water pulled up due to cohesion between water molecules / bycohesion tension;

2

(iii) 1. Water pulled up trunk / moves up at fast rate under tension;

2. Sticking / adhesion (between water and) cells / walls / pulls xylem in;*Adhesion is not a specification requirement.*

Accept cohesion in this context

2

(c) **Elastic tissue**

1. Elastic tissue stretches under pressure / when heart beats then recoils / springsback;

2. Evens out pressure / flow;

Do not allow credit for expands / contracts / relaxes in this context.

From a marking viewpoint ignore all specific references to arteries and arterioles. Consider all points as applying to both.

2 Do accept controls

Muscle

3. Muscle contracts to reduce diameter of lumen / vasoconstriction / constrictsvessel;

4. Changes flow / pressure;

Epithelium

5. Epithelium smooth;

6. Reduces friction / blood clots / less resistance;

6

[15] (a) (i) Healthy volunteers have 'normally' functioning vessels;

11

OR

Blood vessel / lumen / diameter not affected by other factors / is of normal size;

Accept: a valid ethical argument
e.g. treatment does not harm healthy volunteers

Reject: ref. to change in artery thickness

Accept: converse arguments for unhealthy volunteers

Must be related to this investigation

Neutral: to ensure that that the results are due to the independent variable

1

(ii) Avoids bias / selection (by scientists);

Neutral: ref. to having the same number / gender / age of people in each group;

1

(b) (i) Same as experimental group;

Chocolate with no flavenoids;

Neutral: no dark chocolate

Neutral: placebo

Reject: milk chocolate

Neutral: ref. to fair testing

2

(ii) (To ensure that results are) not due to some other substance in the chocolate / due to flavenoids (only);

Must be related to this investigation

Neutral: to ensure that the results are due to the independent variable

Neutral: to show results are not due to other factors

Neutral: to show results are only due to the chocolate

Neutral: to compare results for people who did and did not have flavenoids

1

[5]

12 (a) Endothelium / epithelium;

Allow endothelial / epithelial

Reject: epidermis / endodermis

1

(b) Measurement divided by 8;

1

Allow answer in range of 3-3.3 for two marks;

Correct answer gains 2 marks.

1

(c) (i) Stretches / 'expands' under high pressure / when ventriclecontracts / systole and recoils / 'springs back' under low pressure / when ventricle relaxes / diastole;

Q *References to aorta contracting or relaxing negates marks for stretch and recoil.*

Smooths blood flow / maintains blood pressure / reduces pressure surges;

Stretch and recoil without reference to blood pressure etc. = one mark.

Stretch and recoil to smooth blood flow etc. = two marks

Ignore references to aorta withstanding blood pressure or not being damaged.

2

(ii) (Muscle) contracts;

'It' in answer = muscle

1

(Arteriole) constricts / narrows / alters size

of lumen / reduces / regulates blood flow (to capillaries);

Allow converse (muscle) relaxes and (arteriole) dilates etc / increase blood flow etc. Ignore references to pressure

1

(d) (i) Large / increase in (total) cross sectional area / friction / resistance;

1

(ii) (More) time for exchange of substances;

1

[9]

13 (a) Loading / uptake / association of oxygen at high p.O_2;

In lungs (haemoglobin) is (almost) fully saturated / in lungs haemoglobin has a high affinity for oxygen;

Unloads / releases / dissociates oxygen at low p.O_2;

Unloading linked to higher carbon dioxide concentration;

Allow converse for second marking point in tissues i.e. haemoglobin has low affinity / releases most of its oxygen.

Mark for haemoglobin having high affinity for oxygen must be 'in lungs'.

3 max

(b) (i) Larger the mammal the more to the left / steeper / 'higher' is the curve / the higher the affinity for oxygen; *Allow converse.*

Ignore references to Bohr shift

1

(ii) Smaller mammal has greater surface area to volume ratio;

Smaller mammal / larger SA:Vol ratio more heat lost (per unit body mass);

Allow converse explanation for larger mammals or lower surface area to volume ratio.

Smaller mammal / larger SA:Vol ratio has greater rate of respiration / metabolism;

Allow suitable named mammal as alternative to smaller or larger mammal.

