

Mark schemes

Q1.

- (a) 1. Affects/damages
- basement membrane

ORMore protein channels/carriers in basement membrane;

2. Proteins can pass into the (glomerular) filtrate/tubule;
-
- Ignore nephron.*

2

- (b) Box 4 The non-homologous section of an X chromosome

1

Q2.

- (a)

Ignore references to podocytes

1. High blood/hydrostatic pressure;
Ignore references to afferent and efferent arterioles
Ignore 'increasing/higher blood pressure' as does not necessarily mean high
2. **Two named** small substances pass out eg water, glucose, ions, urea;
Accept correct named ions
Accept mineral ions/minerals
Accept amino acids/small proteins
*Ignore references to molecules **not** filtered*
3. (Through small) gaps/pores/fenestrations in (capillary) endothelium;
Accept epithelium for endothelium
4. (And) through (capillary) basement membrane;

3 max

- (b)
-
- Glucose by facilitated diffusion and active transport and water down a water potential gradient

1

- (c) 17.4;

Accept any number of fours after the decimal point.

1

- (d)
1. Thicker medulla means a longer loop (of Henle);
 2. (The longer the loop of Henle means) **increase** in sodium ion concentration (in medulla)

OR

(The longer the loop of Henle means) sodium ion gradient maintained for **longer** (in medulla)

OR

(The longer the loop of Henle means) **more** sodium ions are moved out (into medulla);

Must have idea of increase/longer/more

3. (Therefore) water potential gradient maintained (for longer), **so** more water (re)absorbed (from loop and collecting duct);

OR

More water is (re)absorbed **from** the loop (of Henle) / collecting duct **by** osmosis;

*Reject water being reabsorbed **into** the loop of Henle*

Direction is important

Accept Ψ for water potential

3

[8]

Q3.

- (a) 1. Affects water potential (of blood/body);
Accept Ψ for water potential
2. Affects volume of urine (produced/removed);
- 2
- (b) 1. Furosemide **and** CVT more effective than placebo/control/C
OR
Furosemide more effective (than CVT);
Accept both (drugs)/A and B more effective than placebo/control/C
2. Correct reference to a significant increase/difference as SD's do not overlap;
- 2
- (c) Lower volume of blood;
- 1
- (d) 1. Water potential of filtrate/tubule decreased;
Accept correct reference to water potential gradient
Accept maintains low water potential.
Accept nephron for filtrate/tubule.
2. Less water (reabsorbed) by osmosis (from filtrate/tubule);
Accept nephron for filtrate/tubule.
Accept no water (reabsorbed) for 'less'
Accept (more) water (absorbed) by osmosis (into filtrate/tubule)
3. Collecting duct (is where osmosis occurs);

*Accept proximal convoluted tubule or distal convoluted tubule or (descending) loop of Henle
Ignore PCT, DCT.*

- 3
- (e) Accept answers in the range 33840 to 34680; 1
- [9]**

Q4.

- (a) Water is also reabsorbed 1
- (b) 1. Concentration rises in descending limb because sodium ions enter and water lost;
2. Concentration falls in ascending limb because sodium ions (and chloride) ions actively removed;
3. But water remains (in ascending limb) because its walls are impermeable (to water). 3
- (c) 1. Concentration rises in collecting duct because it loses water by osmosis;
2. ADH increases permeability (of walls of collecting duct) to water. 2
- [6]**

Q5.

21–25	Extended Abstract Generalised beyond specific context	<p>Response shows holistic approach to the question with a fully integrated answer which makes clear links between several different topics and the theme of the question.</p> <p>Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained.</p> <p>No significant errors or irrelevant material.</p> <p>For top marks in the band, the answer shows evidence of reading beyond specification requirements.</p>
16–20	Relational Integrated into a whole	<p>Response links several topics to the main theme of the question, to form a series of interrelated points which are clearly explained.</p> <p>Biology is fundamentally correct A-level content and contains some points which are detailed, though there may be some which are less well developed, with appropriate use of terminology.</p>

		Perhaps one significant error and, or, one irrelevant topic which detracts from the overall quality of the answer.
11–15	Multistructural Several aspects covered but they are unrelated	Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question. Biology is usually correct A-level content, though it lacks detail. It is usually clearly explained and generally uses appropriate terminology. Some significant errors and, or, more than one irrelevant topic.
6–10	Unistructural Only one or few aspects covered	Response predominantly deals with only one or two topics that relate to the question. Biology presented shows some superficial A-level content that may be poorly explained, lacking in detail, or show limited use of appropriate terminology. May contain a number of significant errors and, or, irrelevant topics.
1–5	Unfocused	Response only indirectly addresses the theme of the question and merely presents a series of biological facts which are usually descriptive in nature or poorly explained and at times may be factually incorrect. Content and terminology is generally below A-level. May contain a large number of errors and, or, irrelevant topics.
0		Nothing of relevance or no response.

