**1.** The diagram below shows part of the glomerulus from a kidney as seen under the electron microscope. Which part is the basement membrane?



(Total 1 mark)

**2.** Where in the kidney does ultrafiltration take place?

A. Glomerulus

B. Loop of Henlé

C. Proximal tubule

D. Collecting ducts

(Total 1 mark)

**3.** (a) Draw a labelled diagram of a nephron.

(3)

(b) Explain the process of ultrafiltration in the kidney.

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(3)

(c) Compare the composition of blood plasma in the renal artery with the composition of the glomerular filtrate.

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(2)

(Total 8 marks)

**4.** The proximal convoluted tubule is a part of the nephron (kidney tubule). Its function is selective reabsorption of substances useful to the body.

(a) Outline how the liquid that flows through the proximal convoluted tubule is produced.

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(2)

(b) (i) Water and salts are selectively reabsorbed by the proximal convoluted tubule. State the name of **one** other substance that is selectively reabsorbed.

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(1)

(ii) State the names of the processes used to reabsorb water and salts.

water ............................................. salts ....................................

(2)

The drawing below shows the structure of a cell from the wall of the proximal convoluted tubule.



(c) The actual size of the cell is shown on the diagram. Calculate the linear magnification of the drawing. Show your working.

Answer .................................................................................................................................

(2)

(d) Explain how the structure of the proximal convoluted tubule cell, as shown in the diagram, is adapted to carry out selective re-absorption.

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(2)

(Total 9 marks)

**1.** C

**[1]**

**2.** A

**[1]**

**3.** (a) *For a diagram of a nephron, award* ***[1]*** *for every two of the following  structures clearly drawn and correctly labelled.*

glomerulus; Bowman’s capsule; proximal convoluted tubule; loop of Henle; ascending and descending both labeled; distal convoluted tubule; collecting duct; afferent arteriole / efferent arteriole; 3 max

(b) difference in diameter of efferent and afferent arteriole;

leads to blood in glomerulus at high pressure;

capillary wall is fenestrated / has pores / holes;

basement membrane has pores;

pores in basement membrane prevent large (protein)  molecules from leaving blood plasma / only allows passage of small molecules;

 passive process; 3 max

(c) (large) proteins in blood plasma but not in glomerular filtrate;

 all other substances equal in concentration; 2

**[8]**

**4.** (a) high pressure in afferent arterioles;

leads to ultrafiltration in the glomerulus / through fenestrated  capillaries in the glomerulus;

drains through the Bowman’s capsule to the proximal convoluted tubule; 2 max

(b) (i) glucose / amino acids 1

(ii) water by osmosis; salts by active transport / facilitated diffusion; 2

(c) magnification = ***or******or*** 4.9 cm scale bar represents 10 m; × 4900 (±200); 2 *Do not award the first mark if incorrect equations are set up such as 4.9 cm = 10* *m.*

(d) microvilli increase the surface area for absorption / active transport;

 mitochondria produce ATP for active transport; 2

**[9]**