EXAM PAPERS PRACTICE

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and

# 11.3 The Kidney & Osmoregulation

Hard

# BIOLOGY

## IB HL

EXAM PAPERS PRACTICE

# 11.3 The Kidney & Osmoregulation

## Question Paper

| | |
|---|---|
| Course | DP IB Biology |
| Section | 11. Animal Physiology (HL Only) |
| Topic | 11.3 The Kidney & Osmoregulation |
| Difficulty | Hard |



**Time allowed:** 10

**Score:** /5

**Percentage:** /100

## Question 1

The following statements describe the events taking place in the malpighian tubules of insects.

I.
The tubules drain into the gut and nitrogenous waste is converted into uric acid.
II.
Uric acid leaves the body along with faeces.
III.
Water moves into the tubules by osmosis.
IV.
Nitrogenous waste and salts move from the haemolymph into the malpighian tubules.
V.
Useful ions are reabsorbed.

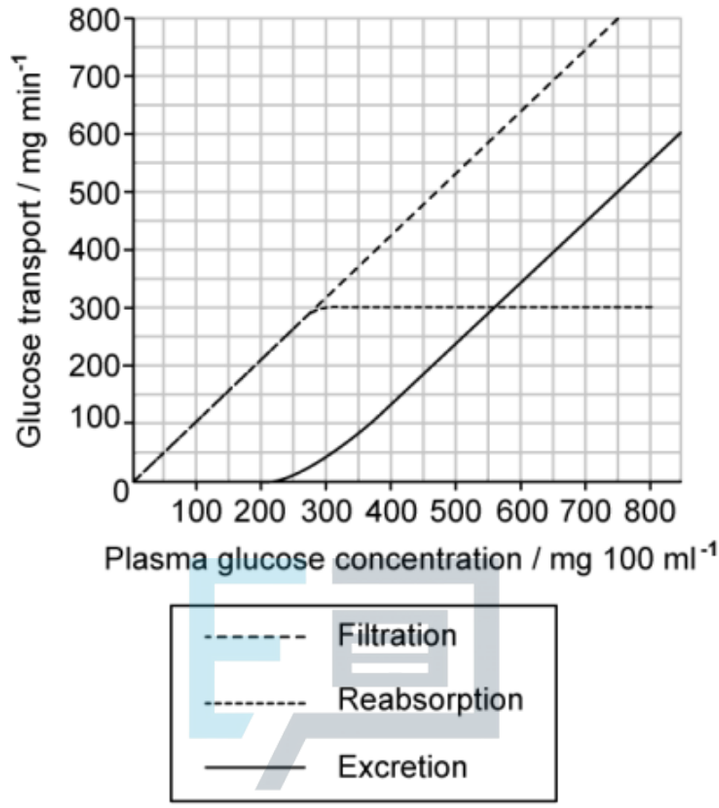
Which row correctly shows the order in which these events occur?

| | First | → | → | → | Last |
|---|---|---|---|---|---|
| **A.** | IV | I | V | III | II |
| **B.** | III | IV | I | V | II |
| **C.** | IV | III | I | V | II |
| **D.** | IV | V | III | II | I |

**[1 mark]**

## Question 2

The graph below shows the filtration, reabsorption, and excretion of glucose by the kidneys at different plasma glucose concentrations. Note that a healthy blood glucose concentration is around 100 mg 100 $ml^{-1}$.






Which of the following is **not** a correct conclusion from the graph?

A. The maximum rate at which the kidneys can reabsorb glucose is 300 mg $min^{-1}$.

B. Glucose in the urine can be normal for a healthy individual.

C. At plasma glucose concentrations higher than 300 mg 100 $ml^{-1}$:

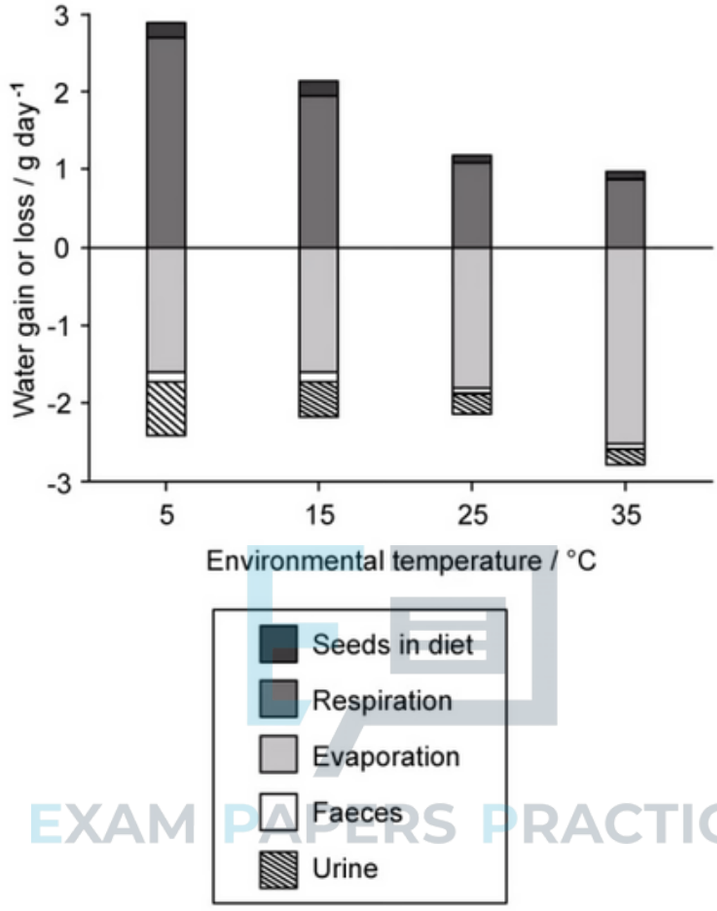
filtration rate - reabsorption rate = excretion rate.

