

# Atmosphere

## Activity 12-Atmosphere- Greenhouse Effect

Activity	Greenhouse Effect
Objectives	To understand how the greenhouse effect affects the world.
Duration of activity	1 hour
Materials Needed	<p><b>5 Jars</b> – Using all 5 jars provides an opportunity to apply scientific theory and the <b>scientific method</b>.</p> <p><b>Vinegar</b> – White, standard vinegar is best.</p> <p><b>Baking Soda</b> – Also known as sodium bicarbonate or bicarb. Don't use Baking Powder! It is a completely different chemical formula.</p> <p><b>Measuring cups and spoons</b> – Important for accuracy during testing.</p> <p><b>Plastic Wrap</b> – Also known as clingfilm. It must be clear and able to seal tightly without tearing. I know we don't want to use plastic, but in this case it is what we need for this science experiment. You can try it with other materials, but we struggled to get the desired results. You can always save the plastic and</p> <p><b>Elastic bands</b> – Large enough to fit over the mouth of the jar to secure the plastic wrap.</p> <p><b>Heat Source</b> – You can use a sunny window sill if you live somewhere with lots of hot direct sunlight, or use a heat lamp, space heater, or in our case we used a heat vent/radiator. It just needs to provide lots of heat evenly between the jars.</p> <p><b>Thermometer</b> – We have a non-contact infrared thermometer that worked perfectly. The kids LOVE using this type of thermometer in their science experiments but you can also use standard dual scale thermometers. If you use standard thermometers you will need</p>

	<p>one for each jar and a small knife or sharp scissors.  <b>Masking Tape and Sharpie</b> – For labeling the jars</p>
<p>Method</p>	<p><b>Directions</b></p> <p><b>1) Prepare the Jars</b></p> <p>Start by labelling the jars. You will want:</p> <ul style="list-style-type: none"> <li>• Air (control)</li> <li>• Vinegar (control)</li> <li>• Baking Soda (control)</li> <li>• Reaction</li> </ul> <p>2) The fifth jar does not need to be labelled, that one you will also be doing the reaction in, but without the plastic covering. However, if you want to label it, go ahead!</p> <p>3) The reason we are doing all of these controls, is that we want to show that it is not just the vinegar or just the baking soda, or just the chemical reaction causing our result. We want to prove it is the trapped carbon dioxide gas.</p> <p>4) Prepare a piece of plastic wrap big enough to cover the mouth of the jar with a bit of extra down the sides so it can be sealed completely. Repeat for 4 jars. Also add an elastic band for each piece of plastic wrap.</p> <p>5) Place plastic wrap on the air jar and secure it with an elastic.</p> <p>6) Add 1/4 up of vinegar to the vinegar jar, then cover with plastic wrap and secure with an elastic.</p> <p>7) Add 1 tablespoon of baking soda to the baking soda jar, cover with plastic wrap and secure with elastic.</p> <p><b>Reaction Time!</b></p> <p>8) This next step is easiest with two people. Have one person read with the plastic wrap and elastic. The other person will add the baking soda to the jar, then add the vinegar. <b>VERY QUICKLY</b> place the plastic wrap over the mouth of the jar and secure it with an elastic. We need to capture the gases from the reaction, so work fast!</p> <p><b>Here comes the sun</b></p> <p>9) Now place the jars in front of your heat source. Ensure they are positioned so they will all be heated evenly. We used a heat register/radiator to evenly apply heat. A windowsill in the bright sun would work well too. Leave the jars with the heat for 5 to 10 minutes. We tested at both the 5 minute and 10 minute mark.</p> <p>This heat source is replicating the warming effect of the sun.</p>

### **Chemical Reaction Comparison**

10) While the four jars are warming, take your fifth jar. Add 1 tablespoon of baking soda and 1/4 cup of vinegar. Watch the bubbly reaction! After about 30 seconds take a temperature reading. What do you notice? Baking soda and vinegar is an endothermic reaction! This is extremely interesting in the context of this greater experiment.

### **Temperature check**

11) After your jars are warmed, it is time to take temperature readings.

12) If you are using a non-contact infrared thermometer, have your students take temperature readings from each jar, we found it best to aim straight down into the jar.

13) If you are using a standard thermometer, make a small slit in the plastic top of each jar, just big enough to slip the thermometer in without letting too much air escape. Place a thermometer in each jar. Wait one minute, then remove the thermometer and check the temperature readings.

What do you notice about the temperature readings? Record your results!

