Name_____ Period _____ Date _____

Airport Screener

STEM Sims

Lesson 1: Airport Screener

Airport screeners have a very important job. Their goal is to look inside luggage using a machine so that no weapons or dangerous materials will be carried onto airplanes. Will you take on the job of protecting the skies?

Here are some definitions to help you in your investigation.

Screen -	to view things to see if they are safe or dangerous
Prohibited -	things that are not allowed by law
Permitted -	things that are allowed by law
Scanner -	a device that uses X-rays to see inside packages or luggage
Solid -	one of the basic forms of matter. Solids have a set shape and volume.
Liquid -	one of the basic forms of matter. Liquids have a set volume but take on the shape of a container. Liquids do not fill any space completely.
Gas -	one of the basic forms of matter. Gases do not have a set volume. Gases take on the shape of a container. Gases do fill any space completely.
Energy -	the ability to do work
Light -	a type of low energy radiation that can be seen by people. Light cannot pass through most solid objects.
X-rays -	a type of high energy radiation that can pass through many things, including some solid objects. This allows people to see certain things on the inside of other things.

Preparing to Do the Science

1. In Table 1, create a list of prohibited items that you think should be alerted if found. Create a list of permitted items that people can bring on an airplane.

Table 1.

Prohibited Items	Permitted Items

Doing the Science

1. Select the Simulation tab to open the Airport Screener simulation.

2. Read the instructions provided on-screen.

3. Click on the timer to set a time of 3 minutes.

4. Select the right green arrow to start the conveyor belt.

5. Selecting the arrows will increase or decrease the speed of the conveyor belt.

6. Luggage will go through the X-ray machine. You can pause the conveyor belt by clicking on the yellow "Pause" button.

7. Selecting the "Magnify" button will enlarge the image of the object.

8. If you selected either the "Pause" or "Magnify" buttons, you have to click on the left or right green arrow to start the conveyor belt again.

9. If you identify a dangerous object in a suitcase, click on the "Alert" button.

10. When time runs out, an on-screen report of your progress will be shown. Record the results of your report in Table 2.

Table 2.

Shift Length	
# Luggage Scanned	
Scanning Rate	
Scanning Quality Rating	
Prohibited Items Missed	
Alert Quality Rating	

Report Analysis

1. Comment on your Scanning Quality Rating. That is, was your rating good or poor. Provide a reason for why you believe you received your Scanning Quality Rating.

2. Comment on your Alert Quality Rating. That is, was your rating good or poor. Provide a reason for why you believe you received your Alert Quality Rating.

Do You Understand?

1. Which form of matter (solid, liquid, or gas) did the X-rays show a shadow of when they were sent through luggage?

2. Why is light not used to see what is inside a piece of luggage when the luggage is closed?

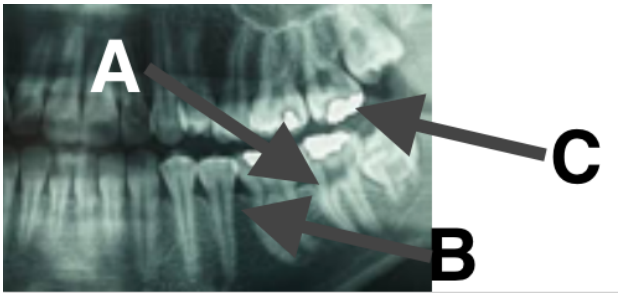
3. Can a person see actual X-rays? Please support your answer with evidence.

4. An X-ray machine has radiation shot from one side of the object that is being viewed and a receiver of X-rays on the opposite side of the object. Why does an X-ray machine need a receiver on the opposite side of the object being viewed?

5. Doctors use X-ray machines to look inside their patients. Why do doctors stand behind a protective wall when they X-ray a patient?

6. A metal can is filled with a gas. Can an X-ray machine tell whether the can is full or empty? Please support your answer with a response.

7. The image below shows a dental X-ray from a patient. The "A" arrow points to a tooth, the "B" arrow points to the person's gum, and the "C" arrow points to a metal filling. Since gums contains lots of liquid, arrange in order from easiest to hardest the ability of X-rays to pass through: a tooth, metal filling, and gums.



8. Again, using the above image, note the thin dark line that runs through the middle of most teeth. What does the thin dark line tell you about the inside of a tooth?

9. Why is it important to screen luggage in airports?

10. What could happen if a prohibited item was allowed onto an airplane?