D. At a plasma glucose concentration of around 200 mg 100 $ml^{-1}$ the glucose transporters in the proximal convoluted tubule become fully saturated.

**[1 mark]**

## Question 3

The graph below shows the effect of environmental temperature on water balance in kangaroo rats. Kangaroo rats are nocturnal, desert-living rodents that spend the daylight hours in underground burrows. Day-time temperatures in the underground burrows can reach 40 °C.






Which of the statements relating to kangaroo rats are correct?

I.
Kangaroo rats can survive in their natural habitat on a diet of seeds alone.

II.
Kangaroo rats are able to minimise water loss in urine due to their thick medullary region.

III.
Kangaroo rats lose less than 0.25 g $day^{-1}$ of water in their faeces.

IV.
Oxidative phosphorylation is an important source of water for kangaroo rats.

A. I, II, and III only.

B. I, II, III, and IV.

C. II and III only.

D. II, III, and IV only.

**[1 mark]**

## Question 4

Nephrogenic syndrome of inappropriate antidiuresis (NSIAD) is a rare condition that can be caused by a gain-of-function mutation in the gene that codes for ADH receptor proteins.

Which of the following will **not** be true for sufferers of NSIAD?

A. The kidney cells will respond to ADH even when ADH levels are low.

B. The body cells will swell up.

C. The kidney cells will have more water transport proteins in their cell surface membranes than normal.

D. Large amounts of dilute urine will be produced.

**[1 mark]**

## Question 5

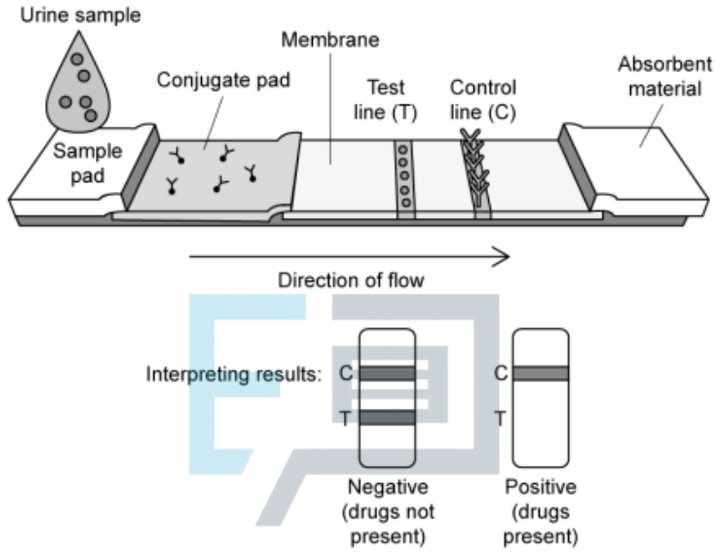
The image below shows a test strip used for drugs testing. Unlike the hormone in a pregnancy test, the substances tested for in this kind of drugs test are too small to bind to more than one antibody at the same time. This type of test is known as a competitive binding assay.

The components of the test contain the following:

Conjugate pad - antibodies complementary to the drug being tested for. The antibodies are attached to a coloured bead.

Test line - bound molecules of the drug being tested for.

Control line - bound antibodies complementary to the antibody from the conjugate pad.






Which of the following correctly explains the appearance of a **positive** result?

A. The drug binds to antibodies on the conjugate pad, preventing them from binding to the test line.

B. The antibodies from the conjugate pad bind to the test line, causing the beads to form a visible band.

C. Unbound antibodies from the conjugate pad bind to antibodies on the control line, forming a visible band.

D. The drug binds to antibodies on the conjugate pad and to antibodies on the test line.

**[1 mark]**