

Ch13 Project: Inquiry Question

How can urinary test strips be used to diagnose disease?

Name: _____ Date: _____

You are a doctor working in a hospital in Vancouver, B.C. Ten years ago, your patient was diagnosed with Type 2 diabetes. She has been careless about following the treatment needed to keep her blood glucose levels regulated. Now she is experiencing fatigue, muscle cramps, swollen legs, nausea and back pain. She explains that sometimes her urine is pinkish and cloudy. What organ may not be functioning properly?



The goal of this project is to identify diseases of the renal system by examining a urinary test strip. To this end you will read and interpret the results of the urinary test strip, identify the disease and answer the questions that follow.

General Instructions

- Read through the Unit 14 Lesson, *Urinary System*.
- Read through the case study.
- Use your knowledge of the urinary system to answer the questions in a word document.
- You must cite your sources of information. Check out these websites for information on citing sources:
<http://www.plagiarism.org/citing-sources/whats-a-citation/>
<http://www.wikihow.com/Sample/MLA-Citation-List>

This Project will be graded according to the Marking Guide at the end of this document.

Project Submission:

Submit your word document to the project drop box

The Case

You are a doctor working in a hospital in Vancouver, B.C. Ten years ago, your patient was diagnosed with Type 2 diabetes. She has been careless about following the treatment needed to keep her blood glucose levels regulated. Now she is experiencing fatigue, muscle cramps, swollen legs, nausea and back pain. She explains that sometimes her urine is pinkish and cloudy. What organ may not be functioning properly?

Part 1: Are the patient's kidneys functioning normally?

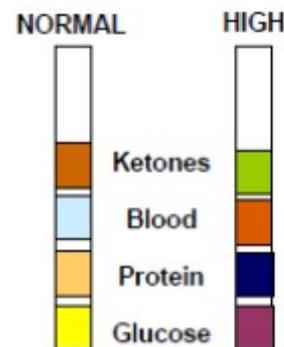
You and your team of medical professional have the following tasks:

- Analyze the information from the urine test to determine if the patient's kidneys are functioning normally (see Instructions for Urine Testing)
- Record whether the levels of each substance (Ketones, Blood, Protein, and Glucose) are NORMAL or HIGH in the results table that follows.

1. Test the patient's urine sample

Table 1: Results of Patient's Urine Test
Urine test strip key

Urine Tests	Patient's Results
Ketones	
Blood	
Protein	
Glucose	



Patients resulting strip



2. Read the information in “Interpreting Urine Test Results.” What substances are present in the patient’s urine that is not present in normal urine?

Interpreting Urine Test Results

Ketones

Ketones are present in the urine when a person does not eat enough carbohydrates (for example, in cases of starvation or high-protein diets), or when a person eats enough carbohydrates but his body can't use them properly (for example, if he has diabetes). Ketones are produced when the body metabolizes fat (instead of carbs) to get the energy it needs to keep functioning.

Protein

Protein is not normally present in the urine. Healthy kidneys take wastes out of the blood but leave protein in the blood. Damaged kidneys may fail to separate blood protein from the wastes and protein may leak into the urine. A small amount of protein in urine can be an early sign of kidney disease. As kidney function worsens, the amount of proteins in the urine increases. Other conditions may also result in protein in the urine.

Blood (Hemoglobin)

Normally, red blood cells and hemoglobin are not present in urine. Healthy kidneys do not allow blood cells to move from the blood into the urine. Even small increases in the amount of red blood cells or hemoglobin in urine may indicate disease. Numerous diseases of the kidney and urinary tract, as well as trauma, medications, smoking, or strenuous exercise, can cause red blood cells or hemoglobin to be present in the urine.

Glucose

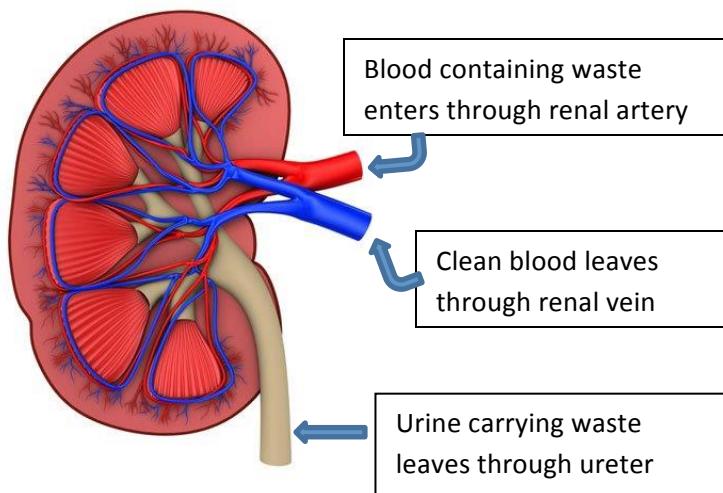
Glucose is normally not present in urine. When glucose is present it may result from a high concentration of glucose in the blood (due to diabetes) or a kidney problem. Therefore, when glucose is present in the urine, further testing is recommended to identify the specific cause.

