Clues in Urine

Trace how kidney activity relates to blood sugar, pressure, and volume.

HAP.14.3 "Investigate relationship between urine composition and the maintenance of blood sugar, blood pressure, and blood volume."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline changes in urine contents or amount, circle the related blood conditions, and number matching pairs to trace each connection.

Three Clues from the Kidneys

1. At a school clinic, a student reports intense thirst and frequent urination. A urine test finds glucose, which normally is nearly absent because the kidneys return filtered glucose to the blood. If blood glucose rises beyond what kidney cells can reclaim, glucose stays in the forming urine. The dissolved glucose holds water in the urine, so more water leaves the body. That water loss can shrink blood volume and lower blood pressure. Urine glucose therefore points to high blood sugar, but the urine test alone cannot identify its cause. A blood test is needed.

2. After a long run on a hot day, another student loses water in sweat. If the student does not drink enough, blood volume falls and blood pressure may drop. The body releases more antidiuretic hormone, or ADH, which makes the kidneys return more water to the blood. The kidneys then produce a smaller amount of darker, more concentrated urine. The urine has less water compared with its dissolved wastes. This response helps protect blood volume and pressure, but it cannot replace the water already lost. A concentrated urine sample may signal water conservation, not high blood glucose.

3. In some people, retaining excess sodium after a salty meal raises blood volume and pressure. The kidneys can respond by excreting more sodium instead of returning as much to the blood. Water tends to follow sodium, so losing more sodium and water in urine can reduce blood volume and help lower blood pressure. In contrast, when blood volume is too low, the hormone aldosterone promotes sodium reabsorption by the kidneys. Retaining sodium helps retain water. Urine sodium also depends on diet, hormones, and kidney function, so one sample cannot prove why blood pressure changed.

2 ANSWER WITH EVIDENCE

Use the passage

1. Trace how blood glucose that is too high can lead to both frequent urination and lower blood pressure.

2. During the long run, how does the change in urine show that the kidneys are helping protect blood volume?

3. If the kidneys excrete more sodium after blood volume rises, what may happen to urine water, blood volume, and blood pressure?

4. What different blood conditions might glucose in urine and a small amount of concentrated urine suggest?

3 YOUR TURN

Your own words

After a hot hike, a student who lost water and ate salty crackers produces a small, concentrated urine sample with little sodium and no detectable glucose. Write 4 to 5 sentences explaining how this pattern could help maintain blood volume and pressure, and name one conclusion you cannot draw from the sample.

Clues in Urine

PART 1 · READ AND MARK

Underline changes in urine contents or amount, circle the related blood conditions, and number matching pairs to trace each connection. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	Trace how blood glucose that is too high can lead to both frequent urination and lower blood pressure.	**Excess blood glucose remains in the urine and holds water there. More water leaves in urine, which can reduce blood volume and lower blood pressure.**
2	During the long run, how does the change in urine show that the kidneys are helping protect blood volume?	**More ADH makes the kidneys return more water to the blood, producing less, more concentrated urine and helping protect blood volume.**
3	If the kidneys excrete more sodium after blood volume rises, what may happen to urine water, blood volume, and blood pressure?	**More water may leave with the sodium in urine, reducing blood volume and helping lower blood pressure.**
4	What different blood conditions might glucose in urine and a small amount of concentrated urine suggest?	**Urine glucose may point to high blood sugar. A small amount of concentrated urine may indicate that the body is conserving water to protect blood volume and pressure.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The small, concentrated sample suggests the kidneys are returning more water to the blood. Returning water helps protect blood volume and pressure after water loss on the hike. Little sodium in the urine is consistent with sodium reabsorption, which can also help the body retain water. No detectable urine glucose does not directly measure the student's blood sugar.

Accept explanations that connect less urine water or sodium loss with water retention and support of blood volume and pressure. Students may instead note that one urine sample cannot establish the cause of the pattern.