Inside the Nephron

Trace how blood becomes urine

HS-AP12-3 "Develop a model of the nephron to explore its structural components, associated hormones, and the functional processes of filtration, excretion, secretion, and reabsorption."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Circle nephron structures, underline movements between blood and filtrate, and number the structures that filtrate passes through in order. Use your marks to plan a model that shows where materials go.

After Soccer Practice

1. After a long soccer practice, your kidneys must remove wastes while saving water. Each kidney contains tiny filtering units called nephrons. Blood enters a knot of capillaries called the glomerulus. Pressure pushes water and small dissolved substances from the blood into the surrounding glomerular capsule; this step is filtration. Blood cells and most proteins remain in the capillaries. The resulting filtrate moves from the capsule through the proximal convoluted tubule, the loop of Henle, and the distal convoluted tubule, then enters a collecting duct. This winding route brings filtrate close to blood vessels again.

2. As filtrate travels, its contents change rather than simply flowing away. In the proximal convoluted tubule, glucose, salts, and much water move from filtrate into nearby capillaries; this return to blood is reabsorption. Along the loop of Henle, water leaves its descending limb, while salts leave its ascending limb. Secretion runs in the opposite direction: some drugs move from nearby capillaries into the proximal tubule, and extra potassium ions move into the distal tubule. A model needs arrows for these crossings because direction determines what stays in blood and what can leave in urine.

3. After practice, low body water can increase the release of antidiuretic hormone, or ADH. ADH makes the collecting duct more permeable to water, so more water returns to blood and less remains in urine. Aldosterone acts on the distal convoluted tubule and collecting duct, increasing sodium reabsorption and potassium secretion; water can follow reabsorbed sodium. The fluid left in the collecting duct becomes urine. It flows toward the ureter, then the bladder, and finally through the urethra to leave the body. This removal is excretion, the last step a complete nephron model should trace.

2 ANSWER WITH EVIDENCE

Use the passage

1. In a nephron model, where should a filtration arrow start and end? What does it carry?

2. In the proximal convoluted tubule, draw one arrow for glucose and one for a drug. Where does each arrow point, and which process does it show?

3. After practice, ADH rises. Where should you label its action on a model? Show the direction of water movement and explain what happens to the amount of urine.

4. If aldosterone rises, which two structures should carry its label? Which way should the sodium and potassium arrows point?

3 YOUR TURN

Your own words

Sketch a nephron model for someone who has finished a hot hike and taken a medicine that must be removed. Label five structures in the filtrate route, use directional arrows for filtration, reabsorption, secretion, and excretion, and show where ADH and aldosterone act.

ANSWER KEY

Inside the Nephron

PART 1 · READ AND MARK

Circle nephron structures, underline movements between blood and filtrate, and number the structures that filtrate passes through in order. Use your marks to plan a model that shows where materials go. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In a nephron model, where should a filtration arrow start and end? What does it carry?	**It starts in the glomerular blood and ends in the glomerular capsule. It carries water and small dissolved substances.**
2	In the proximal convoluted tubule, draw one arrow for glucose and one for a drug. Where does each arrow point, and which process does it show?	**Glucose moves from filtrate to nearby capillaries by reabsorption. A drug moves from nearby capillaries into the tubule by secretion.**
3	After practice, ADH rises. Where should you label its action on a model? Show the direction of water movement and explain what happens to the amount of urine.	**Label ADH at the collecting duct. More water moves from the duct toward blood, leaving less water in the urine.**
4	If aldosterone rises, which two structures should carry its label? Which way should the sodium and potassium arrows point?	**Label the distal convoluted tubule and collecting duct. Sodium moves from filtrate toward blood; potassium moves from blood into filtrate.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

Glomerular blood → glomerular capsule → proximal convoluted tubule → loop of Henle → distal convoluted tubule → collecting duct. A filtration arrow carries water and small dissolved substances from the glomerulus into the capsule. A reabsorption arrow carries water from the collecting duct toward blood, with ADH labeled at the duct. Another reabsorption arrow carries sodium from the distal tubule toward blood, with aldosterone labeled at the distal tubule and collecting duct. A secretion arrow carries medicine from blood into the proximal tubule. An excretion arrow continues from the collecting duct toward the ureter, bladder, and urethra.

Accept models with the five filtrate structures in order and arrows showing the correct direction of each process. ADH should be placed at the collecting duct; aldosterone should be placed at the distal convoluted tubule and collecting duct.