

Mark schemes

- 1** (a) Hydrolysis (reaction);
Accept phonetic spelling 1
- (b) 1. Too big / wrong shape;
Wrong charge - neutral
Accept insoluble
2. To fit / bind / pass through (membrane / into cell / through carrier / channel protein);
3. Carrier / channel protein;
Accept carrier / channel protein not present 3
- (c) Foreign / (act as) antigen / non-self;
Reject foreign cells 1
- (d) 1. Dose to be given;
Accept: interaction with other drugs
2. No (serious) side effects;
3. How effective;
4. Cost of drug; 2 max
- 2** (a) (i) Diffusion;
Ignore references to structures, membrane components etc
Allow simple diffusion
Reject facilitated diffusion 1
- (ii) 1. (Thin / flat body) so short distance for diffusion / short diffusion pathway;
Ignore references to membrane, wall, body surface
2. (Thin / flat body so) large surface area to volume ratio;
'It' refers to flatworm's body 2
- (b) (i) A group of tissues;
Ignore references to function Group = more than one 1

[7]

- (ii) 1. (Carbon dioxide enters) via stomata;
Reject stroma
2. (Stomata opened by) guard cells;
3. Diffuses through air spaces;
Allow concentration gradient. Reject along gradient unless direction made clear
4. Down diffusion gradient;

3 max

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3

- (a) (i) 1. Stomata open;
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

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4

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

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5

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

6

- (a) 1. (Diaphragm / diaphragm muscle) relaxes / relaxed;

Ignore references to inhalation, intercostal muscles or ribs if given as additional information.

2. Domed shape / (diaphragm) moves up;

3. Increases pressure and decreases volume;

3

- (b) 1. Extend / extrapolate curve / graph;

2. (Read off where) it flattens / reaches maximum / peaks;

2

- (c) 1. (Without inhaler) narrower bronchioles / bronchioles not dilated as muscle (surrounding bronchioles) contracted;

Assume answer relates to Curve A, unless otherwise stated.

2. Less air able to pass through / more difficult for air to pass through;

2

[7]

7

- (a) Something that increases chance / increases probability / makes it more likely;

1

- (b) (i) 1976 - / to / and 1980;

1

- (ii) 1980 - / to / and 1996;

1

- (c) 1. Correlation does not mean that there is a causal relationship;

1. Do not accept casual

2. May be some other factor / named factor associated with vehicles and asthma / producing rise in both;

3. (After 1980) asthma continues to rise but exhaust concentration falls / negative correlation (after 1980);

3

[6]

8

- (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

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9

(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 / enzyme-substrate 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

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10

(i) 1. Increases then decreases;

Allow peak / maximum at any time between 13.00 - 14.00 or 7.8 - 8.0;

2. Peak / maximum at 13.00 / 14.00 (hours) / 7.8 - 8.0;

2

(ii) 1. Maximum / overall rate is higher (in branches);

Allow converse for all marking points.

2. Reaches maximum / peak earlier (in the day) (in branches);

3. Starts higher / ends lower (in branches)

2

(iii) 1. Movement starts / peaks earlier in branches / higher up;

2. Creates tension / 'negative pressure' / 'pull'

2

[6]

11

- (a)
1. Haemoglobin carries oxygen / has a high affinity for oxygen / oxyhaemoglobin;
 2. Loading / uptake / association in lungs;
 3. at high p.O₂;
 4. Unloads / dissociates / releases to respiring cells / tissues;
 5. at low p.O₂;
 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 (cm³ dm⁻³) / 320 (cm³ g⁻¹h⁻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 cm³ 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) lost via 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

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12

(a) 0.1 and 0.5;

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 contractions 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]

13

(a) (i) Protein on (surface of) chlamydia;

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

2 max for arguments against

Accept other valid answers

3 max

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14

- (a) 1. Phagocyte attracted to bacteria by chemicals / recognise antigens on bacteria as foreign;

2. Engulf / ingest bacteria;
3. Bacteria in vacuole / vesicle;
4. Lysosome fuses with / empties enzymes into vacuole;
5. Bacteria digested / hydrolysed;

1. Accept names chemical e.g. toxin

2. Allow description of engulfing

3. Accept: bacteria in phagosome

5. Neutral: Break down

5. Accept digestive enzymes destroy bacteria

5. Do not accept "destroy bacteria" as it is in question stem

4 max

- (b)
1. Microvilli provide a large / increased surface area;
 2. Many mitochondria produce ATP / release or provide energy (for active transport);
 3. Carrier proteins for active transport;
 4. Channel / carrier proteins for facilitated diffusion;
 5. Co-transport of sodium (ions) and glucose or symport / carrier protein for sodium (ions) and glucose;
 6. Membrane-bound enzymes digest disaccharides / produce glucose;
 1. *Reject villi on epithelial cells*
 1. *Accept brush border*
 2. *Accept large SA:vol ratio*
 3. *Need idea of "lots"*
 4. *Reject: energy produced*
 5. *Accept Na⁺K⁺ pump*
 6. *Neutral: Channel proteins*
 7. *Accept named example*

6
[10]

15

- (a) Cell wall;

Starch (store);

Chloroplast;

Accept: phonetic spelling

2 max

- (b) Insoluble;

Reduces / 'stops' water entry / osmosis / does not affect water potential / is osmotically inactive;

Accept: description for first point e.g. 'does not dissolve'.

2

- (c) Light sensitive eyespot / eyespot detects light;

Flagellum enables movement towards light;

Chloroplast / chlorophyll absorbs light / for photosynthesis;

Do not penalise references to 'many chloroplasts'.

3

[7]