

AQA, OCR, Edexcel

A Level

A Level Biology

The Kidney Questions

Name:

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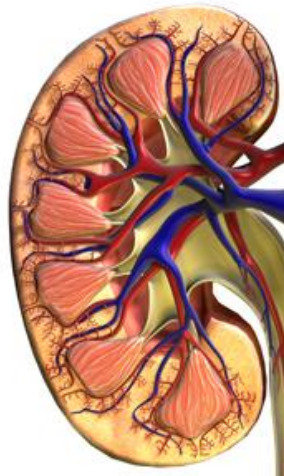
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Total Marks: /34

The Kidneys

The function of the kidneys is to remove waste products from the blood and regulate the water fluid levels of the body.

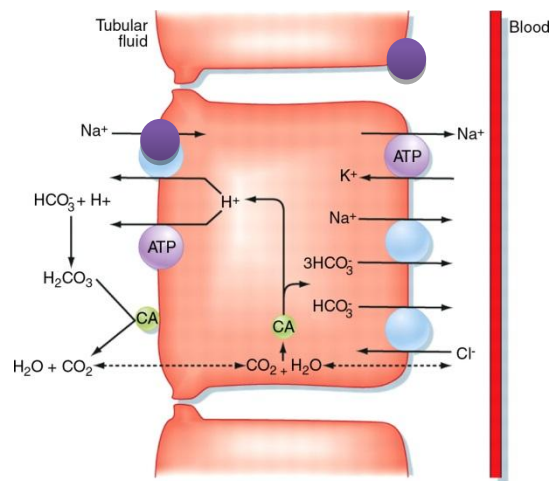
1. Urea is a waste product produced by the liver that is excreted by the kidneys in the form of urine. The entire blood supply passes through the kidney via the renal artery and renal vein to ensure that waste products do not build up in the blood.
 - a) The kidney is made up of a number of different sections in which different processes take place to ultimately allow the formation of urine and the removal of waste products. The diagram below shows the anatomical structure of the kidney.



- i) Describe how blood enters the glomerulus from the renal artery. (3 marks)
- ii) Name the processes that occur in the kidney? (2 marks)
- iii) Describe the process of ultrafiltration. (4 marks)
- iv) How does the afferent arteriole create high blood pressure in the glomerulus? (1 mark)
- v) What is the role of the basement membrane in the cells of the renal capsule? (1 mark)

2. The next stages of kidney function involve reabsorption of molecules from the filtrate back into the blood. Reabsorption in the proximal convoluted tubules (PCT) occurs first. Over 80% of the filtrate is absorbed back into the blood at the PCT.

- a) i) Why is it important that this process of reabsorption occurs? (1 mark)
- b) The diagram below shows the cells in a section of the proximal convoluted tubule.

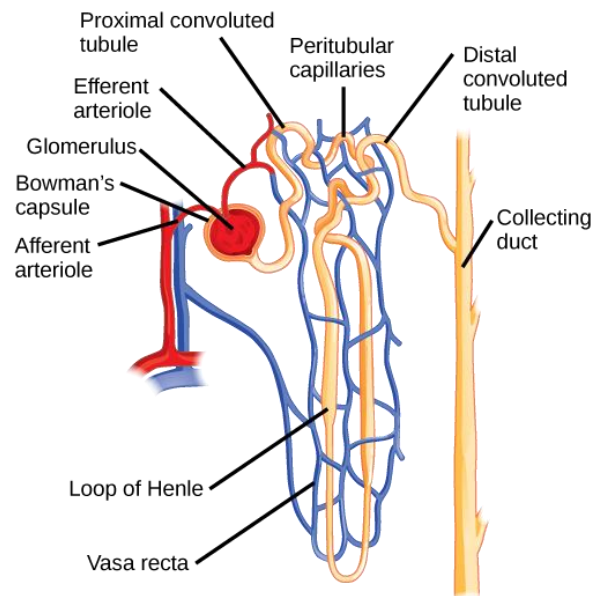


- i) How is the structure of the PCT adapted for its function? (2 marks)
- ii) Why is ATP required in the PCT? (1 mark)
- iii) Suggest why some urea is able to make its way back into the blood from the Kidney? (1 mark)

c) The Loop of Henle is involved in the next stage of kidney function. The function of the Loop of Henle is to recover water and sodium chloride from the urine.

i) The Loop of Henle has a counter-current multiplier mechanism. What is the advantage of this mechanism? (1 mark)

ii) Explain, using the diagram below, the processes that occur in the Loop of Henle. (6 marks)



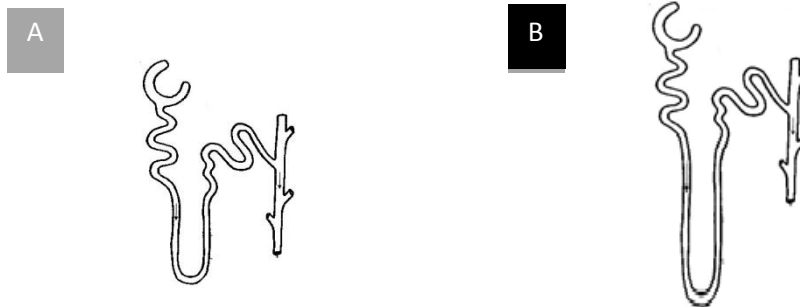
d) The collecting duct is the final place in the kidney that the filtrate passes through before excretion occurs. Therefore it is the final site where water can be reabsorbed into the blood. Water reabsorption in the collecting duct is controlled by a hormone released from the posterior pituitary gland.

i) What is the name of this hormone and how does it affect the collecting duct? (2 mark)

ii) Describe the processes occurring in the body of an individual who is well hydrated in terms of kidney function. (5 marks)

3. Organisms that live in different conditions around the world are adapted to control their water loss.

a) The diagram below shows the structure of a kidney nephron found in two different species of rat; one is from the desert dwelling Kangaroo Rat and one is from the Brown Rat commonly found in the UK.



i) Identify which of the above nephron diagrams belongs to the desert rat and explain how its structure is adapted to its function. (4 marks)