



# CONTENTS



|                                     |    |
|-------------------------------------|----|
| <b>Introduction</b>                 | 5  |
| <b>Pollution and the Atmosphere</b> |    |
| 1. The Greenhouse Effect            | 8  |
| 2. Car Exhaust Emissions            | 15 |
| 3. Ozone Depletion                  | 21 |
| <b>Packaging and Waster</b>         |    |
| 1. How much Garbage?                | 28 |
| 2. Product Packaging                | 32 |
| 3. Solar Bags                       | 36 |
| <b>Recycling</b>                    |    |
| 1. Hand-made Paper                  | 44 |
| 2. Making Soap                      | 48 |
| <b>Energy and the Environment</b>   |    |
| 1. Energy in the Home               | 56 |
| 2. Which How Water System?          | 63 |
| 3. Nuclear Power Station            | 67 |
| 4. Biogas Generations               | 72 |
| <b>Health and the Environment</b>   |    |
| 1. Water Quality                    | 77 |
| 2. Pollen and Asthma                | 81 |

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# INTRODUCTION



This book contains a compilation of exercises that allow students to explore pertinent environmental issues, and experience the interwoven relationship between *science* and *the environment*. It provides students with the opportunity to develop an understanding of a range of relevant worldwide concerns, within a classroom setting.

This book allows students to experience relevant and topical environmental concerns in a very practical way. It covers a wide scope of issues such as the greenhouse effect, energy, waste and pollution, using examples that can be applied to everyday life.

These activities ask students to solve problems, to think for themselves and make decisions about courses of action to be taken. While the issues are discussed with relevant scientific information, environmental conservation is foremost in the design of these exercises.

Students should find these activities easy to perform as little specialised equipment or materials are needed. Most of the chemicals used in the exercises are found in the home, local supermarket or hardware shop. Many activities are designed for 'hands on' approach by students where each person can arrange and manipulate equipment, and actively involve themselves in the lesson.



TEACHER NOTES:

# THE GREENHOUSE EFFECT



**Age Level**—12 to 17 years.

## **Aims**

- To examine the greenhouse effect on the earth's atmosphere
- To examine the impact of technology on the depletion of resources
- To suggest ways that technology can help to overcome the problem of the greenhouse effect
- To discuss environmental issues and how they effect our society

## **Background Information**

The greenhouse effect is the gradual warming of the earth's atmosphere. This is due to the build up of certain gases that absorb heat in the atmosphere. Carbon dioxide and water vapour are natural greenhouse gases that absorb heat so that our earth allows life as we know it to exist. Without these greenhouse gases the earth would be very cold.

If the amount of carbon dioxide, for example, increases in the atmosphere, more heat will be absorbed and the earth will gradually heat up. Other gases also contribute to the greenhouse effect. Methane, chlorofluorocarbons (CFC's), ozone and nitrogen oxides can absorb heat radiation. Although some of these gases are found in lower concentrations than CO<sub>2</sub>, they have the ability to absorb far more heat than carbon dioxide. It is for this reason that CFC's are now being banned in many places in the world.

It has been estimated that as the earth heats up, the climate will change. The oceans will rise as the water expands and ice caps melt.

This activity simulates the greenhouse effect by measuring the rise in temperature of trapped air in a container.

## **Materials Needed**

- Celsius thermometer
- Plastic ice cream container
- Light source; desk lamp with 75 - 100 W globe
- Retort stand and clamp

## **THE GREENHOUSE EFFECT CONTINUED**



### **Method**

1. Pierce a hole in the bottom of an ice cream container large enough for a thermometer to fit through.
2. Place the thermometer tip through the hole. You may have to support the thermometer with plasticine or Blu-tack™, or use a retort stand and clamp.
3. Position another thermometer alongside the ice cream container. Support it in an upright position.
4. Record the initial temperature of each. Switch on the lamp and position it equidistant but close to the two thermometers.
5. Record the rise in temperature of both thermometers at set intervals. Measurements every minute are sufficient. The experiment should run for at least fifteen minutes, but the effect is noticeable within 10 minutes. You may observe that the temperature of the thermometer in the air rises, reaches a peak and generally levels off. The increase in heat of this thermometer is lost by radiation and convection currents. The thermometer inside the container loses heat less easily and therefore the temperature rises to a higher level. Eventually, it too will level off.
6. Students can be asked to plot a line graph of the results. You may choose to get the students to complete the results table only.
7. Discussion of the greenhouse effect and student answers to the questions could follow.

### **Further Activities**

1. Repeat this activity with other types of containers. Lamp shades, large Milo™ tins, washing bowls and plastic food containers may be suitable.
2. While this activity uses a desk lamp or other light source to heat up the container, it is possible to set up the equipment in sunlight. You may have the facilities to use a large dome-shaped container to better simulate the earth and its atmosphere.



ACTIVITY WORKSHEET:

# THE GREENHOUSE EFFECT



Do you know what a greenhouse is? You might have one in your garden! Greenhouses are built so that plants can germinate and grow at warm temperatures. The earth and its atmosphere act like a large greenhouse. The atmosphere keeps the heat in so that the earth does not become too cold for life to exist.

1. You may have heard of the greenhouse effect and the gases that cause it. Write down what you think the greenhouse effect is.

You will set up some equipment to model this effect. The diagram below will show you what equipment you will need. The container models the role of our atmosphere. It keeps some heat in so that the temperature of the earth is reasonably constant. The average temperature of the earth is about 15°C.

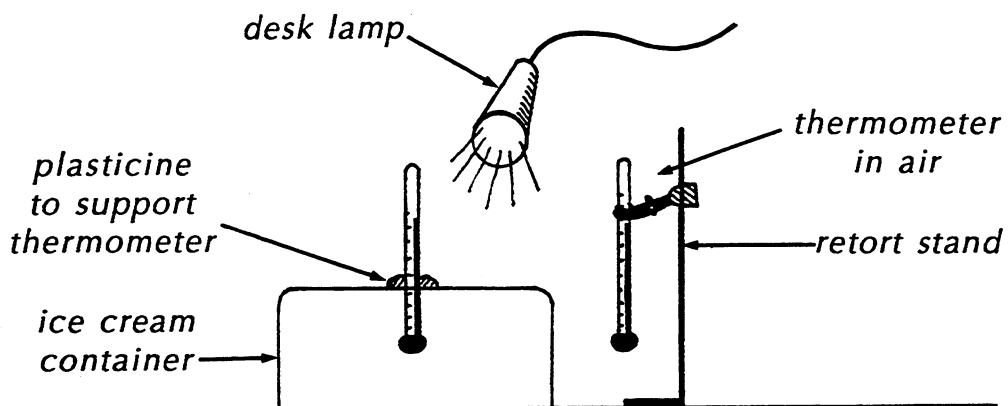


Figure 1: The experimental set-up

You will need to record the temperature changes of both thermometers over a twenty minute period. A graph of your results may help you to answer the questions in this activity.