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## **Lesson Plan: STEM Investigation Skills - Safety in the Lab with WHMIS**

### **Introduction**

Safety is a fundamental aspect of conducting any scientific investigation. This lesson focuses on equipping you with the knowledge and understanding of safe practices and procedures, specifically through the Workplace Hazardous Materials Information System (WHMIS). By understanding and applying these practices, you can ensure a safe and effective environment for all your scientific explorations.

### **🌟 Engage: Understanding the Importance of Safety**

Before we dive into the specifics of WHMIS, let's consider why safety is crucial in scientific settings. Think about the various materials and equipment you might encounter in a science lab. What potential dangers could these pose?

**Discussion Prompt:**

* Share a time when you or someone you know encountered a dangerous situation due to unawareness of safety procedures. What was the outcome?

This discussion will help us understand the real-life implications of safety in science labs and underline the importance of following proper safety guidelines.

### **🔍 Explore: Introduction to WHMIS**

WHMIS stands for Workplace Hazardous Materials Information System. It is a comprehensive plan for providing information on the safe use of hazardous materials used in Canadian workplaces.

**Activity:**

* In groups, explore a set of common laboratory chemicals and their WHMIS symbols. Each group will present their findings, focusing on the hazards these chemicals present and the precautions necessary when handling them.

Through this activity, you will begin to recognize the symbols and their meanings, an essential step in navigating any scientific environment safely.

### **📘 Explain: Key Components of WHMIS**

WHMIS is built around three key elements: Labels, Safety Data Sheets (SDS), and Worker Education and Training.

**1. Labels:**

* **Product Identifier:** The name of the chemical.
* **Pictograms:** Symbols that quickly show the user what type of hazard a substance presents.
* **Signal Words:** Words like "Danger" or "Warning" to emphasize the level of risk.
* **Hazard Statements:** Brief statements describing the nature of the hazard.
* **Precautionary Statements:** Steps to minimize or prevent adverse effects.

**2. Safety Data Sheets (SDS):**

* These provide detailed information about each hazardous material, including its properties, hazards, protective measures, and safety precautions.

**3. Education and Training:**

* Ensures that all individuals are aware of the information on the labels and SDS and know how to safely handle, use, store, and dispose of hazardous materials.

**Mini Quiz:** Test your understanding of WHMIS components with a quick quiz.

### **⚙️ Elaborate: Applying WHMIS in Real Scenarios**

Let's put your knowledge to work. You'll be given several scenarios involving typical activities you might encounter in a science lab.

**Group Task:**

* For each scenario, determine the WHMIS practices that should be implemented. Discuss as a class whether the correct procedures were identified and any additional steps that could enhance safety.

This exercise will help solidify your understanding of WHMIS by applying it to practical, real-world situations.

### **✔️ Evaluate: Demonstrating Your Understanding**

To conclude our lesson, you'll participate in a comprehensive assessment that includes both a written test and a practical component.

**Practical Test:**

* Demonstrate the correct way to handle and store hazardous materials. You will also be asked to interpret labels and SDS for specific chemicals.

This evaluation will help ensure that you have a thorough understanding of WHMIS and can apply this knowledge to ensure safety in the lab.

### **Conclusion**

By the end of this lesson, you should feel confident in your ability to navigate any scientific setting safely, armed with the knowledge of WHMIS. Remember, maintaining a safe environment is not just about personal safety; it's about ensuring the safety of everyone around you. Safety is the first step in any scientific investigation!

This lesson, structured according to the 5E Instructional Model, has provided a comprehensive overview and practical application of safe practices under WHMIS, tailored specifically for Grade 9 students in Ontario, Canada.

