Measuring Air Pressure

Topic

Measuring air pressure and observing weather features

Introduction

The weight of the air pressing down on the Earth's surface is called air pressure. Although you are unable to notice it, the air around you does not always weigh the same. When air is heavy, it presses down harder onto the Earth's surface than when it is light. Variations in air pressure are mainly due to changing air temperature. When the air is warm, it is light and rises, leaving behind an area of low pressure. When the air is cool, it is heavy and sinks, making an area of high pressure. The atmosphere is always working to balance areas of pressure, so air moves from areas of high pressure into the surrounding areas of low pressure. In this investigation, you will make a barometer to measure air pressure over a week and record relevant weather characteristics.

Time required

15 minutes to make the barometer
5 minutes daily for one week for pressure and weather recording

Materials

wide-mouthed glass bottle (about 18 cm high and 7 cm in diameter at the base)
glass bowl (about 8 cm deep with a diameter of 12 cm at the rim)
2-mm index card (10 cm × 5 cm)
tap water
food coloring
plastic jug or bucket
glue
pen to record data
ruler

Safety note

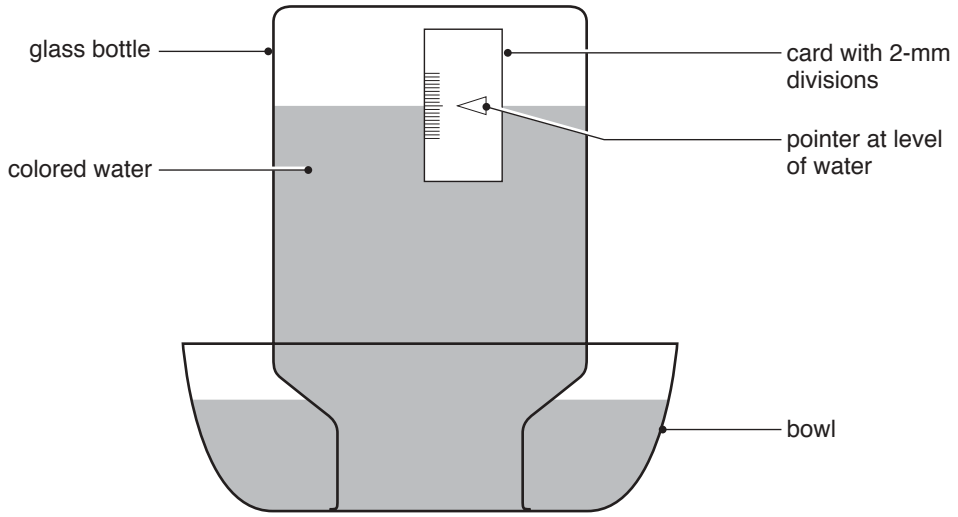
Click the safety icon to view the safety instructions.

Procedure

Part A: Making the barometer

1. Make some colored water by adding a few drops of food coloring to water in the jug or bucket.
2. Fill the bottle to the brim with colored water.
3. Place the empty bowl over the neck of the bottle. Then turn the bottle and the bowl carefully upside down. Make sure the bottle is standing securely on its neck before letting go.

4. Gently let some water out of the bottle until it is about two-thirds full.
5. Draw 2-mm divisions on the piece of card and stick the card to the bottle.
6. Stick a triangle pointer on the card to mark the level of the water in the bottle.
7. Leave your barometer in the shade so it will not be disturbed.



Completed barometer set to start recording air pressure

Part B: Recording data

1. Use the scale on the card to measure how much the water level rises or falls each day. Count the number of divisions up or down from the start and then relative to the previous day's reading. Record your reading in the data table.
2. Record the weather at the time.
3. Make daily readings for a week.

DATA TABLE

Date	Pressure change (mm)	Weather
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Analysis

1. Why did your barometer change as the air pressure changed?
2. What were the characteristics of the weather for the periods of low and high air pressure?
3. How does air pressure affect the weather?

Want to know more?

