



CHEMISTRY ONLINE
— **TUITION** —

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BIOLOGY

ORGANISMS RESPOND TO CHANGES IN ENVIRONMENTS

Level & Board	AQA (A-LEVEL)
TOPIC:	OSMOREGULATION
PAPER TYPE:	QUESTION PAPER - 1
TOTAL QUESTIONS	7
TOTAL MARKS	45

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Osmoregulation - 1

1.

Specialized cells called osmoreceptors react to variations in the blood water potential.

(a) Identify where osmoreceptors are located in a mammal body. **(1)**

(b) An osmoreceptor cell volume shrinks when a person is dehydrated. Describe your reasoning. **(2)**

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(c) The hormone ADH may be secreted in response to osmoreceptor stimulation. Describe and clarify how the kidneys production of urine is impacted by the secretion of ADH. **(4)**

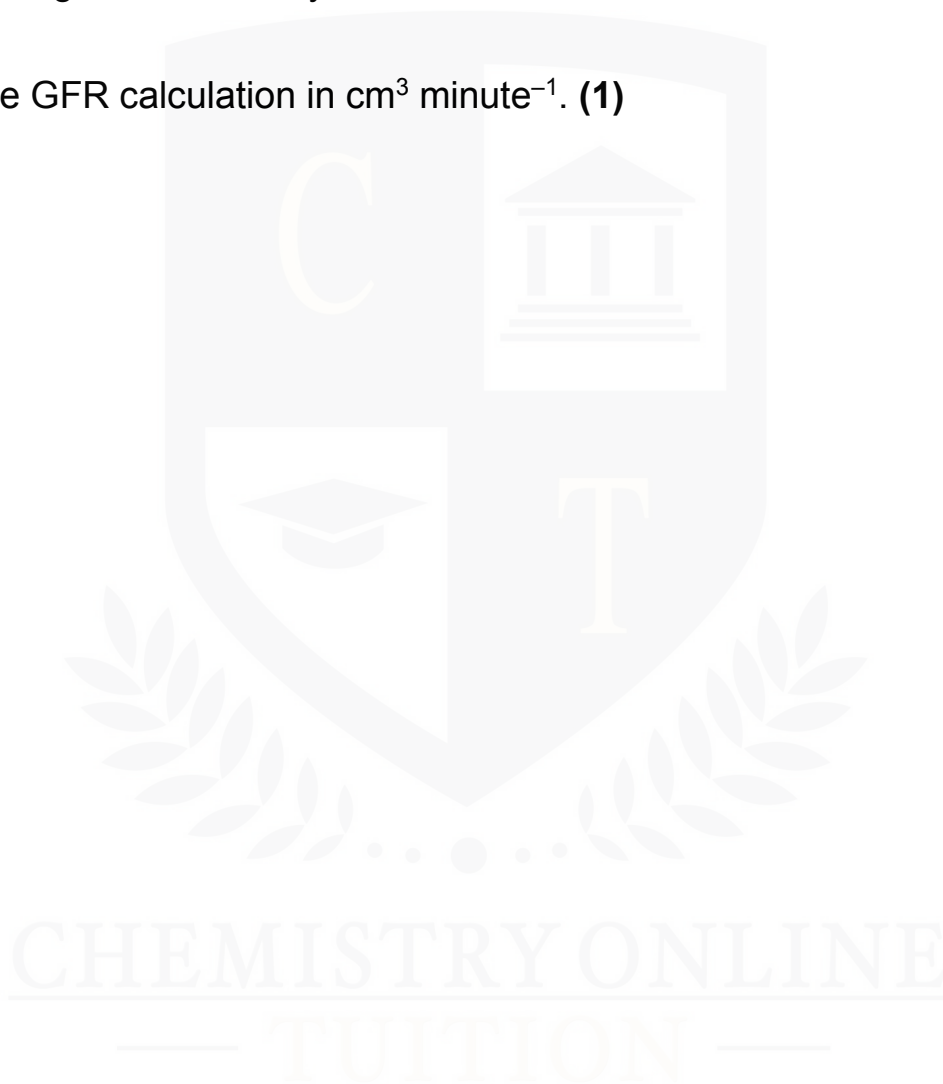


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2.

The rate at which the kidneys eliminate a chemical from the blood known as creatinine indicates how well they filter the blood. The glomerular filtration rate (GFR) is the pace at which they filter the blood. A person urine contained 1660 mg of creatinine in a 24-hour period. The blood flowing into his kidneys had a consistent level of creatinine (0.01 mg cm^{-3}).

(a) Do the GFR calculation in $\text{cm}^3 \text{ minute}^{-1}$. **(1)**



(b) The breakdown product of creatine, which is present in muscular tissues, is creatinine. Name two variables that, besides age and gender, could impact the blood creatinine concentration. **(1)**

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3.

