

Lab Spill!: Scene 1

Talia and DeAndre walked down the hallway towards their physical science class. They were excited because today was a lab day, and lab days were always fun because all of the students got to do experiments.

Suddenly, Talia pointed to the door. “Hey DeAndre, what’s going on outside our class?” As they got closer to the room, they realized that their teacher and the entire class were standing outside the door, which was closed and covered with strips of yellow tape across the frame. Their teacher, Ms. Hooper, stopped them as they got to the door.

Ms. Hooper said, “Sorry, children, there won’t be any lab today. There’s been an accident inside the classroom.”

DeAndre asked, “What happened?”

Ms. Hooper replied, “Someone broke into my room while I was on lunch duty, and now we’re not allowed into the room. Those folks in there are dealing with the problem.”

Talia and DeAndre walked up to the big window that looked into their classroom from the hallway. To their surprise, they saw three adults wearing jackets that said “Haz-Mat” talking rather seriously to a pair of kids that DeAndre recognized from his neighborhood. Those two kids were a couple of years older than he and Talia, and they were always up to no good. He wondered what they’d done now.

Talia cried, “Eww, DeAndre, look at the floor! I wonder what all that is.” DeAndre looked in the window and saw what she was talking about immediately. He said, “Wow, what a mess!”

Ms. Hooper came up behind them and said, “The Haz-Mat team says it’s some sort of mixture. I was the one who found the mess and notified the Haz-Mat team. I noticed right away that the air feels cooler in there than it does out here.” Talia looked in the window at the cabinet where the classroom chemicals were stored and asked, “Do they know what was spilled?”

Ms. Hooper replied, “I didn’t see any containers missing from the chemical storage cabinet, but I’ve used them all in one lab session or another, so any of them could have been opened.”

DeAndre said, “Hey, there’s an empty metal jug on the floor, too!”

Lab Spill!: Scene 2

A member of the Haz-Mat team came up to the window to talk to Ms. Hooper. He didn't open the door, so his voice was a little muffled. "Ms. Hooper, we've got some preliminary information on the mixture, and we interviewed the two students about what they did while they were in here. I've saved computer files of the descriptions and the interview transcript on the school network, if you'd like to look at them. We need to figure out a way to separate the mixture, so we might be a while."

"Thank you, sir. Come on, class, let's go look at those forms. Maybe we can all come up with a way to help out the Haz-Mat team."

Ms. Hooper and the students went down the hall towards the computer lab, where Ms. Hooper logged them all on to the school network. Talia and DeAndre paired up at a computer and opened up the two files. *(Read the attached descriptions and interview transcript).*

"Hey, DeAndre. I think I know how they can separate all of these substances!"

"Yeah, and maybe we could start to figure out what they might be, too!"

Lab Spill!: Scene 3

One of the Haz-Mat team members came into the computer lab where the students were working in groups. “Great job, kids. You did some great research on those substances, and those reports you emailed us in the classroom were really helpful. We’ve got the mixture separated and cleaned up, so you can all go back to your classroom now.”

DeAndre raised his hand and asked, “How did you separate the substances?”

The Haz-Mat team looked through his notes and said, “Well, as you know, Substance 6 evaporated right away, so it was already out of the mixture. So we removed Substance 1 using magnets, and collected it in a container. Then we put the other four substances in a filter and sifted out the powders from the chunks. We used hand separation to remove Substance 5 from Substance 2 since it was in big chunks. So we were left with Substances 3 and 4, the white powders. That was the most complicated separation. But we knew that Substance 3 would dissolve in water but Substance 4 wouldn’t, so we put them in water and strained out substance 4. Then we boiled off the water, which left behind Substance 3. We’ve got everything in separate, labeled containers, and we’re loading them on the truck to take back to headquarters.”

Talia raised her hand and said, “So did you figure out what the substances were?”

The Haz-Mat officer nodded. “We checked the cabinet, and luckily there weren’t many substances with those properties. In fact, each substance had only one chemical that matched its properties. Substance 1 is iron and Substance 2 is sodium chloride, or salt. Substance 3 is sodium bicarbonate, otherwise known as baking soda, and Substance 4 is calcium carbonate, which is used in chalk. None of these substances are very hazardous, although the powders could be harmful if inhaled. Substance 5, however, is potassium, which is very volatile and can be a major fire hazard if it comes into contact in water. We made sure it was put back in oil once we separated it. Substance 6 is liquid nitrogen, which is commonly used in labs. It’s also hazardous, because it has a very low boiling point and can cause major damage to your skin if you touch it for more than a second or two.”

Talia frowned and said, “Hey, I got some of these wrong! But I worked really hard on them, and I thought they matched the descriptions.” DeAndre nodded and said, “Yeah, me too.”

The Haz-Mat officer said, “That’s okay, a lot of substances have very similar properties. If the cabinet had had more than one chemical with the same properties as our substances, we would have had to do much more sophisticated tests back in our lab.” The officer continued, “We also couldn’t have figured everything out as quickly as we did if it hadn’t been for your help. Thanks for all the hard work; you’re all some top notch scientists in the making!”

