



\* Science

# Changes in the Weather

Rudolph, the other reindeer, and Santa faced a challenging problem when fog formed on Christmas Eve, coming quietly and unexpectedly. Just how does fog form, and just where does it come from? The answer lies in two words, "water vapors." It's the key to the mystery.

## Kentucky Science Standards

Patterns, Systems, Scale and Models, Constancy, and Change Over Time  
(2.2-2.6) > Changes in Earth and Sky–Weather Grades 4-6

### Academic Expectations:

- 2.2 Students identify, analyze, and use patterns such as cycles and trends to understand past and present events and predict possible future events  
2.3 Students identify and analyze systems and the ways their components work together or affect each other.

## Ohio Science Standards: Earth and Space Sciences

### Weather (Fog)

#### Benchmarks Grades 4-5

D. Analyze weather and changes that occur over a period of time.

*\*Note: No direct correlation to weather changes for grade 6. Benchmark D requires the description of the formation of rocks and minerals as impacted by weather.*

### Objective:

Students will:

- Identify how existing water in the air develops into fog--fine particles of water floating in the atmosphere near the ground--when the earth cools rapidly, and cool air comes in contact with warm air.
- Understand the effect of fog; causing low visibility due to the formation of 100% humidity at ground level and a high degree of water vapors suspended in the air.

### Assessment:

Students will be able to:

- Explain the role of water vapors in the concept of condensation and in the formation of the weather condition, fog.

Sample selected response items to gauge student understanding:

1. Water exists in the atmosphere in different forms causing changing weather conditions. Identify which condition is formed when the earth cools rapidly and the cool air comes in contact with warm air?
  - a. rain
  - b. snow
  - c. fog
  - d. hail

*Answer: c. fog*

2. Describe what happens on a cold day when you breathe out warm, moist air from your mouth?

*Answer: Warm moist air comes in contact with cold air, cools and condenses to simulate "fog."*

3. Weather is shaped by four conditions—heat or cold (sun), wetness or dryness (earth), clearness or cloudiness (air), and calm or storm (water). Explain the role that these condition play in the formation of fog.

*Answer: The sun heats the air throughout the day to create warm air. The earth provides the foundation (lower level) to "trap" the air as it cools. Air streams move within different temperatures that interact when they come in contact. Water changes as it heats and cools creating water vapors in the form of condensation.*

### **Vocabulary:**

- Fog
- Water vapor
- Condensation

### **Materials:**

For each student group:

- Large clear glass bottle with cork or lid
- Heated water (teacher supervised)
- Liquid measuring tools
- Light source
- Tray or container of ice cubes
- Task instruction sheet (see handout)

For each student:

- Note taking Journal
- Writing tools

### **Activity**

#### **In a Fog**

#### **Teacher will:**

1. Read aloud the poem, *Fog*, by Carl Sandburg. Substitute the word "it" for the word "fog" and have students guess the happening being described in the poem.

**"It"** (fog) comes  
on little cat feet.  
It sits looking  
over harbor and city  
on silent haunches  
and then moves on.

2. Facilitate with students the completion of a KWL chart, first extracting from students their prior knowledge about fog (What I Know). Continue discussion to prompt student inquiry and their questions

- regarding additional information that is needed to understand the weather condition of fog (What I Want to Know).
3. Distribute the Handout, "In a Fog." Introduce the task, individual responsibilities, assign team groups, and provide materials for the exploration of the making of fog. Have a list of materials needed by each group at the supply table for the "Equipment Manager" to use as a checklist.
  4. Instruct students to record group responses and illustrations in journals, upon completion of experimentation review collected data, discuss observations made, and create a summary of the group's work for sharing with classmates.
  5. Monitor group progress by listening to student discussions, asking probing questions, and observation of student hands-on manipulation of materials. Use checkpoints to ensure relevancy of student discussions and that directions are being followed by each group member.
  6. Facilitate a discussion regarding the exploration and information gained about the creation of fog.
  7. Facilitate completion of the KWL chart (What I Learned).
  8. Have students reflect on the production of Rudolph, *the Red-Nosed Reindeer*, by asking their opinion of what knowledge would have been beneficial for Santa and Rudolph to know in recognition of signs of coming fog.

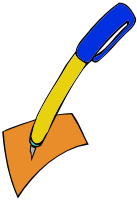


## Science Handout: In a Fog

### Directions:

Your task today is to explore the formation of fog. Follow these steps to help you successfully complete the exploration. Record your group's responses and illustrations on separate paper. Once your group has completed the task, review the collected data, discuss the observations made, and create a summary of your work for sharing with the class.

### Step 1: Assign jobs for each group member.



**Recorder:** writes down the words, descriptions, and/or quantitative observations the group discovers throughout the exploration.



**Illustrator:** creates diagrams with labels for different stages and observations of the exploration.



**Equipment manager:** gathers and handles the materials to complete the exploration.



**Reader/Observer:** reads orally the directions and/or questions for the group and uses reasoning and thinking to make qualitative observations throughout the exploration.

### Step 2: Make a prediction

What do you think will happen as you work through this exploration? Use some scientific vocabulary to state predictions.

### Step 3: Set up and conduct the exploration

- Prepare your table area by removing all unnecessary items
- Review each person's job
- Pour heated water into a glass jar slowly to prevent the glass for shattering

- Remove all but about 3 centimeters of water from the jar. Be careful not to splash!
- Position the jar so the light source is behind it and so it is visible by all group members
- Place the jar directly onto a tray of ice cubes.
- Record observations, quantitative and qualitative, of the water and air inside the jar. Include drawings and diagrams in your note taking.

**Step 4: Review the results and draw conclusions**

- Look over the recorded notes, drawings and diagrams made during the exploration
- Share observations with your group giving each person an opportunity to speak
- Create a group summary that includes actions taken, questions that arose during the exploration, observations made, inferences drawn based upon observations, and a conclusive team statement that scientifically describes what happened to the water in the jar. Record this information on large chart paper.

**Step 5: Share experiences**

- As each group shares their experiences of the exploration, evaluate the inferences made and the conclusions drawn. Keep notes of evidence that supports or questions those statements. When the group finishes, politely pose comments and/or questions that you may have about the data collected and shared.

**Step 6: Reflect**

- Write a letter to Santa and Rudolph explaining why the fog occurred and caused so many problems on Christmas Eve.