











































My Weekly Weather Journal

Week: _____

Date	Weather			Temperature	Rainfall	Wind Strength	Wind Direction
Mon	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Tue	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Wed	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Thu	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Fri	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Sat	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Sun	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	

Weather Forecast

Mon	Tue	Wed	Thu	Fri	Sat	Sun

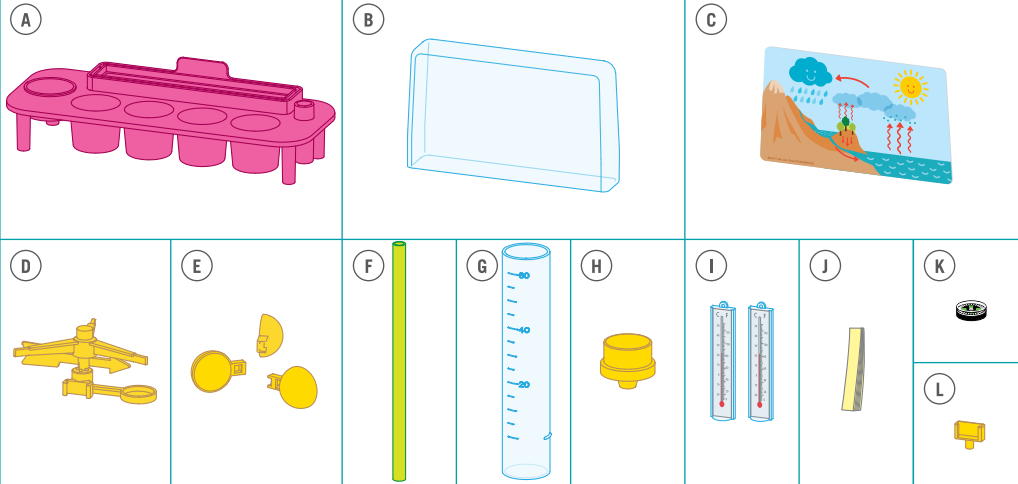
STEAM

POWERED GIRLS™

WEATHER STATION

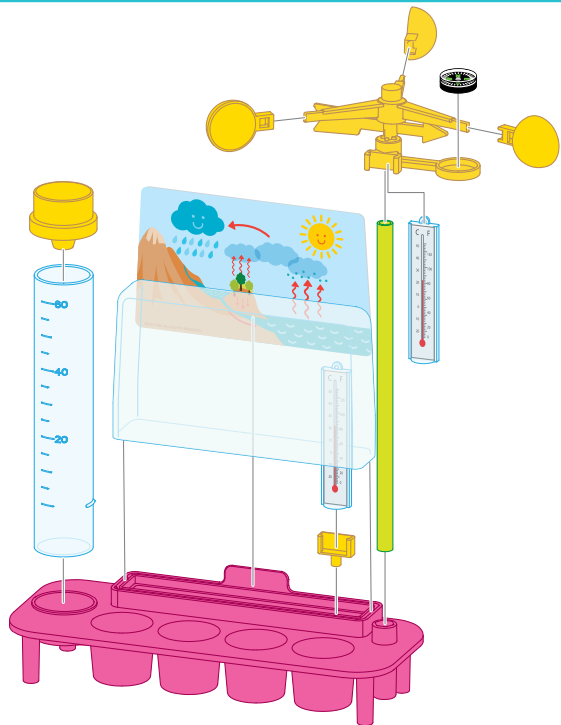


A. CONTENT



Part A: Base with seed tray x 1, Part B: Transparent cover x 1, Part C: Water cycle backdrop x 1, Part D: Wind vane and anemometer hub x 1, Part E: Anemometer cup x 3, Part F: Plastic tube x 1, Part G: Rain gauge x 1, Part H: Funnel cover x 1, Part I: Thermometer x 2, Part J: pH paper, Part K: Compass x1, Part L: Thermometer stand x 1, and detailed instructions.