Haz-Mat Team Preliminary Descriptions of Unknown Substances

- Substance 1 consists of an element that is neither a nonmetal nor a metalloid, and is characterized by thin, dark grey filaments exhibiting magnetic properties
- Substance 2 consists of a compound, characterized by larger, chunky white grains that are highly soluble in water and can be made by the neutralization of an acid with a base.
- Substance 3 consists of a compound that is a fine, white powder. It is soluble in water, is non-metallic and has no noticeable odor. When mixed with a strong acid, it produces carbon dioxide.
- Substance 4 consists of a compound that is a white, odorless powder but has a different texture than Substance 3 and is insoluble in water but soluble in dilute acids. It has an extremely high melting point.
- Substance 5 consists of soft, shiny silver chunks of an element. When placed in water, the chunks do not dissolve but instead catch fire and explode.
- Substance 6 is no longer visible, but is described by the two students as a clear, odorless liquid element that spilled out of the jug and immediately began hissing and steaming; however, the steam was very cold.

Haz-Mat Team Interview Transcript:
Atlanta Public Middle School Lab Spill

HM = Haz-Mat Team

TM1 = Troublemaker #1

TM2 = Troublemaker #2

HM: What were you kids doing in here?

TM1: Nuthin, just having some fun, you know?

TM2: Yeah, we wuz just messin around in the cabinet, quit makin' such a big deal out of it!

HM: How did you get into the cabinet?

TM1: I picked the lock with my pocket-knife, it was easy!

HM: (Snatches the knife away) Well then, we're going to get the cops in here to take you to jail, knives are illegal in school. You kids are in some BIG trouble; a lot of people could have gotten hurt! Do you even know what chemicals you were messing with?

TM2: I dunno, we just pulled out a bunch of containers and started dumping stuff. Plus, when we kicked over that jug, this clear stuff spilled out and started hissing and steaming, but it was way cold. It was awesome!

TM1: Yeah, but at least we put all the containers away. (Laughs) Don't we get some credit for that?

HM: Of course not! Do you remember any of the labels on the containers that you grabbed?

TM1: Nope. I failed physical science when I was in 6th grade. How am I supposed to remember any of that stuff?

HM: (Sighs) Okay, we're done here. Somebody call the cops to arrest these two, and we'll get started on figuring this mixture out.

Guideline for Haz-Mat Report Assignment

To complete this case, your group will be filling out a Haz-Mat report and turning it in for a grade. Each group will turn in ONE report, so make sure that you write your group number on your report. For example:

United States Government - Hazardous Materials Response Team Report

Date October 12, 2004 Location Columbia Middle School, Decatur, GA

Report Completed By Group 4

The report has four main parts:

1. **Situation:** This is where you describe the spill, how it happened, and describe the substances. You have all of this information in the scenes, the interview transcript and the Haz-Mat descriptions. Your summary should be brief; we only want the main idea!
2. **Protocol:** This is where you describe what you would do to separate the substances. Be as clear as you can, and make sure to say what you would do to each substance!

For example:

I would separate Substance 1 by blah blah blah, then I would separate Substance 2 by blah blah blah, then...

3. **Identification of Materials:** This is where you write down what you think each substance is.

For example:

Substance 1 = Blah Blah Blah
Substance 2 = Blah Blah Blah

On a separate piece of paper, write down why your group thinks each substance is what you wrote down. Do this for each substance, and write down the sources you used to find the information. For one extra credit point for each substance, you may write down if the substance has any hazards, like it is flammable or could hurt your skin.

4. **Concluding Comments:** If you have anything else that you want to add, such as recommendations to the school to prevent this from happening again, write it here. At the bottom of the page, each member in your group (team) should put their initials on the spaces provided.

United States Government - Hazardous Materials Response Team Report

Date _____ Location _____

Report Completed By _____

Situation:

Protocol: (outline the procedure used to deal with the substances)

Identification of Materials:

Potential Hazards:

Concluding Comments:

Team Member Initials: _____

Self Evaluation Worksheet

Date: _____

Your Name: _____ Group #: _____

Instructions: Please circle the response with which you agree the most. This evaluation will only be read by your teacher and will **not** be shown to other students.

1. How would you rate *your* participation in group discussion and group work?

5 Excellent 4 Very Good 3 Good 2 Fair 1 Poor

2. How would you rate *your* effort in completing the case?

5 Excellent 4 Very Good 3 Good 2 Fair 1 Poor

3. Did *you* complete the assigned homework? **Yes** **No**

If No, explain why:

4. How well did *you* work with everyone in your group?

5 Excellent 4 Very Good 3 Good 2 Fair 1 Poor

5. Overall, how would you rate *your* performance in this case?

5 Excellent 4 Very Good 3 Good 2 Fair 1 Poor

6. What praise or criticism do you have for other group members? What are your thoughts about the case?
