Mass Transport in Animals

Mark Scheme

Name: _____

Class: _____

Date: _____

Time: **83 minutes**

Marks: **57 marks**

Comments:

1.

(a) 1. Renal vein;

2. Vena cava to right atrium;

3. Right ventricle to pulmonary artery;

3

(b) 1. Vein;

2. Wide(r) lumen

OR

Thinner wall;

2

(c) 1. (Plasma) proteins remain;

Accept albumin/globulins/fibrinogen for (plasma) protein

2. (Creates) water potential gradient

OR

Reduces water potential (of blood);

3. Water moves (to blood) by osmosis;

4. Returns (to blood) by lymphatic system;

4

[9]

2.

(a) 1. Aortic/semi-lunar valves is closed;

Accept 'aorta valve' or 'valve to the aorta' or 'valve between the aorta and the ventricle'.

Do not accept S-L/A-V valve.

2. Because pressure in aorta higher than in ventricle;

Accept 9-10kPa in ventricle and 13kPa in aorta.

Ignore incorrect figures.

2

(b) 1. Elastic recoil (of the aorta wall/tissue);

Reject muscle contracting.

Ignore reference to muscle relaxing.

2. Smooths the blood flow

OR

Maintains rate of blood flow

OR

Maintains blood pressure;

Ignore reference to preventing backflow of blood.

2

(c) 1. Peaks/contractions at the same/similar time

OR

Same/similar pattern;

Mark the answer as a whole.

Accept 'shape (of curve)' for 'pattern'.

2. Lower pressure;

2

(d) 167 (beats minute^{-1})

OR

164 (beats minute^{-1})

OR

171 (beats minute^{-1});

Full answers

166.6 recurring, 164.383562, 171.428571

Accept any number of decimal places as long as rounding correct.

1

[7]

3. (a) 1. Only use single lines/do not use sketching (lines)/ensure lines are continuous/connected;

2. Add labels/annotations/title;

3. Add magnification/scale (bar);

4. Draw all parts to same scale/relative size;

5. Do not use shading/hatching;

2 max

(b) 1. Blood vessel **X** – artery/arteriole **and**

Blood vessel **Y** – vein/venule;

2. (Difference in) lumen size

OR

(Difference in) wall thickness;

Ignore name of blood vessel, eg. (pulmonary) artery

2

(c) 1. Carry/wash sharp instruments by holding handle

OR

Carry/wash sharp instruments by pointing away (from body)/down;

Accept for 'instruments', a suitable named example, eg. scalpel

2. Disinfect instruments/surfaces;

Accept for 'instruments', a suitable named example, eg. scalpel

Accept for 'disinfect', sanitise OR use antiseptic

3. Disinfect hands

OR

Wash hands with soap (and water);

Accept for 'disinfect', sanitise OR use antiseptic

4. Put organ/gloves/paper towels in a (separate) bag/bin/tray to dispose;

2 max

[6]

4. (a) 1. Muscle contracts;

2. Constricts/narrows arteriole/lumen;

Accept decreases for constricts/narrows

Accept vasoconstriction for 1 mark

2

(b) (Ventricles and arteries)

1. Ventricle (muscles) relaxed

OR

Arteries recoiled;

Accept references to ventricle, artery or atrium (singular)

Accept no muscle activity

OR

Diastole

OR

Arteries smoothing blood flow

2. No (blood) backflow (into ventricles)

OR

No blood movement to/in/from arteries;

Accept flow/pumped for movement

(Atria and ventricles)

3. Atria (muscle) contracted;

4. Blood movement from atria (into ventricles);

Accept flow/pumped for movement

4

(c) Vena cava;

1

(d) 2 marks for correct answer = 130 (beats min^{-1});;

1 mark for correct stroke volume = 104

2

[9]

5. (a) Valve **A**

(Left) atrioventricular

Chamber **B**

Left ventricle;

Reject right side in either context

*Accept mitral/bicuspid for Valve **A**.*

*Reject tricuspid for Valve **A***

*Ignore AV for Valve **A***

1

(b) Accept any **two** suitable safety precautions for 1 mark, eg;

Use a sharp scalpel/scissors

Wash hands/wear gloves

Disinfect bench/equipment

Cover any cuts

Cut away from self/others/on a hard surface

Safe disposal

Ignore take care with scalpel/scissors or keep away from fingers

Ignore goggles

1 max

(c) 1. Pressure in (left) atrium is higher than in ventricle/**B causing** valve to open;
OR
(When) pressure above valve is higher than below valve it opens;

Ignore pressure in front of/behind valve

As long as direction of opening/closing of valve is correct, ignore 'semi lunar'

2. Pressure in (left) ventricle/**B** is higher than in atrium **causing** valve to close;
OR
(When) pressure in below valve is higher than above valve it closes;

Accept cords/tendons prevent valve turning inside out

Ignore pressure in front of/behind valve

As long as direction of opening/closing of valve is correct, ignore 'semi lunar'

2

(d) 1. More impulses/action potentials along sympathetic (nervous system pathway/branch);

Ignore signals/information/ messages

Idea of more impulses/action potentials is required

2. To SAN increasing the heart rate (seen in **Figure 2**);

2

(e) 73

(this is the *best* answer since all numbers quoted in the question are to 2 s.f.)

(73.4375)

Accept 73.4 / any correct rounding

1

(f) **Group to be given**

1. Sugar solution (only)
   OR
   A drink with sugar (**and** no caffeine);

   Accept 'glucose' for sugar

   Ignore named drinks unless qualified

   Ignore 'sugar' by itself

   Ignore references to use of a placebo tablet

Reason

2. To show/prove that sugar (alone) is not causing the increases (in HR)
   OR
   To show that sugar does not have an effect;

   Accept 'to see the effect of sugar'

2

[9]

6.

(a) 1. (Because) same water potential (as valve);

2. (So) prevents loss or gain of water by osmosis / down water potential 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 ±) standard deviation for <u>minimum</u> 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]

7.

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

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).

$\frac{70-81}{81}$ *or* $\frac{81-70}{81}$ *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 × 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]