B. ASSEMBLING THE WEATHER STATION



WHAT IS WEATHER?

Weather is made up of many different phenomena like temperature, precipitation (things that fall from the sky such as rain, hail, sleet and snow), sunshine, wind direction and force, cloud, lightning, etc. In this kit, there are altogether 5 experiments, some of which also involve sub-activities. Are you ready to be a little meteorologist?

HOW TO ASSEMBLE?

Put the thermometer into the thermometer stand and insert it into the base. Then cover it with the transparent cover. Insert the card behind the transparent cover. Insert the rain gauge to the base and put on the funnel cover. Insert the plastic tube to the base. Cover the plastic tube with the wind vane and anemometer hub set. Slot the three cups into the hub, making sure that they all point in the same direction (all clockwise or all anticlockwise). Push the compass into the hole in the centre of the arm. Slide the thermometer down into the brackets on the end of the arm until it stops.

HOW DOES IT WORK?

Your weather station is designed to measure wind, rainfall and temperature. The anemometer and wind vane measure the wind. The anemometer cups catch the wind and make the anemometer spin. The faster it spins, the higher the wind speed. Look at the compass and see which way the wind vane is pointing to know the wind direction. The compass contains a magnetized metal disc. Its magnetic poles are lined up with the N and S letters, which show north and south. The disc spins so that the poles point towards the Earth's magnetic poles. The rain gauge measures how much rain has fallen. The funnel catches the rain and helps stop the water in the tube from evaporating. The thermometer measures air temperature. The special liquid inside the bulb expands and reaches up when it heats up, showing a higher temperature. The liquid contracts again when it cools.

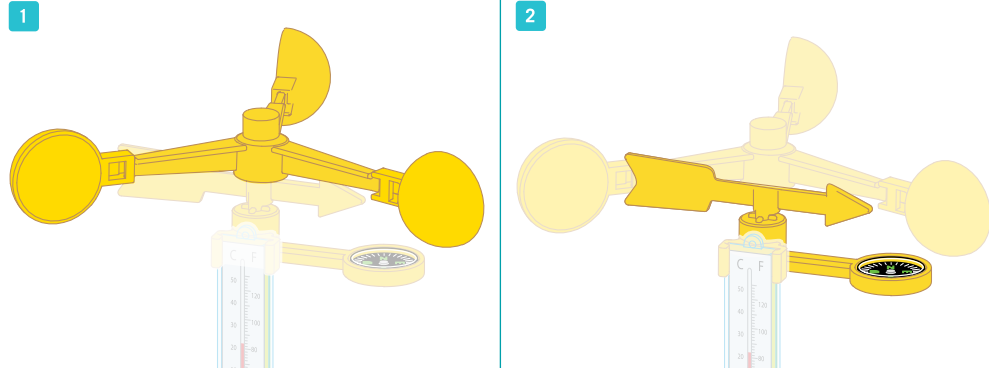
TROUBLESHOOTING

- If the anemometer or the wind vane do not spin freely, they may be trapped by their spindles. Pull the spindles up slightly to free the anemometer or wind vane. You may also polish the spindles with a sand paper or add a bit cooking oil as lubrication.
- If the weather station topples over, add some more water, and make sure the rain gauge is standing on a flat surface.
- If the compass is not turning freely, give it a gentle tap.
- If the rain gauge does not fill up during rain, make sure that it is not sheltered.

C. WIND

Winds are simply made by air moving from place to place. Air starts moving because it gets warmed by the ground and then rises upwards. This activity shows you how warm air rises.

What you need from your kit: A compass, a wind vane, an anemometer, a plastic tube, a base with seed trays.



1. Anemometer: it does not have a scale to read, but by watching it, you can estimate if the wind is calm, light, breezy or strong. Write down your estimation.

2. Wind vane: look at the compass and estimate which way the arrow on the wind vane is pointing (N, W, SE, and so on). Write down the direction.