The kidneys of a mammal filter out urea from the blood and concentrate it in the filtrate.

(a) Explain the process of extracting urea from blood. **(2)**



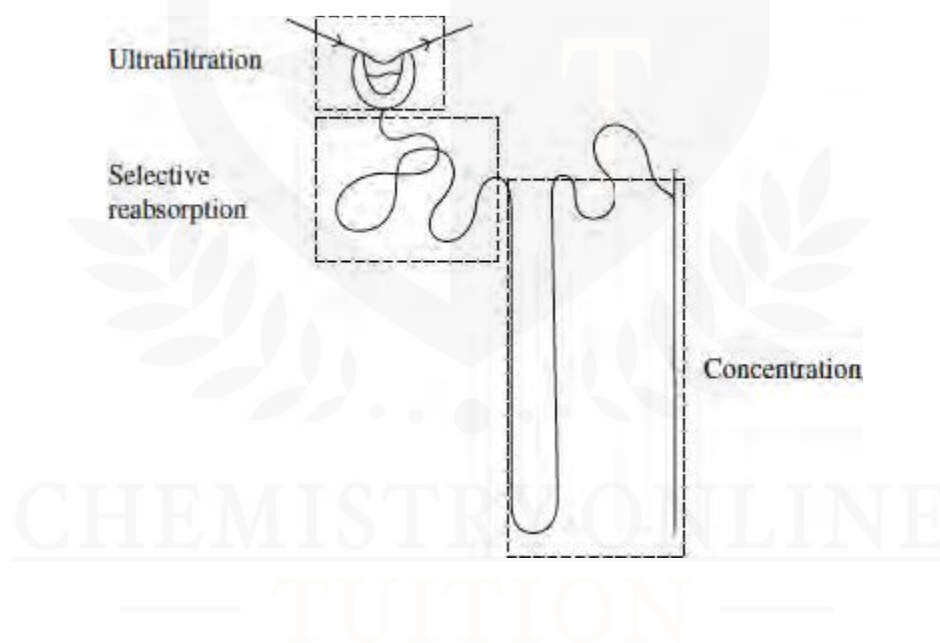
(b) Describe how the filtrate urea concentration is achieved. **(3)**

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4.

The production of urine in a mammalian kidney involves three processes. These three processes are concentration, selective reabsorption, and ultrafiltration. The graphic illustrates the locations of various nephron processes.



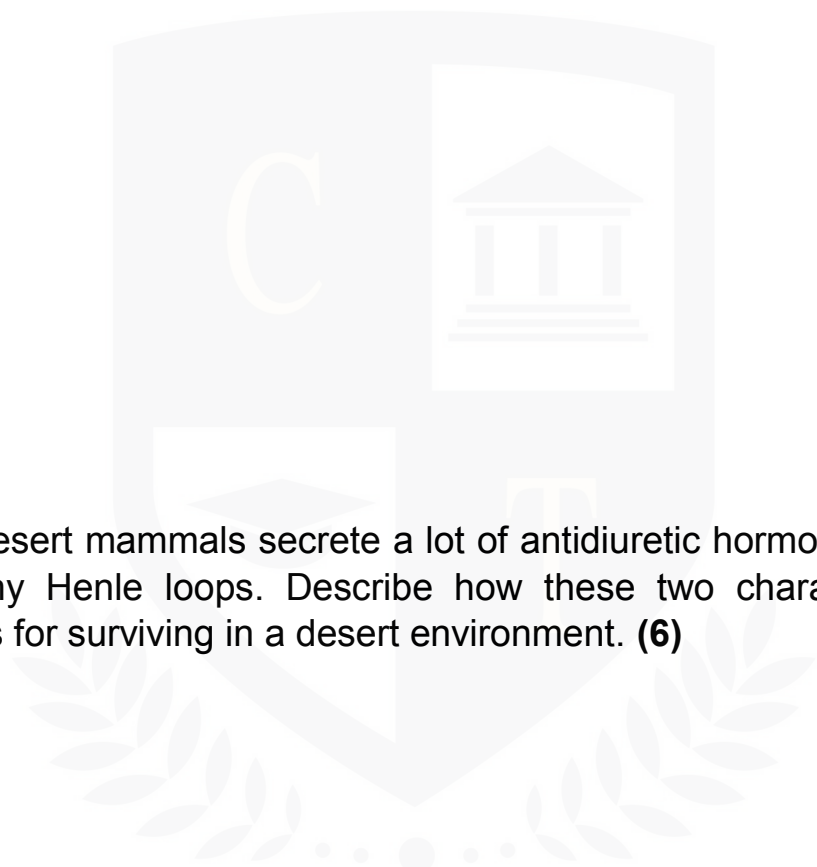
(a) Explain how glomerular filtrate is made by ultrafiltration. (5)

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(b) Insulin secretion is absent in certain diabetics. Describe the impact of low insulin on a non-insulin secreting person kidney ability to reabsorb glucose.

