

# Clouds and How They Form

## FRAMEWORK

I. Scientific and Engineering Practices

II. Cross-Cutting Concepts

III. Physical Sciences

## SKILLS/OBJECTIVES

- Learn about how clouds form
- Changes in water state (liquid→water vapor)
- Learning the meanings of cloud names

## MATERIALS

- 1-liter clear plastic bottle with cap
- 1 bike pump
- 1 adaptor
- 1 pair of safety glasses
- rubbing alcohol
- A large bag of cotton balls

## NOTES

If the weather is bad, do activity 2b instead of activity 2. The third activity should be done by an adult as a class demonstration. For the third activity, hold the bottle horizontally when pumping in air in case it flies off because of the pressure. Also, have one person pump twice (ONLY) and another hold down the adaptor to the bottle firmly, and take caution when unplugging the adaptor from the bottle to form the cloud.

## BACKGROUND

- Go over 3 main types of clouds (stratus, cumulus, cirrus) using worksheet.
- Recap on last week's lesson about gas and liquid states of water, and how it's just a matter of density.
  - ex. Vapor is why we can see our breath on a cold day- the air we breathe has moisture in it.
- Introduce concepts of condensation vs. evaporation as the changing of states from gas to liquid and back
- Introduce cloud formation process: when warm, moist air meets cold, dry air, vapor condenses and forms a cloud
  - 3 things are necessary for a cloud to form:
  - 1. Moisture (there must be enough water vapor in the air)
  - 2. Cooling air (the air temperature must be cool enough for the water vapor to condense)
  - 3. Tiny particles for the water droplets to gather together on (like dirt and dust in the air)
- Temperature is proportional to pressure

Activity #1	<b>Cloud Shapes</b>
Materials	Cotton Balls
Worksheet	Yes

- Clouds can come in all types of forms- we will talk about the different forms using the lesson sheet.
- Talk about stratus, cumulus, and cirrus clouds using the worksheet. Have them try to figure out the meanings of cirrocumulus and cirrostratus clouds using the terms they have learned.
- **Now use your cotton balls to make one stratus cloud, one cumulus cloud, and a cirrus cloud. Which one will be lowest in the sky, and which one will be highest in the sky?**

Activity #2	<b>Cloud Watch</b>
Materials	Nothing
Worksheet	Yes

- Clouds often form where two weather fronts meet, such as when a cold front meets a warm front. Some clouds form when certain things like storms are about to happen. So, the kinds of clouds you can see can tell you a lot about what kind of weather is coming!

- **Go outside and see how many clouds you can identify. Write the names of the clouds down on the worksheet and draw what they look like.**

Activity #2b	<b>Flashcards!</b>
Materials	Pre-made cloud flashcards
Worksheet	No

- **Now that we know what certain clouds are named, let's test our knowledge of it with flashcards! Can you tell me what these clouds look like?** Show them the names of the clouds on the flashcards and then turn the card around to show them the cloud's picture on the back if they can describe what it looks like.

Activity #3	<b>Cloud In a Bottle</b>
Materials	Bottles, warm water, matches
Worksheet	No

- **Put on your safety glasses and place a couple drops of rubbing alcohol in the bottom of the bottle.**
- **Swirl the alcohol around so that it coats the sides of the bottle.**
- **Put the adaptor stopper in the bottle.**
- **Pump the bicycle pump twice, making sure that the adaptor is held down to stay in the bottle.**
- **When you are done pumping, pull out the stopper.** You should see a cloud form instantly inside the bottle.
- The reason this works is because by pumping pressure into the bottle, you are creating high pressure inside the bottle. When you open the bottle, the high pressure air comes out quickly into the low pressure air (since pressure likes to spread around), and as this happens, air expands quickly. When air expands quickly, the temperature drops quickly, which causes the water molecules to condense in the bottle.

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## CONCLUSIONS

- Clouds come in all different shapes
- Clouds form when warm, moist air cools down and forms water droplets around tiny dust particles
- Condensation is the change of matter from a gaseous state to a liquid state