3. Are the patient's kidneys functioning normally? State two pieces of evidence to support your answer.

Part 2: How do normal kidneys work?

Your patient doesn't understand how normal, healthy kidneys work to remove wastes and keep blood composition stable—within normal ranges. Use the information on Excretory System handout, part A. Show her the diagrams, and answer her following questions:

1. What blood component should be completely removed from the blood as it passes through the kidney?
2. What five blood components should be kept in the blood as they pass through the kidney?
3. In addition to water, what blood components should be balanced so that they are presented in the correct concentrations in the blood?
4. What three substances would you expect to find in the urine that is excreted by the kidney?



A. Kidneys Regulate the Composition of Blood

Your kidneys play a vital role in maintaining homeostasis. They excrete (remove) urea and other wastes, regulate the amount of water in the blood, and adjust the concentration of various substances in the blood. The substances removed from the blood form urine. The cleaned blood then travels to the heart and is pumped to the rest of the body. As blood travels through the kidney, some blood components need to be:

- Kept in the blood because they are essential. Red blood cells, white blood cells, protein, glucose and amino acids should be kept in the blood. These components should not be present in urine.
- Removed from the blood and excreted in the urine because they are toxic (poisonous). Urea is a toxic substance that should be removed from the blood.
- Balanced so they are present in the correct concentration in the blood. A certain amount of water and salt is needed by the body and will remain in the blood. If excess water and excess salt are present in the blood, they should be excreted in the urine.

Answer the following questions:

5. What five substances form the filtrate?

6. What determines which blood components remain in the blood and which end up in the filtrate in the nephron?

7. Which substances in the filtrate does your body need?

8. What two substances in the filtrate are essential and need to be completely reabsorbed?

9. What two substances should be balanced by being selectively reabsorbed?

10. If you drink a lot of water, you may produce large amounts of urine that has a light yellow color. If you do not drink enough water, you may produce a small amount of urine that has a dark yellow color. How would you explain these observations?

Part 3: Patient's With Kidney Disease

So far you have discussed the function of normal kidneys. Now you will consider what might be going wrong in patients with kidney disease. In patients with kidney disease, the kidney structure is damaged and does not function properly. Kidney damage may occur as a result of diabetes, high blood pressure, abnormal kidney development, damage by viruses or bacteria, or by an auto-immune response in which antibodies attach to the kidneys.

1. Your patient's diabetes has caused kidney disease. What substances in the patient's urine indicate that her kidneys are not functioning properly?

2. Your patient reported pinkish and cloudy urine. What substance might cause her urine to be pink? (1 point)

What substance might cause her urine to be cloudy?

3. What process (filtration or reabsorption) was not working properly in your patient?

Explain how you know this.

4. Each day the millions of nephrons in your kidneys produce a total of about 180 liters (47gallons) of filtrate that flows into your nephron. What would your life be like if your kidneys only carried out filtration (and did not also carry out reabsorption) and all of that fluid became urine?
5. Explain why drinking large amounts of water results in the production of large amounts of urine.
6. Explain why eating large amounts of salty foods increases the amount of salt in the urine?
7. Why is kidney disease a serious health risk? What would happen to a person if their kidneys did not function properly?

Part 4: Diabetes prevention program

Your task:

Prepare a type 2 diabetes prevention program for the patient as a means to prevent further kidney dysfunction. You must base your program on information found in 3 sources from the internet. Scribing answers to the following questions: What is type 2 diabetes? What condition precedes it? What factors associated with diabetes can be altered by the patient? What would you ask your patient to do? Base your answer on three pieces of evidence found in your research.

Marking Guide

Marking Guide	
Parts 1, 2 and 3:	
Answer is appropriate to the question Content is factually correct Supporting points are presented in a logical progression No major spelling or grammatical errors	/16
Part 4	
Answer is appropriate to the question Content is factually correct Supporting points are presented in a logical progression No major spelling or grammatical errors	/6
Source Citation	/3
TOTAL	/25