Excretory Products and their Elimination

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. Animals that excrete mainly ammonia are called:
(a) uricotelic **(b)** guanotelic **(c)** ureotelic **(d)** ammonotelic

2. The kidneys filter 114 mL of plasma a minute. How much filtrate is formed in a day?
(a) 164.16 L **(b)** 6.84 L **(c)** 1,641.6 L **(d)** 2.74 L

3. If 190 L of filtrate is formed in a day and 1.8 L of urine is passed, the percentage of filtrate reabsorbed is:
(a) 94.05% **(b)** 90% **(c)** 99.05% **(d)** 0.95%

4. Aquatic amphibians are mainly:
(a) uricotelic **(b)** guanotelic **(c)** ureotelic **(d)** ammonotelic

5. Antennal (green) glands are the excretory structures of:
(a) prawns and other crustaceans **(b)** cockroaches and other insects
(c) earthworms **(d)** vertebrates

6. Which part of the kidney reabsorbs nearly all nutrients and 70–80% of electrolytes and water?
(a) Proximal convoluted tubule **(b)** Juxtaglomerular apparatus
(c) Glomerulus **(d)** Collecting duct

7. Which substance increases Na^+ and water reabsorption in the distal parts of the tubule?
(a) aldosterone **(b)** renin
(c) angiotensin II **(d)** ADH (vasopressin)

8. Assertion (A): Aquatic amphibians excrete mainly urea.
Reason (R): The nitrogenous waste depends on the water available: ammonia needs most water to remove, urea less, and uric acid the least.
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. What is the difference between ammonotelism, ureotelism and uricotelism?

10. The GFR of a person is 130 mL per minute, and they pass 2 L of urine a day. Find the filtrate formed in a day and the percentage reabsorbed.

11. An adult excretes about 25 g of urea a day. How much is that in 30 days?

12. What is the main nitrogenous waste of land snails? Why is it suited to them?

13. In which animals are kidneys the excretory structures?

14. Name the part of the kidney that releases renin when GFR falls.

15. Name the substance that converts angiotensinogen to angiotensin I.

16. Name the condition: ketone bodies in the urine.

Section C — Word problems — 4 × 4 = 16 marks

17. Describe the structure of the human kidney and the nephron.

18. A person's kidneys filter 125 mL of plasma a minute and they pass 2 L of urine a day. (a) How much filtrate is formed in a day? (b) What volume is reabsorbed, and what percentage is that? (c) Name the part of the nephron that reabsorbs most of the filtrate. (d) Which hormone increases water reabsorption when the body is short of water?

19. Classify these animals as ammonotelic, ureotelic or uricotelic, and explain the link with their habitats: land snails, bony fishes, mammals, birds.

20. Describe the role of each part in urine formation: descending limb of the loop of Henle, juxtaglomerular apparatus, glomerulus.

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Answer key

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Q	Answer	Working
1	**(d) ammonotelic**	most bony fishes, aquatic amphibians and aquatic insects
2	**(a) 164.16 L**	114 × 1,440 minutes
3	**(c) 99.05%**	(190 − 1.8) ÷ 190 × 100
4	**(d) ammonotelic**	they excrete ammonia
5	**(a) prawns and other crustaceans**	—
6	**(a) Proximal convoluted tubule**	—
7	**(a) aldosterone**	—
8	**(d) A is false, but R is true.**	A is false: they are ammonotelic. R is true.
9	**Ammonotelic animals excrete ammonia, which is very toxic and needs a lot of water (bony fishes). Ureotelic animals excrete urea, less toxic (mammals, land amphibians). Uricotelic animals excrete uric acid as a paste or pellet with very little water (birds, reptiles, land snails, insects).**	—
10	**187.2 L; 98.93%**	130 × 1,440 mL; (187.2 − 2) ÷ 187.2 × 100
11	**750 g (0.75 kg)**	25 × 30
12	**Uric acid (uricotelic); it is nearly insoluble and needs very little water, saving water**	—
13	**Vertebrates**	—
14	**Juxtaglomerular apparatus**	—
15	**renin**	—
16	**Ketonuria**	—
17	**The kidneys are reddish-brown, bean-shaped organs on either side of the backbone; each has an outer cortex and inner medulla with medullary pyramids projecting into calyces, and about a million nephrons. Each nephron has a glomerulus (a tuft of capillaries from the afferent arteriole, leaving by the efferent arteriole) enclosed in Bowman's capsule, followed by the PCT, the hairpin-shaped loop of Henle, and the DCT, which drains into a collecting duct.**	—

Q	Answer	Working
18	**(a) 180 L; (b) 178 L, 98.89%; (c) the proximal convoluted tubule; (d) ADH (vasopressin)**	125 × 1,440 mL
19	**land snails: uricotelic; bony fishes: ammonotelic; mammals: ureotelic; birds: uricotelic. Ammonia needs much water to remove; urea less; uric acid very little, so it suits animals that must save water.**	—
20	**descending limb of the loop of Henle: is permeable to water but almost impermeable to electrolytes; juxtaglomerular apparatus: releases renin when GFR falls; glomerulus: filters blood under pressure (ultrafiltration)**	—

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