Oxygen required for respiration so (haemoglobin) releases more oxygen / oxygen released more readily / haemoglobin has lower affinity;

4

[8]

14 (a) (i) Faster / greater / more effective response in children;

Do not accept children have more haemoglobin

1

(ii) Use line of best fit;

1

Extrapolate / extend line (and read from graph);

Allow calculation using rate of increase per day = one mark.
However for both marks this must be linked to line of best fit.

1

(iii) More than one polypeptide chain;

Allow many polypeptide chains.

'Haemoglobin has four polypeptide chains' must be in correct context to gain mark.

1

(b) (i) Has same water potential;

Allow converse for effect of using distilled water or a concentrated solution.

1

No (net) water movement / osmosis;

1

Cells will not swell / burst / change size;

No osmotic lysis = two marks

1

(ii) Pernicious anaemia (cells) greater range / spread / variation of diameters / widths;

Some pernicious anaemia (cells) wider than 9 (µm) / some less than 5.5 (µm) / without pernicious anaemia none more than 9 (µm) / none less than 5.5 (µm);

Pernicious anaemia (cells) peak / most frequent at 8.5 (µm) / peak / most frequent at higher diameter / / without pernicious anaemia peak / most frequent at 7 (µm) / peaks at lower diameter;

There are several alternatives for marking points 2 and 3

2 max

[9] (a) Diet including saturated fats leads to higher plasma cholesterol concentrations;

15

Higher in all age groups;
But sample size is very small;
Standard deviations overlap / suggest wide variation;

3 max

(b) The sex of individual is a risk factor for high cholesterol;
To remove a / one variable / to establish a fair test;

2

(c) Monkeys and humans closely related therefore similar conclusions might be drawn;High concentrations of plasma cholesterol lead to an increased risk of cardiovascular disease in humans;
Don't know if diet has the same effect in monkeys (as in humans) / could have different effects because not the same species;

3

[8] 1. SAN initiates heartbeat / acts as a pacemaker / myogenic;

16

Q *Must be in context*

2. (SAN) sends wave of electrical activity / impulses (across atria) causing atrialcontraction;

Reject: signals / electronic / messages / <u>nerve</u> impulses once only

3. AVN delays (electrical activity / impulses);

Neutral: reference to non-conducting tissue delaying impulses instead of the AVN

4. (Allowing) atria to empty before ventricles contract / ventricles to fill before theycontract;

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

6. (Causing) ventricles to contract (from base up) / ventricular systole;

5 max

[5] (a) Increase in / more carbon dioxide;

17

Curve moves to the right / depressed;

Q *Any reference to haemoglobin increasing affinity for oxygen disqualifies second mark point.*

2

(b) (i) More haemoglobin;

So can load / pick up more oxygen (in the lungs);

Q *Second mark point must relate to idea of loading oxygen. Answers referring only to transport of oxygen should not be credited this mark.*

2

(ii) (Haemoglobin) has lower affinity for oxygen / more oxygen released;

In / to the cells / tissues;

2

[6]

(a) Sends out electrical activity / impulses;

18

Initiates the heartbeat / acts as a pacemaker / (stimulates) contraction of atria;

Q *Ignore reference to ventricles.*

2

(b) Fluctuation and overall decrease;

Steep decrease first / after two years and then gradual decrease;

2

(c) Diet low in cholesterol / LDLs;

Less absorbed into blood / from intestines;

2

(d) Diet has greater effect in decreasing blood cholesterol concentration;

Difficult to judge effect of drug as it is used at same time as diet / drug is not used on its own;

Decrease in blood cholesterol concentration linked to reduced risk of heart disease;

Q *Allow converse for third marking point.*

2 max

[8] (a) (Blood) plasma;

19 **1**

(b) More / larger proteins / less urea / carbon dioxide / more glucose / amino acids / fattyacids / oxygen / high(hydrostatic) pressure;

Q *Reference to blood cells / water potential = neutral*
Q *<u>No</u> Protein should not be credited*

1

(c) (i) <u>Contracts</u>;

Q *Do not accept pumping of heart / heart beating*

1

(ii) Loss of fluid / volume;

Friction / resistance (of capillary wall);

Q *Reference to a narrow lumen is not sufficient to gain a mark unless friction or resistance is mentioned.*

