IGCSE BIOLOGY • EXERCISE SHEET

13.1 Excretion in humans

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS urea 尿素 • nephron 肾单位 • ions 离子 • amino acids 氨基酸 • liver 肝脏

Objective

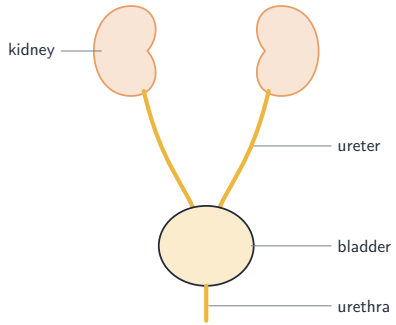
Build the skills to answer exam questions on **excretion in humans** 人体排泄 — the wastes removed, the **urinary system** 泌尿系统, the **nephron** 肾单位, and **urea** 尿素 from the liver.

You must be able to:

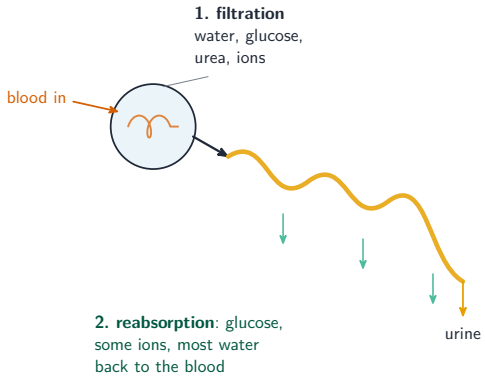
- define excretion and name the main wastes
- state the urine pathway and the role of the kidney
- describe filtration and reabsorption in a nephron; explain how urea is made

1 Worked examples

■ Kidney and nephron



Urine path: kidney → ureter → bladder → urethra



Glomerulus filters; the nephron reabsorbs all glucose, some ions and most water — what's left is urine

- **urea** is made in the **liver** from excess amino acids (deamination); it is toxic.

■ Homeostasis: the loop, and the two examples

Homeostasis 稳态 is the maintenance of a constant internal environment. Every example follows the same **negative feedback** 负反馈 loop:

a change from the norm → receptor detects it → coordinator → effector acts → the change is reverse

Temperature control. The skin and the hypothalamus detect the change; the effectors are in the skin and the muscles.

Too HOT	Too COLD
sweat glands release more sweat; its water **evaporates**, taking heat from the skin	little sweat produced
vasodilation 血管舒张 — arterioles near the surface widen, so more blood flows near the surface and more heat is lost by radiation	**vasoconstriction** 血管收缩 — arterioles narrow, so less blood flows near the surface and less heat is lost
hairs lie flat	hairs stand up, trapping an insulating layer of air; **shivering** — muscles contract rapidly, and respiration in them releases heat

△ Blood vessels **do not move up and down** in the skin. It is the arterioles that widen or narrow — saying the capillaries "rise to the surface" is a specific, commonly penalised error.

Blood glucose control. Both hormones come from the **pancreas** 胰腺.

- Glucose **too high** → the pancreas releases **insulin** 胰岛素 → the liver converts glucose to **glycogen** 糖原 for storage, and cells take up more glucose → the level falls.
- Glucose **too low** → the pancreas releases **glucagon** 胰高血糖素 → the liver converts glycogen back to glucose → the level rises.

Type 1 diabetes 糖尿病 is caused by the pancreas not producing enough insulin, so blood glucose stays high; it is treated with insulin injections and by controlling diet and exercise.

Worked example. Explain what happens after a large sugary meal. Blood glucose rises above the norm; the pancreas detects this and releases insulin; insulin makes the liver convert glucose into glycogen and makes body cells take up more glucose; blood glucose falls back towards the norm; insulin release then decreases — which is what makes the loop negative feedback.

2 Practice

2.1 Name the two main waste products removed by excretion. [2]

2.2 State the pathway of urine from the kidney to outside the body. [2]

2.3 Name the organ that releases insulin, and state the effect of insulin on the liver. [2]

2.4 Explain how sweating cools the body. [2]

2.5 State what is meant by negative feedback. [2]

3 Exam-style questions

3.1 Urea is made in the: [1]

A kidney
B liver
C bladder
D lungs

3.2 A nephron cleans the blood.

(a) Name the two main processes in a nephron. [2]

(b) State which substances are reabsorbed into the blood. [2]

3.3 Explain why urea must be excreted from the body. [1]

3.4 A person exercises hard on a hot day, then rests and eats a large meal.

(a) Describe two ways the skin responds while the person is too hot, and explain how each reduces body temperature. [4]

(b) Explain why shivering raises body temperature when the person cools down afterwards. [2]

(c) After the meal, blood glucose rises. Describe the response that returns it to normal, naming the organ, the hormone and the storage compound. [4]

(d) State the hormone released when blood glucose falls too low, and describe its effect. [2]

(e) Explain why this control system is described as negative feedback. [2]