22 **(a)** Fig. 22.1, **on the insert**, is a cross section of part of the cortex of a mammalian kidney.

(i) Which letter identifies the region with the highest hydrostatic pressure?

..... **[1]**

(ii) Which **two** letters identify regions that **do not** contain plasma proteins?

..... **[1]**

(b) Studies of the cell surface membranes of the **distal** convoluted tubule have provided the following evidence:

- Sodium-potassium pumps:
  - move potassium ions from the blood to the tubule fluid
  - move sodium ions from the tubule fluid to the blood
  - use ATP in these processes.

- Sodium-calcium co-transport proteins:
  - move calcium ions from the tubule fluid to the blood
  - move sodium ions into the tubule fluid
  - use the electrochemical gradient of sodium ions to drive this process.

(i) Using this information and your own knowledge, compare the processes occurring in the **proximal** and **distal** convoluted tubules.

.....

.....

.....

.....

.....

.....

..... **[3]**

(ii) Nephrogenic diabetes insipidus is a disease of the kidney that affects the regulation of water potential in the blood. One cause is lithium poisoning. Lithium ions enter the kidney tubules through sodium channels.

This prevents the cells of the collecting duct from responding to ADH in the blood.

State and explain **one** symptom you would expect to observe as a result of nephrogenic diabetes insipidus.

.....

.....

.....

.....

..... **[2]**

(c) Fig. 22.2 shows a podocyte from the kidney. The many gaps between the microscopic processes form fenestrations in the Bowman's capsule.

Fig. 22.2

(i) Explain why podocytes are usually unable to undergo mitosis.

.....

.....

.....

.....

.....

.....

..... **[3]**

(ii) Studies show that after damage by infection or injury, it is possible for nephron tissues to be regenerated. Adult stem cells are involved in this process.

What features of adult stem cells make them suitable for regeneration of tissues in the kidney?

.....

.....

.....

.....

..... **[2]**

END OF QUESTION PAPER