HOW DOES IT WORK?

The anemometer and wind vane measure the wind, with the anemometer catching wind and spinning to show speed, and the wind vane turning to show direction. To help with this, the compass set into the wind vane contains a magnetised metal disc, the poles of which align with N (north) and S (south); the disc spins so that the poles always point towards the Earth's magnetic poles.

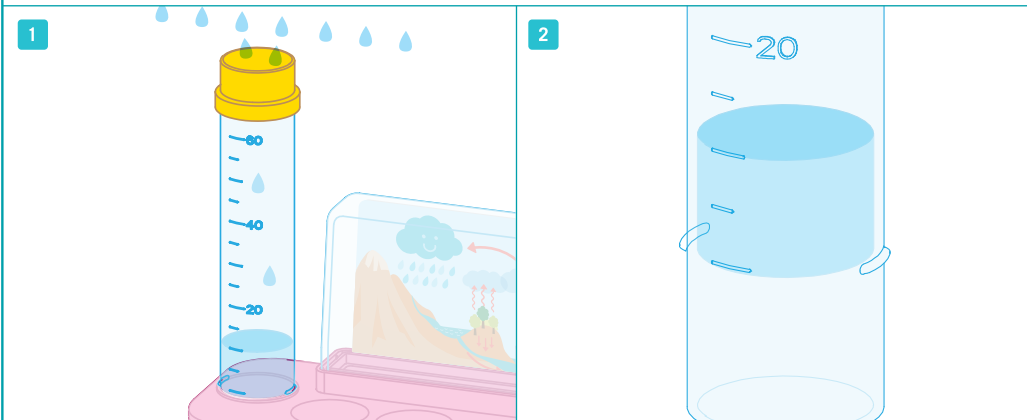
WANT TO KNOW MORE?

- You can see how rising air causes winds when you visit the seaside on a hot day.
- The Sun heats the land, making it warm. The land heats the air above, making the air warm. The air rises, and is replaced by cool air flowing in from over the sea. This flowing air is called a sea breeze.
- Glider pilots and birds of prey (such as vultures) use rising air currents to carry them up into the air. The rising currents they use are called thermals.

D. RAIN

When water droplets condense from atmospheric water vapor and then become heavy enough to fall under gravity, they become rain. Rain is a major component of the water cycle and deposits most of the fresh water on the Earth. Different amount of rainfall creates various types of ecosystems, and closely relate to the living of animals and plants.

What you need from your kit: A rain gauge, a funnel cover.



1. Place the setup outdoor. Make sure the rain gauge is not covered or sheltered. Let the rain gauge collect the rain droplets when it rains.

2. Hold it vertical and measure the rainfall by reading the marking. Remember to keep the rain gauge at your eye's level so that the reading is correctly taken. Write down your reading.

WANT TO KNOW MORE?