## **WHMIS Safety Quiz**

### **🟢 Easy Questions**

1. **What does WHMIS stand for?**
   * A) Workplace Hazardous Material Information Sheet
   * B) Workplace Hazardous Management Information System
   * C) Workplace Hazardous Materials Information System
   * D) Work Health Materials Information System  
     **Answer: C**
2. **What symbol might you find on a container that is highly flammable?**
   * A) Skull and crossbones
   * B) Flame
   * C) Exclamation mark
   * D) Gas cylinder  
     **Answer: B**
3. **Where should you find safety information about a chemical in the lab?**
   * A) In the textbook
   * B) On the chemical’s label
   * C) In the school's general safety manual
   * D) From your lab partner  
     **Answer: B**
4. **What is the purpose of WHMIS?**
   * A) To provide fun facts about chemicals
   * B) To ensure workplace safety and knowledge about hazardous materials
   * C) To help teachers plan lessons
   * D) To prevent the use of chemicals in labs  
     **Answer: B**
5. **Which of the following is a requirement on a WHMIS label?**
   * A) Price of the chemical
   * B) Name of the supplier
   * C) Food pairing suggestions
   * D) Colour of the chemical  
     **Answer: B**
6. **What type of information does a Safety Data Sheet (SDS) provide?**
   * A) Historical data about the chemical
   * B) Detailed safety information about the chemical
   * C) General knowledge about chemistry
   * D) Instructions for experiments  
     **Answer: B**
7. **Who needs WHMIS training?**
   * A) Only chemistry teachers
   * B) Only students
   * C) Anyone who works with or is exposed to hazardous materials
   * D) Only laboratory managers  
     **Answer: C**
8. **What does a ‘Danger’ signal word indicate?**
   * A) The chemical is safe to handle without gloves
   * B) There is no significant risk
   * C) There is more severe hazard/risk
   * D) The chemical can be stored anywhere  
     **Answer: C**
9. **Which pictogram indicates toxic hazards?**
   * A) Flame
   * B) Skull and crossbones
   * C) Tree
   * D) Hand  
     **Answer: B**
10. **What should you do if you do not understand a WHMIS symbol on a chemical you are using?**
    * A) Ignore it and continue your work
    * B) Ask a classmate
    * C) Guess the meaning based on its look
    * D) Ask your teacher or refer to WHMIS documentation  
      **Answer: D**

### **🟡 Moderate Questions**

1. **What is the difference between the ‘Danger’ and ‘Warning’ signal words under WHMIS?**
   * A) ‘Danger’ is used for mild hazards, ‘Warning’ for extreme hazards
   * B) ‘Danger’ is for more severe hazards, ‘Warning’ for less severe
   * C) No difference, they can be used interchangeably
   * D) ‘Warning’ is for chemical storage only  
     **Answer: B**
2. **Which of these is NOT a part of a WHMIS label?**
   * A) Precautionary statements
   * B) Colour coding to indicate chemical type
   * C) Product identifier
   * D) Pictograms  
     **Answer: B**
3. **How often should WHMIS training be updated?**
   * A) Once every ten years
   * B) Every time new hazardous material is introduced
   * C) Only when the regulations change
   * D) WHMIS training does not need to be updated  
     **Answer: B**
4. **What should you do if a chemical spill occurs in the lab?**
   * A) Clean it up immediately with your hands
   * B) Leave it and evacuate the lab
   * C) Report it to the teacher and follow the emergency procedures
   * D) Cover it with paper towels  
     **Answer: C**
5. **What information is NOT found on a Safety Data Sheet (SDS)?**
   * A) Chemical reactivity data
   * B) Chemical pricing information
   * C) First-aid measures
   * D) Handling and storage recommendations  
     **Answer: B**
6. **Which pictogram would you find on a container that can cause skin burns?**
   * A) Corrosion
   * B) Health hazard
   * C) Exclamation
7. mark
   * D) Gas cylinder  
     **Answer: A**
8. **Why is it important to have WHMIS training before starting any lab work?**
   * A) To ensure you can handle materials safely and respond to emergencies
   * B) It's not important; it’s just a legal requirement
   * C) To make the lab work more interesting
   * D) To be able to skip other safety trainings  
     **Answer: A**
9. **Which section of the SDS would you consult to find out how to store a chemical safely?**
   * A) Toxicology information
   * B) Regulatory information
   * C) Handling and storage
   * D) Disposal considerations  
     **Answer: C**
10. **If a chemical has a ‘Biohazard’ pictogram, what should you be cautious about?**
    * A) It may pose a fire risk
    * B) It can cause environmental damage
    * C) It may be infectious or pose other biological hazards
    * D) It is safe to handle without gloves  
      **Answer: C**
11. **What role does the signal word on a WHMIS label play?**
    * A) Decorative purpose only
    * B) Indicates the level of hazard associated with the chemical
    * C) Shows the cost of the chemical
    * D) Specifies the weight of the container  
      **Answer: B**