1 max

(d) <u>Water potential</u> (in capillary) not as low / is higher / less negative / water potential gradient is reduced;

More tissue fluid formed (at arteriole end);

Less / no <u>water</u> absorbed (into blood capillary) by <u>osmosis</u>; (into blood capillary);

Q *The last two marking points must be in context of movement into the blood capillary*

3

[7] (a) Arrows on all five vessels in correct direction;

20 **1**

(b) E;

1

(c)

Feature	Vessel C	Vessel E
Valves	Absent	Present
(Relative) thickness of walls	Thicker	Thinner
Elastin / elastic tissue / fibres	More	Less
Muscle	More	Less
Lumen	Narrow	Wide

Two marks for two correct rows

Accept any pair of contrasting terms with same meaning as those used.

2 max

(d) Contracts;

(Causing) vasoconstriction / narrows lumen;

2

(e) (Elastic tissue) stretches when pressure is high;

Springs back / recoils / returns to normal;

Q *Do not credit references to contracting, relaxing or expanding*

2 max

[8]

21 (a) 1. Large surface area provided by lamellae / filaments increases diffusion / makes diffusion efficient;;

Q *Candidates are required to refer to lamellae or filaments. Do not penalise for confusion between two*

2. Thin epithelium / distance between water and blood;

3. Water and blood flow in opposite directions / countercurrent;

4. (Point 4) maintains concentration gradient (along gill) / equilibrium not reached /as water always next to blood with lower concentration of oxygen;

5. Circulation replaces blood saturated with oxygen;

6. Ventilation replaces water (as oxygen removed);

6

(b) Mixing of air and water (at surface);

Air has higher concentration of oxygen than water;

Diffusion into water;

Plants / seaweeds near surface / in light;

Produce oxygen by photosynthesis;

2 max

(c) Not much oxygen near sea bed;

Toadfish haemoglobin (nearly) saturated / loads readily at / has higher affinity for oxygen at low partial pressure (of oxygen);

2

(d) The chimpanzee and the bonobo are more closely related (than to the gorilla);

They have identical amino acids / one of the amino acids is different in the gorilla;

2

[12]

22

(a) (i) plasma;

1

(ii) tissue fluid;

1

(b) fluid **Y** contains little / no protein; *reject blood cells*
molecules too large (to pass through capillary wall);

OR

fluid **Y** contains less glucose; some will have entered tissue cells; accept any other biologically correct difference marked in a similar way.

2 max

(c) hydrostatic pressure / blood pressure / arterial pressure;
greater than osmotic effect which forces molecules / fluid out;
ignore references here to diffusion or osmosis.

2

[6]

23

(a) (i) the atrioventricular / mitral / bicuspid / tricuspid valves (closing);

1

(ii) pressure in artery greater than pressure in ventricle;

1

(b) correct answer 5250 = 3 marks;
where answer incorrect:
one heart beat identified as taking 0.8 s; heart rate calculated as 75 (beats per minute); cardiac output = heart rate x stroke volume; *marking points to be awarded independently but onus on candidate to show clearly what has been done*

3

[5

] (a) (variation in) temperature will affect the solubility of oxygen / rate of respiration / use of

24

oxygen by cells / diffusion / gas exchange; *to gain credit point made must concern oxygen*

1

(b) (i) there is no difference between the partial pressure of oxygen in the two groups / the partial pressure of oxygen is the same in each group;

1

(ii) results may have been due to chance and statistical test allows us to determine the probability of this / of the difference between results being significant;
enables acceptance or rejection of null hypothesis;
The key points here are chance and probability used in the correct context.

2

(c) **A**;
because partial pressure of oxygen only reduced when zinc in water / in **Y** / because when injected zinc / in **X** has no effect on partial pressure of oxygen in blood;

2

(d) less oxygen transport to cells / in fish / in blood;anaerobic respiration;
lactic acid produced / less carbon dioxide removed (from gills);
more H^+;

3 max

(e) (i) copper;calculation based on comparing concentration in woodlice with that in leaves;
accept any suitable method here, giving marks for the method and explanation. For example, calculating ratio of concentration in woodlice to concentration in leaves.