(4)



(c) Some desert mammals secrete a lot of antidiuretic hormone (ADH) and have lengthy Henle loops. Describe how these two characteristics are adjustments for surviving in a desert environment. **(6)**

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5.

(a) A person with diabetes and a person without the disease consumed the same quantity of glucose. An hour subsequently, the diabetic blood glucose concentration was greater than the non-diabetic. Describe your reasoning.

(3)

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6.

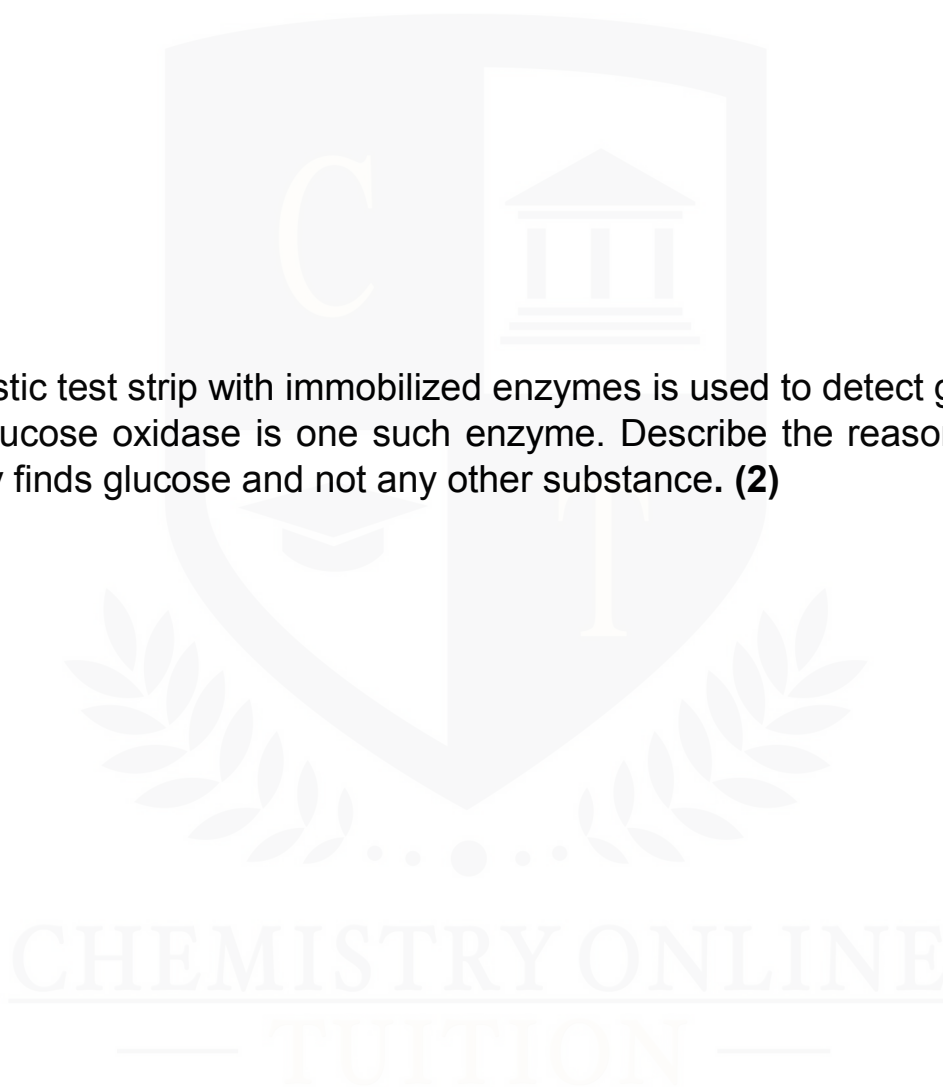
(a) A person without diabetes does not have glucose in their urine. Describe your reasoning. **(3)**



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(b) A diabetic may have glucose in their urine due to a high blood glucose content. Explain why. **(2)**

(c) A plastic test strip with immobilized enzymes is used to detect glucose in urine. Glucose oxidase is one such enzyme. Describe the reason the test strip only finds glucose and not any other substance. **(2)**



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(d) A diabetic produces more urine if his glomerular filtrate has a high content of glucose. Describe your reasoning. **(3)**



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(e) Urine containing blood plasma proteins is observed in certain types of renal disease. Which area of the nephron would have been harmed by the

illness for the urine to contain blood plasma proteins? Give an explanation for your response. **(3)**



7.

(a) A little creature found in deserts is the kangaroo rat. It rarely drinks and absorbs very little water from its diet. Its body temperature at its center is 38 °C.

Water is consumed by the kangaroo rat by eating and drinking. Explain the kangaroo rat different means of obtaining water. **(2)**

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