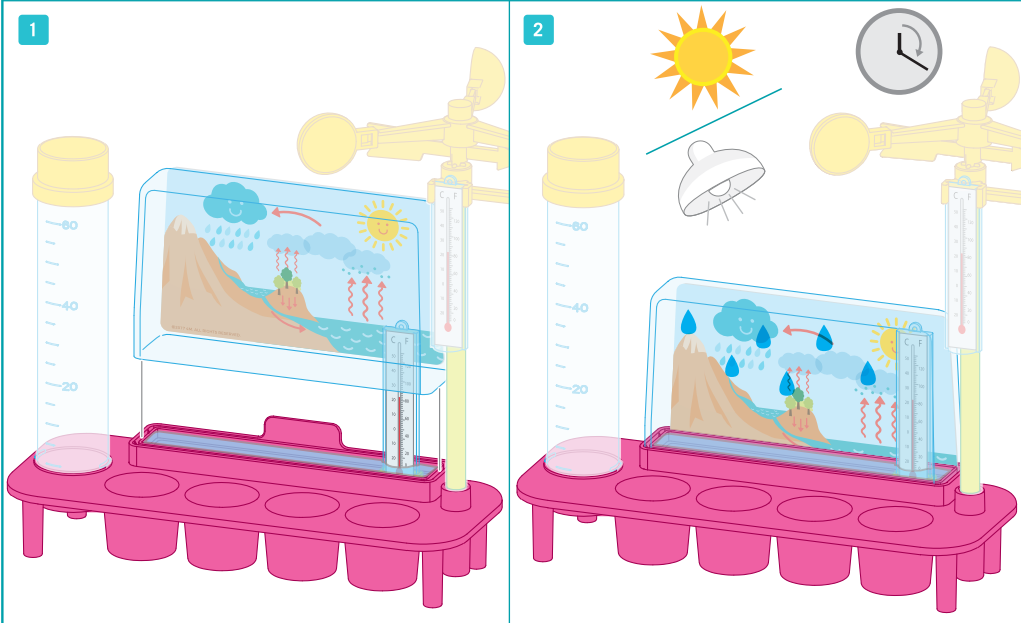
- When there is a rainstorm, the heavy and persistent rainfall can cause severe traffic disruption and even major floods and landslips.
- The weather in the tropics is dominated by the tropical rain belt, which moves from the northern to the southern tropics and back over the course of the year. When the tropical rain belt lies in the southern hemisphere, the northern tropics will have a dry season with sparser precipitation, and days are typically sunny throughout.
- The dry season has very low rainfall, some watering holes and rivers will dry up. The lack of water causes crops to wilt and animals to migrate or die because of shortage of food.

E. WATER CYCLE

In this activity, you can make a mini model of the water cycle to demonstrate water evaporation and rain formation.

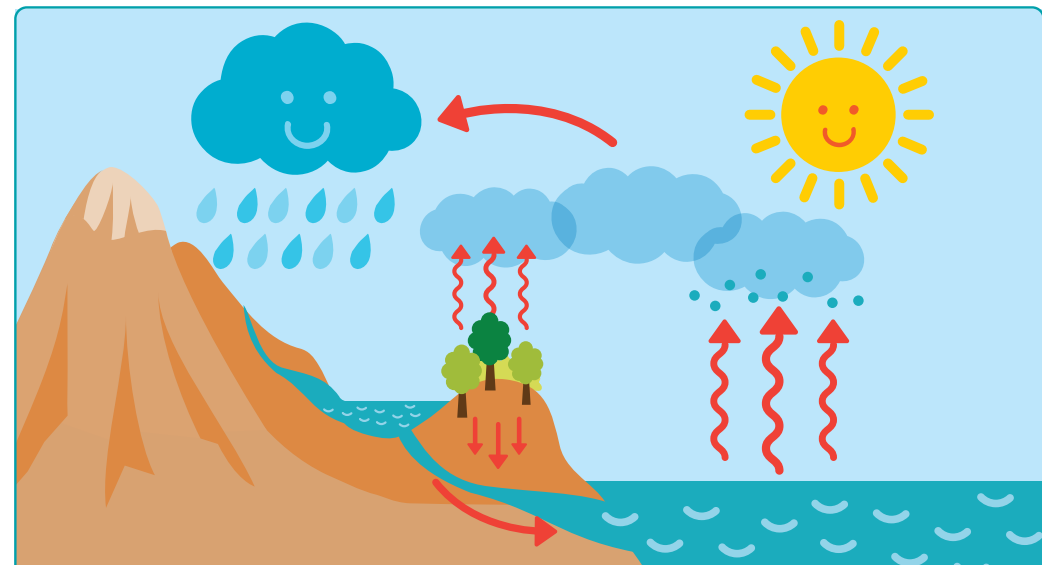
What you need from your kit: A base with seed tray, a plastic cover, a thermometer, a thermometer stand, a water cycle backdrop.

