**MAKE A CLOUD CHAMBER**

*In this activity, you will create a cloud chamber with your group to indirectly see subatomic particles.*

***WARNING:*** *Wear safety goggles and take precautions around dry ice.*

**TIME:** One class period

**MATERIALS:**

* Quart jar with lid
* Sponge
* Safety goggles for each group member
* 1 Tbsp. 91% rubbing alcohol
* Permanent black marker
* Flashlight

**Part 1.** Introduction

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| **Instructions:**Today, your experiment will involve subatomic particles. Discuss subatomic particles with your teacher and class. Below, write down a definition and notes from the conversation. |

**What are subatomic particles?**

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**Part 2.** Hypothesis

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| **Instructions:**Watch the video clip “Make a Cloud Chamber” from the beginning until 1:19. With your group, generate a hypothesis about how you will be able to “see” subatomic particles without a microscope. Write your hypothesis below. On the next page, sketch what you expect to see. |

**Hypothesis:**

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**Sketch the following:**

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| **What do you think subatomic particles look like? What do you expect to see in your cloud chamber?** |

**Part 3.** Create Your Cloud Chamber

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| **Instructions:**Collect your materials and begin assembling your cloud chamber. Refer to the instructions below or watch the video again if you have any questions. When you have finished, let your teacher know. Your teacher will be taking your group into a separate room to conduct the experiment. While you are waiting for your turn, answer the questions in **Part 5**. |

1. Stuff the sponge in the bottom of the jar so it does not fall out when the jar is turned upside down.
2. Pour the alcohol on the sponge. The sponge should not drip or fall if the jar is turned upside down.
3. Color the inside of the lid completely with the black marker. This will create contrast so you can see the reflection of the subatomic particles more easily.
4. Put the lid on the jar.

**Part 4.** Experimentation and Observation

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| **Instructions:**When it is your turn to perform the experiment, bring your cloud chamber and flashlight into the dark room. Follow your teacher’s prompts during the experiment.**WARNING: DO NOT TOUCH DRY ICE WITH YOUR BARE HANDS OR BREATHE IN THE FUMES. WEAR SAFETY GOGGLES WHILE NEAR THE DRY ICE.** |

1. Discuss with your teacher what you expect to observe based on your hypothesis.
2. Place the cloud chamber upside down on the dry-ice setup.
3. Shine the flashlight over the lid; slowly move the flashlight at different angles.
4. Discuss with your group what you see in the cloud chamber.

When you have finished with the experiment, draw what you observed and answer the prompts below.

**Sketch the following:**

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| **1) What did you observe in the cloud chamber?** |

**Does the evidence support your hypothesis? Why or why not?**

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**If not, provide three possible explanations and revise your hypothesis.**

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**Part 5.** Understanding

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| **Instructions:**While you are waiting to perform the experiment, answer the prompts below using the Internet or a textbook. Remember to use trusted scientific organizations (e.g., HyperPhysics; your teacher may provide one or two more examples of where this information exists). |

**Define the following words:**

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|  | **DEFINITION** |
| **ATOM** |  |
| **ELECTRON** |  |
| **NEUTRON** |  |
| **PROTON** |  |
| **CONDENSATION NUCLEUS** |  |
| **CHALLENGE:** If you have additional time, define the words below. |
| **MUON** |  |
| **SUPERSATURATE** |  |

**Explain what happens during condensation.**

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**Why are condensation nuclei important?**

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**When everyone has completed the experiment and finished their worksheet, watch the remainder of the video clip “Make a Cloud Chamber” as a class.**