Scenario 1: CSI Crime Scenario - who stole the laptop?

Dialogue to be read or acted out by student volunteers and/or teacher(s).

At beginning of class (prior to DNA analysis):

CSI Tucker: Welcome the new CSI trainees and tell them that they will be helping solve a case involving a stolen laptop. Tell them that you have brought in the victim to tell them what happened.

Lois McArthur: Well, I’d been out shopping, and when I came home, I found that my back door was open. I looked around to see if anything was missing and discovered that my laptop had been stolen from my office.

CSI Tucker: Do you know anyone who would want to steal your laptop?

Lois: No. It was an old computer and was working really slow.

CSI Tucker: Since your house wasn’t broken into, who would know how to get into your house?

Lois: Well, I kept a key hidden under the flower pot. Ted, my boyfriend, and Susan, my best friend, knew about the key. I guess that Bill, my ex-boyfriend, knew about the key, too. I meant to move it, but I forgot.

CSI Tucker: (To the new CSI Trainees) Tell them that you processed the crime scene and that the only thing recovered was a Kleenex found on the office floor. Tell them that you recovered snot from the Kleenex, and that they’ve already analyzed it to prove it wasn’t Lois’ DNA. Now you’ve brought in the 3 suspects.

CSI Tucker: Suspect A: Could you identify yourself and tell us your relationship to Lois. Also, where were you on the day of the crime?

Suspect A: Ted: My name is Ted. I’m Lois’s boyfriend. I think she’s been dating Bill behind my back, but I would never steal her laptop. And besides, I was out of town on the day of the crime.

CSI Tucker: Suspect B: Could you identify yourself and tell us your relationship to Lois. Also, where were you on the day of the crime?

Suspect B: My name is Bill. Lois and I used to go together, but we broke up several months ago. We’re still friends, though, and I would never come into her house uninvited, let alone steal her computer.
CSI Tucker: Suspect C: Could you identify yourself and tell us your relationship to Lois. Also, where were you on the day of the crime?
Suspect C: Susan: My name is Susan. I’m supposed to be Lois’s best friend and I’m Bill’s sister. I know she had a date with Bill last week. If you ask me, Susan is two-timing Bill and stringing my brother along. I admit I’m mad with her, but I would never steal that piece of junk laptop of hers.

CSI Tucker: Explain to the CSI Trainees that they will now help analyze the DNA recovered from the snot on the Kleenex.

After the DNA analysis:

CSI Tucker: The DNA belongs to Susan. Can you tell us why you stole her piece of junk laptop?

Susan: She was two-timing my brother, sending emails to him telling him she loved him, but I know she was emailing Ted and telling him the same thing. I wanted to prove to my brother that she was just using him.
Objective: Use gel electrophoresis (DNA fingerprinting) to find out who stole Lois’ laptop computer.

Hypothesis: Make a prediction about who you think stole the laptop. Ted, Bill, or Susan.

FYI: Agarose gel electrophoresis is a method used to separate molecules based on size using an electric field. Agarose is a polysaccharide purified from seaweed. It is boiled with a buffer and then poured into a tray to cool and solidify into a gel. The gel is then placed in a box and covered with a buffer solution. When hooked up to a source of electricity, the DNA will migrate from the negative electrode (black) to the positive electrode (red). It does this because DNA is a negatively charged molecule. DNA fragments migrating through the gel are separated based on size. Small fragments meet less resistance and thus travel further through the gel. DNA itself is not visible within the gel so we have added a dye that attaches to the DNA.

Materials:
- 1 gel box
- 1 10mL agarose gel
- 1 tube rack
- 1 box of pipette tips
- 1 micropipetter
- 4 DNA samples (thief, S1, S2, S3)
- 1 power box
- 500 mL 1X TAE buffer
- 1 plastic tray (for staining)
- 50 mL 5X FastBlast stain

Procedure:

1. ____ The gel and the buffer have already been prepped and placed in the gel box for you to save time.

2. ____ Remembering correct pipetting procedures (ask for help if you need it), place 10.0 µl of the thief’s DNA in the correct well in the gel (look at the figure above).

3. ____ Following the directions in step 2, pipette 10.0 µl of DNA from each suspect into their appropriate well.
4. _____ We will be running 2 gels to a box. Once both groups have loaded their DNA you can place the lid on the gel box. Do not hook up the power box until both groups have loaded the DNA into their gels.

5. _____ Make sure the power box is off and plugged into the outlet. Connect the black and red wires to the appropriate outlets on the power box. Power on the gel box and make sure the current is on 200 and set the timer for 30 minutes (if there is a timer).

6. _____ If bubbles are rising on the sides of the gel box then you have hooked up the power box correctly.

7. _____ It will take some time before we can analyze the results (20 – 30 min.). You need to let the colored dye run ½ to ¾ of the way down the gel. During this time, answer the questions below in your lab book.

8. _____ Once your DNA has migrated to an appropriate length, power down the power box. Remove the plug from the outlet, and then you can remove the red and black wires from the power box.

9. _____ Using gloves (only 1 person per group), remove the gel carefully and place it in the tray with the FastBlast stain. Leave it stain until you begin to see bands. You can then compare each suspect to the DNA left behind by the thief.

**Gel Electrophoresis Questions**

1. What is the purpose of agarose gel electrophoresis?
2. What is agarose purified from?
3. Why does the DNA migrate from negative to positive?
4. Do small or large DNA fragments migrate further down the gel? Why?
5. How are we able to see the DNA bands?
6. Who stole the laptop? Was your prediction correct?
Answers to Student Handouts

1. What is the purpose of agarose gel electrophoresis?
   The purpose of agarose gel electrophoresis is to size separate DNA fragments.

2. What is agarose purified from?
   Agarose is purified from seaweed.

3. Why does the DNA migrate from negative to positive?
   The DNA has a negative charge and is repelled from the negative charge and towards the positive charge.

4. Do small or large DNA fragments migrate further down the gel? Why?
   Small fragments migrate further down the gel, because they can move through the matrix created by the agarose gel faster than larger fragments.

5. How are we able to see the DNA bands?
   We stain the Gel and the stain binds to the DNA making it visible to the human eye.