Nephron structure and ultrafiltration

Student activity • observation and reasoning

YEAR 11 / LESSON 69 / BIOLOGY ONLY

The question

How is a small-solute filtrate separated from blood?

Use the supplied examples, record your reasoning and correct it using evidence.

Equipment

- Student booklet, paper models, pencil and ruler

Paper, modelling and written reasoning only. No chemicals or biological samples are handled.

Course coverage: Biology only: 2.74B–2.75B. Nephron and filtrate.

Plan, model or apparatus sketch

Draw and label the apparatus or biological model; identify one limitation.

Method and reasoning

Read the whole sequence before starting

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1. Label glomerulus, Bowman’s capsule, proximal and distal convoluted tubules, loop of Henle and collecting duct.

2. Trace blood through the glomerular capillaries and filtrate into the tubule as separate routes.

3. Explain pressure-driven filtration through the glomerular barrier.

4. Classify water, glucose, ions and urea as normally entering filtrate, while blood cells and most large plasma proteins remain in blood.

5. Explain why this stage is not a selective removal of only harmful substances: useful glucose is filtered too.

6. Evaluate a sieve analogy: it suggests size separation but does not represent living filtration layers, pressure control or all charge effects.

Cleanup

• Return models and keep the corrected work.

Record your evidence

Blank spaces are for your own work

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Reference and task data

Glomerular filtrate is formed from blood plasma under pressure. It normally contains water and small solutes, including glucose, ions and urea, but not blood cells or substantial large proteins. It is not yet the final urine. No biological fluid samples are used.

Example / trial	Observation / evidence	Explanation / limit
Evidence / comparison		
Explanation		
Limit / correction		

Show your calculations, labelled model or correction here.

Explain and evaluate

Use evidence and show calculation steps where relevant

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1. Where is the capillary tuft?

2. Where does filtrate first collect?

3. What drives filtration?

4. Name two useful filtered substances.

5. Why are blood cells normally retained?

6. Is initial filtrate the same as urine?