What you need from home: Water, a desk lamp.



1. Set up as shown in the diagram. Pour some water into the tub and then cover with the transparent cover. Place water cycle backdrop behind the cover.

2. Place the model outdoors under sunshine, or alternatively put a desk lamp (a 60-watt incandescent light bulb) about 15 cm (6 inches) away from the glass and switch it on. Ask an adult to help you with the desk lamp, as it could get hot. Wait for a couple of 10 minutes, you will see some water droplets condensed and formed on the cover. This is how rain is formed.



HOW DOES IT WORK?

The heat from the desk lamp or the Sun makes the water inside the base warm. This makes some water evaporate into the air inside the case. The warm air rises to the top of the case, where the plastic cover cools it down. The water vapour in the air condenses, forming water droplets underneath the cover. When there is enough water, it drips down then runs back into the water inside the base. This is a mini model of the water cycle. The water inside the base represents the ocean, the plastic cover represents a cloud, and the dripping water represents rain. You will also notice some rain water collects in the small dip in the mountain, which represents a lake. In real life, this would be fresh water because the minerals that make sea water salty are left behind in the sea when the water evaporates. Some water will seep through the soil, and collect in the base of the mountain. This represent underground water.

WANT TO KNOW MORE?

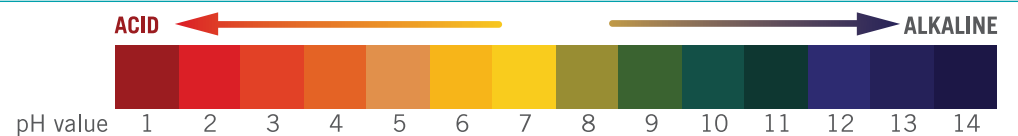
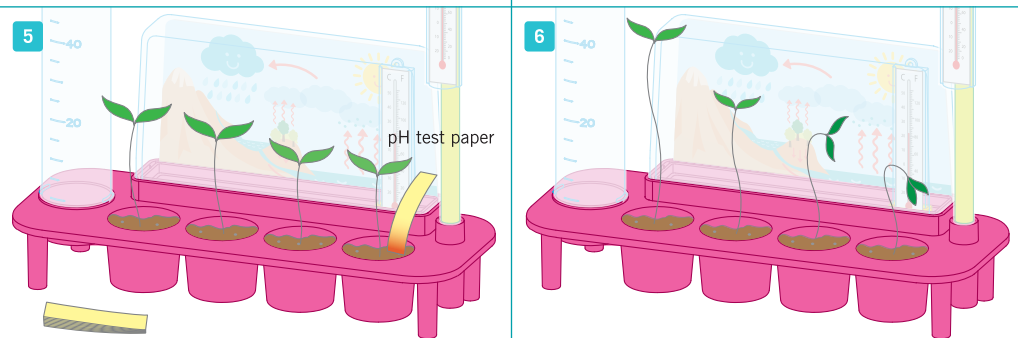
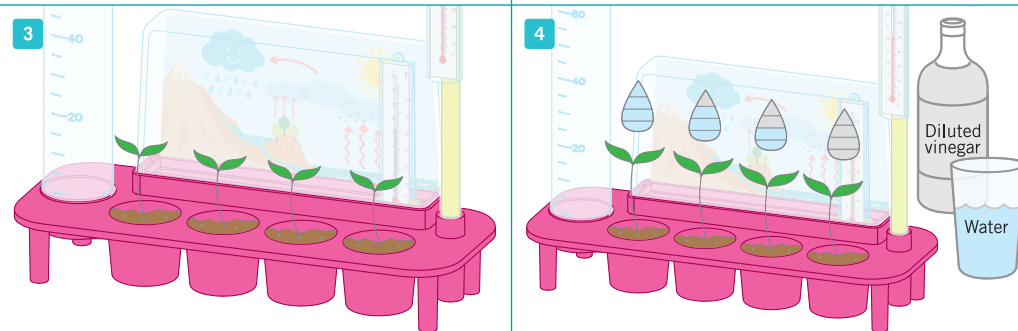
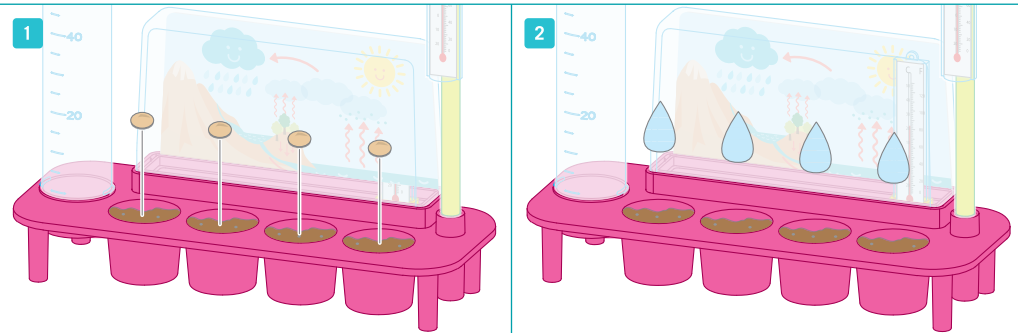
- The water in the oceans is salty, but rain is made of fresh water. That's because the minerals in the sea are left behind when the water evaporates.
- In a hundred years, an average particle of water spends 98 years in the ocean on its way round the water cycle.
- Only about one hundredth of a thousandth of all the water on Earth is in the atmosphere at one time.
- The water going round the water cycle today is the same water that was going round the water cycle when the dinosaurs were alive.