Commentary on terms and statements in the levels mark scheme

The levels mark scheme for the essay contains a number of words and statements that are open to different interpretations. This commentary defines the meanings of these words and statements in the context of marking the essay. Many words and statements are used in the descriptions of more than one level of response. The definitions of these remain the same throughout.

Levels mark scheme word/statement	Definition
Holistic	Synoptic, drawing from different topics (usually sections of the specification)
A fully integrated answer which makes clear links between several different topics and the theme of the question	All topics relate to the title and theme of the essay; for example, explaining the biological importance of a process. When considering, for example, the importance of a process, the explanation must be at A-level

	<p>standard.</p> <p>'Several' here is defined as at least four topic areas from the specification covered. This means some sentences, not just a word or two. It does not mean using many examples from one topic area.</p>
<p>Biology is detailed and comprehensive A-level content, uses appropriate terminology, and is very well written and always clearly explained.</p>	<p>Detailed and comprehensive A-level content is the specification content.</p> <p>Terminology is that used in the specification.</p> <p>Well written and clearly explained refers mainly to biological content and use of terminology. Prose, handwriting and spelling are secondary considerations. Phonetic spelling is accepted, unless examiners are instructed not to do so for particular words; for example, glucagon, glucose and glycogen.</p>
<p>No significant errors or irrelevant material.</p>	<p>A significant error is one which significantly detracts from the biological accuracy or correctness of a described example. This will usually involve more than one word.</p> <p>Irrelevant material is several lines (or more) that clearly fails to address the title, or the theme of the title.</p>
<p>For top marks in the band, the answer shows evidence of reading beyond specification requirements.</p>	<p>An example that is relevant to the title and is not required in the specification content. The example must be used at A-level standard.</p>
<p>Response mostly deals with suitable topics but they are not interrelated and links are not made to the theme of the question.</p>	<p>Not addressing the biological theme of the essay (e.g. importance) at <u>A-level standard</u>.</p>

The ways in which water and the regulation of water content are important to organisms.

In order to fully address the question and reach the highest mark bands students must also include at least five topics in their answer, to demonstrate a synoptic approach to the essay.

Specification reference	Topic area
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3.1.1	Monomers and polymers – carbohydrates – lipids – proteins
3.1.7	Water
3.2.3	Transport across membranes – osmosis – water potentials
3.3.2	Gas exchange – plants
3.3.2	Gas exchange – fish
3.3.2	Gas exchange – insects
3.3.4.1	Mass transport in animals - blood – circulation
3.3.4.1	Mass transport in animals – tissue fluid and formation
3.3.4.2	Mass transport in plants – transpiration stream
3.3.4.2	Mass transport in plants – translocation
3.5.1	Photosynthesis
3.5.4	Nutrient cycles – leaching and eutrophication
3.6.1	Growth responses in plants
3.6.4	Homeostasis
3.6.4.3	Control of blood and water potential

In order to fully address the question and reach the highest mark bands students must also include at least four topics in their answer, to demonstrate a synoptic approach to the essay.

Students may be able to show the relevance of other topics from the specification.

Note, other topics from beyond the specification can be used, providing they relate to the title and contain factually correct material of at least an A-level standard. Credit should not be given for topics beyond the specification which are below A-level standard.

[25]

Q6.

(a) Hypothalamus.

1

(b) 1. Water potential of blood will decrease;
2. Water moves from osmoreceptor into blood by osmosis.

2

(c) 1. Permeability of membrane / cells (to water) is increased;
2. More water absorbed from / leaves distal tubule / collecting

- duct;
3. Smaller volume of urine;
4. Urine becomes more concentrated.

4

(d) 115.2 / 115.3 (cm³ minute⁻¹).

1

- (e) Any **two** of the following for 1 mark:
Muscle / body mass
Ethnicity
Exercise
Kidney disease – do not accept 'health'.

1

[9]