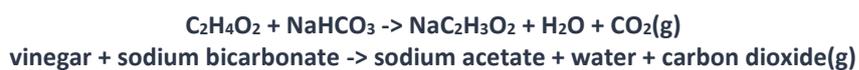
### **Greenhouse Effect Results**

14) The chemical reaction in the enclosed jar is warmer than all the other jars with plastic covering. Those control jars are all about the same temperature. The coldest jar is the chemical reaction with no plastic covering. So cool!

### **The Greenhouse Science**

15) The chemical reaction between baking soda and vinegar is an acid-base reaction. Baking soda is a base and vinegar is an acid. When we combine them, they react in a bubbly, endothermic reaction. Endothermic means it becomes colder during the reaction.

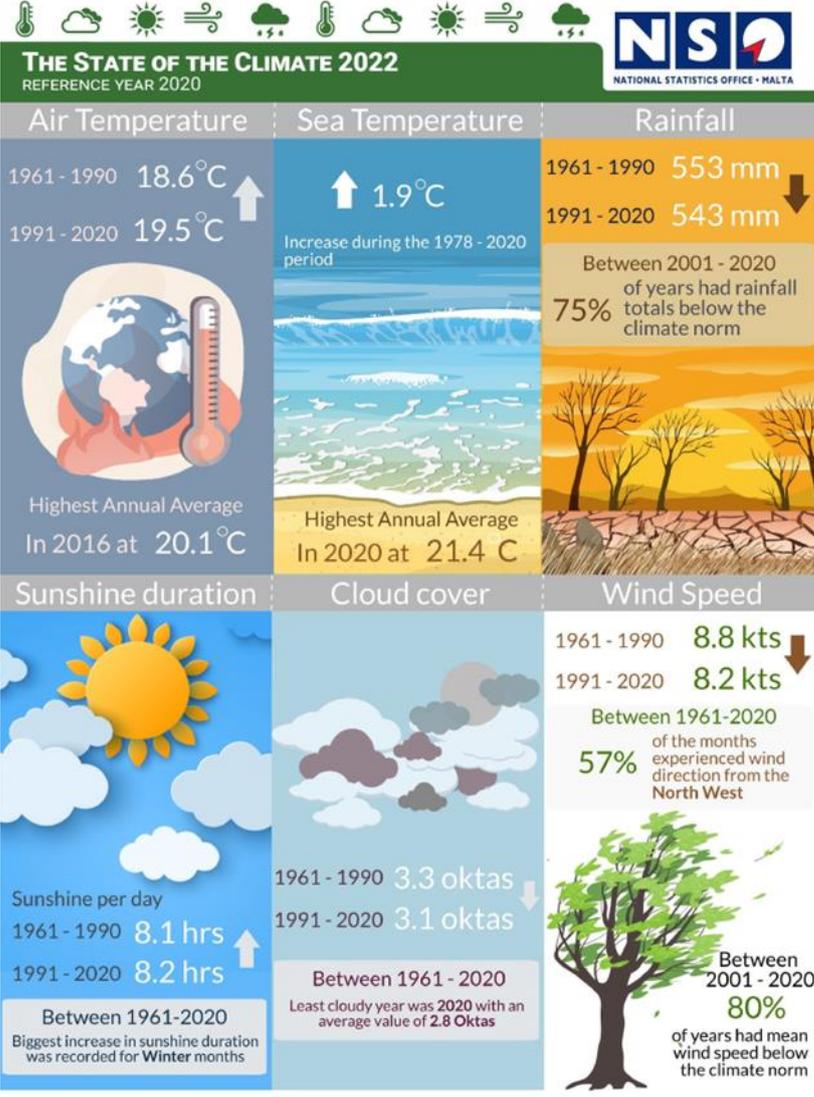
***Here is the chemical formula of this reaction***



The carbon dioxide is a gas, just like it is in the atmosphere, where it is one of the greenhouse gases.

# Activity 13-Atmosphere-Data Collection

Activity	Data Collection
Objectives	1)To understand how to read infographics 2)To compile information on the different topics and present findings to the class 3)To understand more about the earth's atmosphere
Subject	Maths and English
Age group	8-10
Individual or Group Activity	Both
Classroom or Field Activity	Classroom
Duration of Activity	1 hr