2

(ii) not absorbed from gut / passes out in faeces / egested / urine / excreted;

1

(iii) woodlice eat large amount of leaves;copper stored / accumulates in body;

2

(f) (i) mutation;

1

(ii) (as a component of) nucleic acids / DNA / RNA / nucleotides;phospholipids;
ATP / ADP;

2 max

(iii) arsenic-tolerant plants would not be able to take up phosphates / take up a littlephosphate; since likely to involve same mechanism / same carrier / protein; (process of) growth would be poorer than non-tolerant plants;

3

[20] (a) correct answer: 77 - 78 ;; *allow 75 - 80* = 2 marks

25

OR Use of 55 AND 17 saturation / fall = 38; = 1 mark

OR (Fall = y % +) use of $\frac{200y}{98}$; = 1 mark

2

(b) (in exercise) - faster respiration rate meaning more CO_2 production; CO_2 is acidic / forms carbonic acid / lactic acid production; release of H^+ ions;

3

[5] (a) The muscle in the wall / sphincter contracts;

26

Accept converse

Reducing blood flow / narrowing / closing arteriole;

The muscle to which the candidate is referring must be clearly in the wall of the arteriole.

2

(b) (i) Blood flow increased in humans / reduced in seals;

1

(ii) Less oxygen / blood taken to muscles;

None is incorrect

(More) oxygen available for organs / brain; Can stay under water longer (without breathing);

max 2

[5]

(a) 0.1 / 0.9 (s);

27

1

(b) Two marks for correct answer of 75 (beats per minute);

One mark for incorrect answer based on cardiac cycle taking 0.8 seconds;

2

(c) (i) Pressure in ventricle higher than pressure in atria;

1

(ii) Prevents backflow of blood / prevents flow from ventricles to atria;

1

(d) Increase (in stroke volume) as blood pressure increases, remains constant / plateaus; after 3 kPa / when stroke volume = 82cm^3

2

(e) Two marks for correct answer of 80;
One mark for incorrect answer recognising that ventricle contracts once every cardiac cycle / stroke volume = 70 cm^3

2

(f) 1 Muscles (surrounding veins) contract and press on (walls of) vein and squeezesblood along veins;

2 Valves prevent backflow / ensure flow in one direction;

3 Systole / contraction of heart pumps blood (through arteries) into veins /residual arterial pressure / negative pressure in chest due to inspiration;

4 Recoil of heart muscle during diastole / after contraction;

5 Draws blood from veins into atria;

Accept sucks

6 Wide lumen little resistance / friction

6

[15]

28

(a) (i) 1 Reduces heart rate;

2 Keeps heart rate stable / reduces variation in heart rate;

3 Nullifies external stimulus;

Individual points must be supported with information from the graph
If no information quoted max 1 mark

2

(ii) To ensure change in heart rate due to beta blocker and not person's behaviour / knowing may affect heart rate;

1

(b) (i) Beta blockers reduce mortality (following myocardial infarction) /
Greater reduction in the older group;

1

(ii)

$$\frac{\text{Deaths with placebo - deaths with beta blocker}}{\text{Deaths with placebo ;}} \quad / \quad \frac{\text{Extra deaths}}{\text{deaths with placebo}}$$

x100;

2

[6]

(a) (i) **C** and **D**;

29

1

(ii) left ventricle with thicker wall / more muscle / (muscle in) left ventricle contracts <u>more</u> forcefully / beats more strongly;

1

(b) higher in atria / lower in ventricles;atrioventricular valves / valves between atria and ventricles open; *(position of valves must be identified.*

Do not accept an unqualified reference to valves.

Assume pronouns refer to atria.)

2

(c) (i) allows blood to pass into ventricles / from atria / so that atriacan empty; before ventricles contract;

2

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

2

[8]

(a) made of (different) tissues / specified tissues;

30

1

(b) (i) 20 µm as it consists of endothelium only / does not contain muscle, connective tissues and elastic tissue;

(consider other answers and credit understanding.)

1

(ii) 1 mark calculation derived from diameter - (2 × wall thickness) / answer of 3mm;
2 marks 2mm / 2000µm;

2

(c) stretches as a result of high pressure / surge of blood;
then recoils;

2

[6]