F. ACID RAIN

When we burn some sorts of fossil fuels, such as coal, gases are released into the air. These gases include sulphur dioxide and nitrogen oxides. When these gases mix with water droplets in clouds, they make materials called acids. When the water falls from the clouds, it is known as acid rain. Acid rain harms plants that it falls on, even large trees. It also harms animals in rivers and lakes. In this activity you can see how acid affects the growth of plants.

What you need from your kit: A seed tray, pH paper.

What you need from home: Vinegar, cotton pads or compost, some beans (such as runner beans or mug beans).



1. Fill each compartment of the seed tray with a cotton pad, or with some compost. Wash your hands after handling compost. Put a bean into each compartment, and water the cotton pad or compost to make it damp.
2. Put the seed tray somewhere warm. Add a little water to keep the cotton or compost damp.
3. Now you need to wait until the beans germinate (that means a shoot grows upwards and a root grows downwards from the bean). This could take a few days. Keep adding a little water to keep the cotton or compost damp. When the beans have germinated, put the beans by a window, where they will get some light.
4. Put 250 ml of water into a clean jar. Add two teaspoons (10 ml) of vinegar to the water to make diluted vinegar. Now water plants as follows each day, for five days:
 - Plant 1: 2 teaspoons (10 ml) of plain water only
 - Plant 2: 0.5 teaspoon (2.5 ml) of diluted vinegar from your jar, and 1.5 teaspoons of plain water
 - Plant 3: 1 teaspoon (5 ml) of diluted vinegar, and 1 teaspoon of plain water
 - Plant 4: 1.5 teaspoon (7.5 ml) of diluted vinegar from your jar, and 0.5 teaspoon (2.5 ml) of plain water
5. After five days, test the pH of each pot. To test a pot, press a small piece of pH test paper into the soil. Match the colour of the paper against the pH colour scale and write down the pH values. Different colours indicate the degree of acidity and alkalinity. For example, red is very acidic, purple is very alkaline, and yellow is neutral. The level of acidity or alkalinity can also be represented with numbers, with 1 = very acidic, 7 = neutral and 14 = very alkaline. Here are the pH values of some household materials e.g. tap water = pH7, tea = pH6, coffee = pH4, vinegar= pH3 tomato = pH8, olive oil = pH9.
6. After five days, look at your plants. Which plants have grown best?