### **🔴 Hard Questions**

1. **Which statement best describes the relationship between a WHMIS label and an SDS?**
   * A) They provide the same information in different formats
   * B) The label provides immediate hazard information, while the SDS provides detailed safety information
   * C) The SDS is required only when the label is missing
   * D) The label is for lab use, the SDS is for office use  
     **Answer: B**
2. **How should you respond if you find an unlabeled bottle of chemical in the lab?**
   * A) Label it yourself based on what you think it contains
   * B) Use it only if you are sure of the contents
   * C) Report it to your supervisor and do not use it
   * D) Smell it to determine its contents  
     **Answer: C**
3. **What does a missing or damaged label on a chemical container indicate about WHMIS compliance?**
   * A) It is a minor issue that can be overlooked
   * B) It indicates a breach of WHMIS regulations
   * C) It is only a problem if the chemical is hazardous
   * D) It means the chemical is not hazardous  
     **Answer: B**
4. **In the context of WHMIS, what is the significance of the precautionary statement on a chemical label?**
   * A) It suggests how to safely dispose of the chemical
   * B) It provides suggestions for minimizing exposure and other risks
   * C) It lists the legal consequences of mishandling the chemical
   * D) It describes the chemical's physical properties  
     **Answer: B**
5. **What is the most appropriate action if a Safety Data Sheet (SDS) seems outdated or incomplete?**
   * A) Ignore it as long as the label is correct
   * B) Continue using the chemical as usual
   * C) Report it and request an updated version
   * D) Write in the missing information yourself  
     **Answer: C**
6. **Which scenario best illustrates a proper application of WHMIS training?**
   * A) A worker uses a chemical without reading the label because they are in a hurry
   * B) A student keeps their WHMIS training certificate in their locker
   * C) A lab technician uses PPE as specified on the chemical’s SDS
   * D) A teacher stores all chemicals together to save space  
     **Answer: C**
7. **Which SDS section is crucial for emergency responders?**
   * A) Disposal considerations
   * B) Fire-fighting measures
   * C) Regulatory information
   * D) Stabil ity and reactivity  
     **Answer: B**
8. **What should be your first step if exposed to a chemical that causes severe skin burns, according to WHMIS guidelines?**
   * A) Apply a neutralizing substance
   * B) Rinse the affected area with plenty of water
   * C) Immediately leave the laboratory
   * D) Cover the area with bandages  
     **Answer: B**
9. **How can the information on an SDS affect the storage of chemicals in a lab?**
   * A) It specifies the temperature and lighting conditions for storage
   * B) It only suggests the type of container to be used
   * C) It provides legal guidelines for storage quantities
   * D)
10. It is not relevant to storage  
    **Answer: A**
11. **What is the primary purpose of WHMIS pictograms?**
    * A) To make the label more visually appealing
    * B) To provide quick visual information about the hazards of a chemical
    * C) To indicate the chemical's country of origin
    * D) To show how to use the chemical safely  
      **Answer: B**

These quizzes are designed to evaluate and reinforce your understanding of WHMIS and safety practices in a scientific setting, progressing from basic to advanced levels of difficulty.