

ACTIVITIES

Student Activities *continued*

- 7 Students should explain, in writing, why the smoke was drawn up the opposite chimney, how this is seen in weather if the mixture is large enough, and what this process is called. (The hot air moved upward, displacing the cold air and drawing the nearby, warmed air with it. If a large enough exchange of air occurs, winds or tornados develop. This process is perpetual, and is called convection.)
- 8 Students should synthesize the two experiments to decide whether their original explanation, prediction and hypothesis (steps 3 and 4) were right.
- 9 Students should research to answer the question "How can this natural phenomenon help us to keep air in buildings, planes, or other closed spaces fresher and safer?" Use the internet to find a source, report on their findings in a paragraph they share with the class and synthesize into a proposed class project to build a prototype or proposal of a prototype.

ASSESSMENT

- Vocabulary sheet
- Synthesis of experiments stating whether their original explanation,
- Prediction and hypothesis (steps 3 and 4) were right
- Explanation of convection in weather (step 7)
- Paragraph on safe air

Convection Vocabulary Key:

- **Convection** - transfer of heat vertically through air movement or circulation
- **Density** - the amount of mass in existence
- **Weather** - activity in the atmosphere that includes wind, temperature, cloudiness, moisture, pressure, etc.
- **Perpetual** -unending
- **Vortex** - a spiral or whirling mass of water or air that draws objects with it to the center, or "eye".



TEACHERS GUIDE



**GAS CONVECTION
APPARATUS**
ITEM # 3210-01

ENERGY - HEAT

Also know as Convection Box, Ventilation Apparatus. For demonstrating the phenomenon of convection in air and the principle of room ventilation. Consists of an enameled metal box, having a sliding glass door and two glass chimneys. When the included tea light candle is placed under one chimney and a smoldering tape or parchment paper is placed underneath the other chimney, the flow pattern of smoke dramatically illustrates the formation of convection currents.

Materials

Note: Experiments are most easily seen in small group settings, so multiple Convection Apparatus are suggested.

- Clip of a weather forecast that includes wind or hooks for tornados
- 3 Convection Apparatus
- small aquarium with solid divider
- 2 500ml beakers
- food coloring
- 35g salt
- vocabulary list
- candles
- lighter
- sockets
- tapes or touce papers

Goals & Objectives

Students will:

- describe the forces of nature involved in weather, and how that creates motion or air current.
- Practice hypothesizing and predicting, based on scientific knowledge.
- use scientific knowledge in practical life choices.

DISCUSSION

Enrichment Activities

- 1 How can knowing about convection help me to apply tornado-safety facts?
- 2 How can convection help air quality and avoidance of airborne illness?

ACTIVITIES

- 1 Show students the weather clip.
- 2 Ask students for suggestions on how to forecast the weather. Group students by similar answers if this is workable, (3-4 students per group).
- 3 Ask students if they can use the vocabulary words to either explain what causes weather to develop, or predict what they will learn about weather. Write these on the board, and save to analyze after the experiments. (See attached sheet.)
- 4 Teach students about density as it relates to air. Ask students which rooms in their homes are cooler (or more easily kept cool), the basement or the upstairs. Using that information, students must write a hypothesis about the density of cold air. (Correct ones should somehow state that cold air is more dense than warm air.)
- 5 Tell students that in this experiment water should represent air. Choose a student to dissolve the salt in one beaker of 500ml of water. Another student can add food coloring until color is vivid. Red works well. Yet another student can put a contrasting food color, green or blue, in the other beaker of 500 ml water. Students need to identify which water is most dense.

(The beaker with the salt.) Now one student can pour one beaker in one side of the aquarium, while another student pours the second into the other side. A third student should quickly remove the divider as all students notate their observations. Observations should include which color (density) of water went where. (Salt water, red in this case, What formations did the water create as the water moved? (Was there a swirl effect? What does that remind them of in weather forecasts?)

Note

It is always best to DO an experiment ahead of time to be able to best present it to the class.



- 6 Students should apply their knowledge about density to predict what will happen between hot air and cold air. They now use the convection apparatus. Light the Light the tape or touce paper and set it to smolder under the other chimney. Students should notate where the smoke goes (up the chimney over the candle.)

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STUDENT HANDBOOK

Student Name: _____

1 Use the vocabulary words (see reverse) to explain what causes weather to drop:

5 “How can this natural phenomenon help us to keep air in buildings, planes, or other closed spaces fresher and safer?”

a Research on the Internet and report your findings.

2 Note your predictions on what you will learn about weather:

3 Write down your hypothesis about the density of cold air:

b Propose a class project to build a prototype or proposal of a prototype.

4 Write down your explanation of convection in weather:



V O C A B U L A R Y

6 Convection Vocabulary:

- Convection
- Density
- Weather
- Perpetual
- Vortex