WRITE DOWN THE TEST RESULTS ON THE FOLLOWING TABLE:

PLANT	1	2	3	4
Water (teaspoon)	2	1.5	1	0.5
Diluted vinegar (teaspoon)	0	0.5	1	1.5
PH indicator colour				
PH value				
Observation				

WHAT HAPPENED?

You should find that the plant grown in plain water grows best, and the plant grown with most vinegar grows least well. Vinegar contains acid that damages the plants so they can't grow properly. The acid in acid rain is a different sort of acid, but it affects plants in the same way.

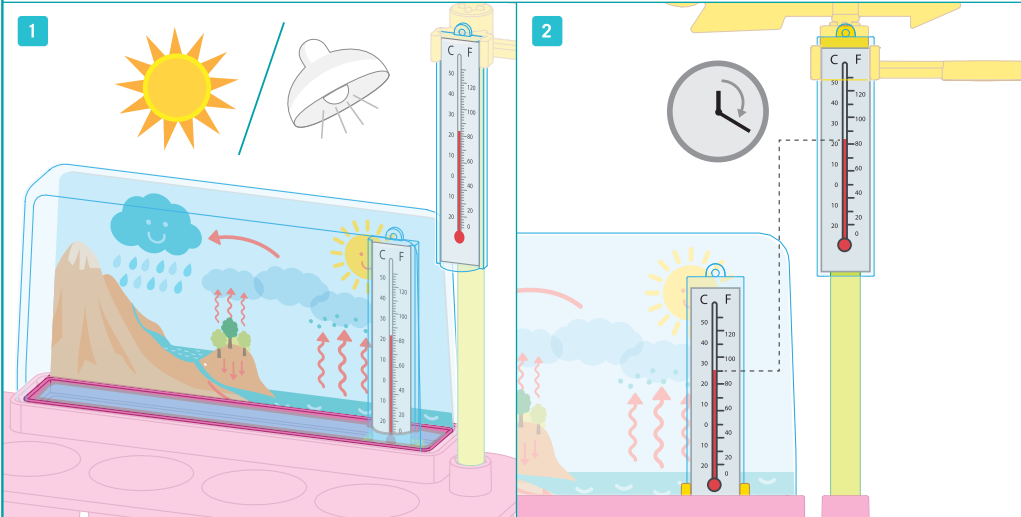
The pH paper shows the acidity of the soil in each pot. The lower the pH number is, the more acidic the soil is. The pot with the most vinegar added to it will be the most acidic. PH paper contains special chemicals called indicators that change colour when they touch acids (or chemicals called alkalis, which are the opposite of acids).

G. GREEN HOUSE EFFECT AND GLOBAL WARMING

The Earth is wrapped in a blanket of air called the 'atmosphere', which is made up of several layers of gases. The Sun is much hotter than the Earth and it gives off rays of heat (radiation) that travel through the atmosphere and reach the Earth. The greenhouse effect is a way in which the Earth's atmosphere traps heat from the Sun. This makes the planet warm. Without the greenhouse effect, the Earth would be a much colder place. Certain gases in the atmosphere are better at trapping heat than others. A gas called carbon dioxide is one of the best.

What you need from your kit: a base with seed tray, a water cycle and greenhouse effect demonstration set, 2 thermometers, a thermometer stand.

What you need from home: a desk lamp, baking soda, vinegar. Important: ask an adult before using a desk lamp, as the lamp could get very hot.



1. Set up as shown in the diagram. Place the set up outdoors under sunshine, or alternatively stand the set up on a desk near a desk lamp with a 60 - watt incandescent light bulb. The thermometers should face away from the lamp so that the lamp does not heat the thermometer bulb, and both should be the same distance about 15 cm (6 inches) from the lamp.

