

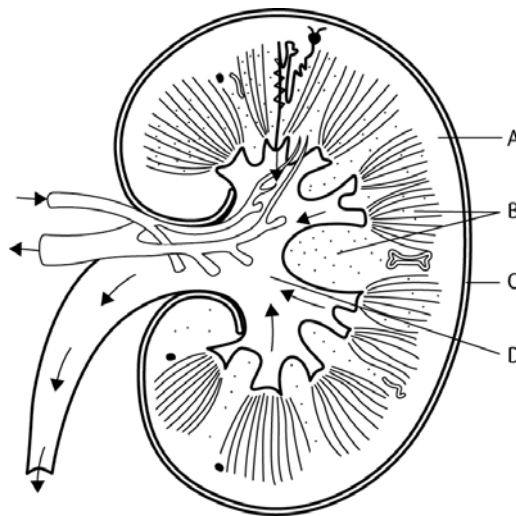
Exemplar exam question – Chapter 11, *Human health and physiology II***Structured questions**

The question below requires a good knowledge of both the structure and function of the kidney as well as the ability to suggest medical conditions that might affect its functioning.

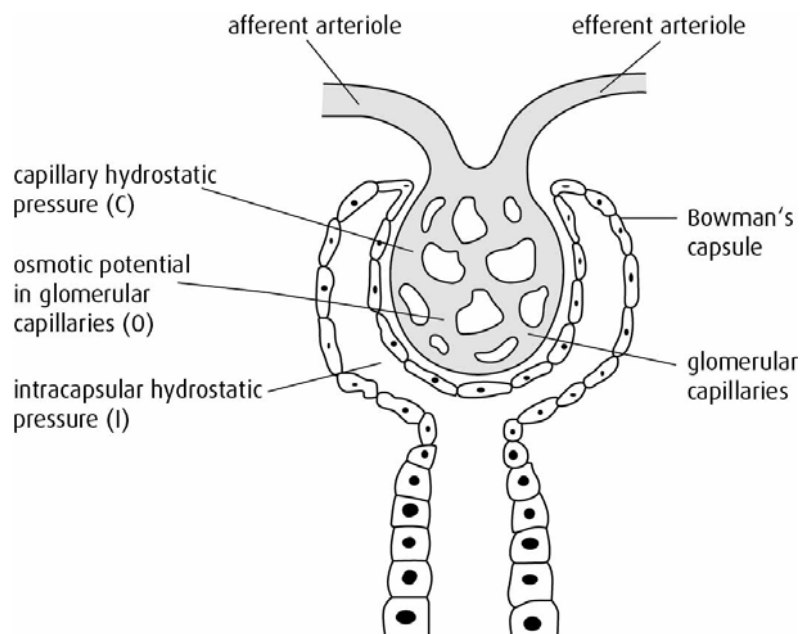
Exemplar question

- a** Label the structures **A–D** shown in the diagram below of a human kidney.

(4)



- b** The diagram below shows the structure of the Bowman's capsule and associated blood vessels.



- i** Explain the importance of the difference in diameters of the afferent and efferent arterioles. (2)
 - ii** Write an equation that shows how the three forces (I, O and C) shown in the diagram interact to produce filtration pressure. (1)
 - iii** If blood pressure in the glomerulus falls, renal function will be impaired. Suggest **two** situations or medical conditions when this might happen. (2)
- c** The cells of the proximal convoluted tubule have microvilli and many mitochondria. What is the significance of these structures? (4)

Student response

- a** A = cortex, B = medulla, C = enclosing membrane, D = pelvis region
- b**
 - i** The diameter of the afferent arteriole is greater than that of the efferent arteriole. This produces high blood pressure in the glomerulus, which is important to allow ultrafiltration to take place.
 - ii** $I \leq O + C$
 - iii** Blood pressure might fall if the person lost a lot of blood in an accident or had anorexia and had few proteins in the blood to produce osmotic pressure in the blood.
- c** Microvilli provide a large surface area for substances to be absorbed or exchanged and mitochondria are always present when energy is needed. This suggests that the cells in the tubule are actively absorbing substances from the tubule. Energy for active uptake comes from the mitochondria and the efficiency of absorption is increased by the villi.

Commentary

This is a very good answer. The student has provided just the right amount of information, using technical terms correctly. The equation in part **ii** shows that the student understands that the inward pressure must exceed the pressure from inside the tubule so that small molecules can enter it.

Total marks awarded: 8 out of 8