Special Safety Note To Experimenters

Each experiment includes special safety precautions that are relevant to that particular project. These do not include all the basic safety precautions that are necessary whenever you are working on a scientific experiment. For this reason, it is absolutely necessary that you read, copy, and remain mindful of the General Safety Precautions that follow this note. Experimental science can be dangerous, and good laboratory procedure always includes carefully following basic safety rules. Things can happen very quickly while you are performing an experiment. Materials can spill, break, even catch fire. There will be no time after the fact to protect yourself. Always prepare for unexpected dangers by following basic safety guidelines the entire time you are performing the experiment, whether or not something seems dangerous to you at a given moment.

We have been quite sparing in prescribing safety precautions for the individual experiments. We made this choice for one reason: we want you to take very seriously every safety precaution that is printed in this book. If you see it written here, you can be sure that it is here because it is absolutely critical to your safety.

One further note: The book assumes that you will read the safety precautions that follow, as well as those in the box within each experiment you are preparing to perform, and that you will remember them. Except in rare instances, these precautions will not be repeated in the procedure itself. It is up to you to use your good judgment and pay attention when performing potentially dangerous parts of the procedure. Just because the book does not say BE CAREFUL WITH HOT LIQUIDS or DON'T CUT YOURSELF WITH THE KNIFE does not mean that you should be careless when simmering water or cutting a piece of wood. It does mean that when you see a special note to be careful, it is extremely important that you pay attention to it. If you ever have a question about whether a procedure or material is dangerous, wait to perform it until you find out for sure that it is safe.

GENERAL SAFETY PRECAUTIONS

Accidents caused by carelessness, haste, insufficient knowledge, or taking unnecessary risks can be avoided by practicing safety procedures and being alert while conducting experiments. Be sure to check the individual experiments in this book for additional safety regulations and adult supervision requirements. If you will be working in a lab, do not work alone. When you are working off-site, keep in groups with a minimum of three students per group, and follow school rules and state legal requirements for the number of supervisors required. Ask an adult supervisor with basic training in first aid to carry a small first-aid kit. Make sure everyone knows where this person will be during the experiment.

PREPARING:

—Clear all surfaces before beginning experiments

—Read the instructions before you start

—Know the hazards of the experiments and anticipate dangers

PROTECTING YOURSELF:
—Follow the directions step-by-step; do only one experiment at a time
— Locate exits, fire blanket and extinguisher, master gas and electricity shut-offs, eyewash, and first-aid kit
—Make sure there is adequate ventilation
—Do not horseplay
—Keep floor and workspace neat, clean, and dry
—Clean up spills immediately
—Never eat, drink, or smoke in the laboratory or workspace
— Do not eat or drink any substances tested unless expressly permitted to do so by a knowledgeable adult
— Be careful not to slip or fall into the water when working near rivers and streams, and do not enter water that is deeper than your rubber boots.
— Do not enter fast-moving water, floodwater, or rivers/streams where the water level is higher than normal

USING EQUIPMENT WITH CARE:
—Set up apparatus far from the edge of the desk
—Use knives and other sharp or pointed instruments with caution
—Pull plugs, not cords, when removing electrical plugs
—Clean glassware before and after use
—Check glassware for scratches, cracks, and sharp edges
—Clean up broken glassware immediately
—Do not use reflected sunlight to illuminate your microscope
—Do not touch metal conductors
—Use alcohol-filled thermometers (do not use mercury-filled thermometers)

USING CHEMICALS:
—Never taste or inhale chemicals
—Label all bottles and apparatus containing chemicals
—Read labels carefully
—Avoid chemical contact with skin and eyes (wear safety glasses, lab apron, and gloves)
—Do not touch chemical solutions
—Wash hands before and after using solutions
—Wipe up spills thoroughly

HEATING SUBSTANCES:
—Wear safety glasses, apron, and gloves when boiling water
—Keep your face away from test tubes and beakers
—Use test tubes, beakers, and other glassware made of Pyrex™ glass
—Never leave apparatus unattended
—Use safety tongs and heat-resistant gloves
— If your laboratory does not have heat-proof workbenches, put your Bunsen burner on a heat-proof mat before lighting it
— Take care when lighting your Bunsen burner; light it with the airhole closed and use a Bunsen burner lighter in preference to wooden matches
—Turn off hot plates, Bunsen burners, and gas when you are done
—Keep flammable substances away from flames and other sources of heat
—Have a fire extinguisher on hand