2. Wait for about 20 minutes. Then look at the thermometers again and write down the readings. How much has the temperature risen inside and outside the bottle?

HOW DOES IT WORK?

The lamp or the Sun warms the set up, and this warms the air inside the case, which makes the temperature of the air trapped inside the case rise. The lamp also heats the air around the thermometer outside the set up, but this time, the warm air can escape and be replaced by cooler air, so the temperature does not rise as high as the temperature inside the case. The plastic cover acts like the Earth atmosphere. It demonstrates how the Earth's atmosphere traps heat.

FOLLOW-UP EXPERIMENT

1. Take the thermometer out from the base and put it to one side to allow the thermometers to return to room temperature.
2. Put a teaspoon of baking soda and two teaspoons of vinegar into the water inside the base, and stir gently. Wait ten seconds and then put the thermometer back onto the stand.
3. Now repeat steps 1 and 2 on the previous page. This time, has the temperature in the case risen more than it did the first time? The baking soda and the vinegar react together to make a gas called carbon dioxide, and this mixes with the air in the case. Carbon dioxide is good at trapping heat. It traps some of the heat that passes through the case. So this time the temperature in the case rises higher. This shows that adding carbon dioxide to the air in the case makes the air trap more heat. This is what is happening in the Earth's atmosphere. We are adding carbon dioxide to the atmosphere, which is causing the phenomenon of global warming











































WANT TO KNOW MORE?

- Carbon dioxide is known as a greenhouse gas. Other greenhouse gases include water vapour and methane.
- Global warming is the slow warming of the atmosphere. It is happening because we are adding carbon dioxide to the atmosphere.
- The carbon dioxide comes from burning fossil fuels (oil, gas and coal), and from cutting down forests.
- Melting glaciers and retreating ice around the North Pole are visible signs of global warming.
- Since 1970, the average global temperature has been risen at a rate of roughly 0.15°C per decade.

H. MY WEEKLY WEATHER JOURNAL

Write down the readings over a week. Try to take readings at the same time of each day to improve accuracy. Compare your readings with those of the local observatory to see how accurate your records are. You may photocopy this page or make similar charts to continue recording for another weeks. Share the records you made with your friends and family!

Week: _____











































Date	Weather			Temperature	Rainfall	Wind Strength	Wind Direction
Mon	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Tue	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Wed	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Thu	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Fri	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Sat	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Sun	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	

Weather Forecast

Mon	Tue	Wed	Thu	Fri	Sat	Sun

My Weekly Weather Journal

Week: _____





























Date	Weather			Temperature	Rainfall	Wind Strength	Wind Direction
Mon	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Tue	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Wed	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Thu	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Fri	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	
Sat	 Sunny	 Cloudy	 Windy			Breeze <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Strong <input type="checkbox"/>	
Sun	 Sunny	 Cloudy	 Windy			Calm <input type="checkbox"/>	
	 Rainy	 Stormy	 Snowy			Light <input type="checkbox"/>	

Weather Forecast

Mon	Tue	Wed	Thu	Fri	Sat	Sun

My Weekly Weather Journal

Week: _____





























Date	Weather	Temperature	Rainfall	Wind Strength	Wind Direction
Mon	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Tue	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Wed	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Thu	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Fri	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Sat	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Sun	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	

Weather Forecast

Mon	Tue	Wed	Thu	Fri	Sat	Sun

My Weekly Weather Journal

Week: _____

Date	Weather	Temperature	Rainfall	Wind Strength	Wind Direction
Mon	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Tue	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Wed	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Thu	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Fri	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Sat	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	
Sun	 Sunny			Calm <input type="checkbox"/>	
	 Cloudy			Light <input type="checkbox"/>	
	 Windy			Breeze <input type="checkbox"/>	
	 Rainy			Strong <input type="checkbox"/>	

Weather Forecast

Mon	Tue	Wed	Thu	Fri	Sat	Sun