<p>Materials</p>	<p>Internet</p> <p>Tablets</p> <p>Paper and pen</p> <p>Squared paper for bar graphs</p>																		
<p>Method</p>	 <p><b>THE STATE OF THE CLIMATE 2022</b> REFERENCE YEAR 2020</p> <p><b>NATIONAL STATISTICS OFFICE - MALTA</b></p> <table border="1"> <thead> <tr> <th>Air Temperature</th> <th>Sea Temperature</th> <th>Rainfall</th> </tr> </thead> <tbody> <tr> <td>1961 - 1990 18.6°C 1991 - 2020 19.5°C ↑</td> <td>↑ 1.9°C Increase during the 1978 - 2020 period</td> <td>1961 - 1990 553 mm 1991 - 2020 543 mm ↓</td> </tr> <tr> <td>Highest Annual Average In 2016 at 20.1°C</td> <td>Highest Annual Average In 2020 at 21.4 C</td> <td>Between 2001 - 2020 of years had rainfall totals below the climate norm 75%</td> </tr> <tr> <th>Sunshine duration</th> <th>Cloud cover</th> <th>Wind Speed</th> </tr> <tr> <td>Sunshine per day 1961 - 1990 8.1 hrs 1991 - 2020 8.2 hrs ↑ Between 1961-2020 Biggest increase in sunshine duration was recorded for Winter months</td> <td>1961 - 1990 3.3 oktas 1991 - 2020 3.1 oktas ↓ Between 1961 - 2020 Least cloudy year was 2020 with an average value of 2.8 Oktas</td> <td>1961 - 1990 8.8 kts 1991 - 2020 8.2 kts ↓ Between 1961-2020 of the months experienced wind direction from the North West 57%</td> </tr> <tr> <td></td> <td></td> <td>Between 2001 - 2020 80% of years had mean wind speed below the climate norm</td> </tr> </tbody> </table> <p>The Official climate norm period for Malta is 1961-1990</p>	Air Temperature	Sea Temperature	Rainfall	1961 - 1990 18.6°C 1991 - 2020 19.5°C ↑	↑ 1.9°C Increase during the 1978 - 2020 period	1961 - 1990 553 mm 1991 - 2020 543 mm ↓	Highest Annual Average In 2016 at 20.1°C	Highest Annual Average In 2020 at 21.4 C	Between 2001 - 2020 of years had rainfall totals below the climate norm 75%	Sunshine duration	Cloud cover	Wind Speed	Sunshine per day 1961 - 1990 8.1 hrs 1991 - 2020 8.2 hrs ↑ Between 1961-2020 Biggest increase in sunshine duration was recorded for Winter months	1961 - 1990 3.3 oktas 1991 - 2020 3.1 oktas ↓ Between 1961 - 2020 Least cloudy year was 2020 with an average value of 2.8 Oktas	1961 - 1990 8.8 kts 1991 - 2020 8.2 kts ↓ Between 1961-2020 of the months experienced wind direction from the North West 57%			Between 2001 - 2020 80% of years had mean wind speed below the climate norm
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<p>Method</p>	<p>Look at this infographic and discuss the data in your class.</p> <ol style="list-style-type: none"> <li>Use kiddle.co (search engine for kids) to search for information about this data. e.g. Increase in air temperature (how does it affect us?/why is this happening? what can we do?)</li> </ol>																		

	<p>2. Split the class into groups so that each group delves deeper into the different topics and their connection to climate change. Ask each group to present their findings to the whole class.</p> <p>b) You can also take this lesson a step further and ask each group to draw a bar graph on each topic, after further research. For example a bar graph on the difference between air temperature from the 1960s to the present. This can be done if further research is done in addition to the infographic's information.</p>

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# Atmosphere- Activity 14- Carbon Dioxide Experiment

Activity	Carbon Dioxide Experiment
Objectives	To understand that upon certain reactions carbon dioxide is emitted into the atmosphere and it is responsible for temperature rise
Subject	Science
Age group	7-10
Individual or Group Activity	Optional
Classroom or Field Activity	Class
Materials	1 balloon 1 bottle 1 kitchen funnel 1/2 cups of vinegar 2 teaspoons of baking soda
Method	<p><b>Step 1:</b> Start with pouring 1/2 cups of vinegar into your bottle.</p> <p><b>Step 2:</b> Using the funnel, add 2 teaspoons of baking soda into your balloon. It's important to make sure that the baking soda goes to the large, bottom area of the balloon.</p> <p><b>Step 3:</b> Now it's time to connect the bottle to the balloon! Stretch the balloon around the neck of the bottle (which is already filled with vinegar). Make sure that the baking soda remains in the balloon by holding the top of the balloon over one side of the bottle while attaching it to the bottle's neck.</p> <p><b>Step 4:</b> Almost there! Hold the balloon around the neck of the bottle and stand it upright. Allow the baking soda to drop into the bottle and to mix with the vinegar. A chemical reaction will take place quickly. You will see that the</p>

	<p>mixture will bubble and then release gas. As a result the balloon will begin to inflate!</p>
Video	<p><a href="https://www.youtube.com/watch?v=HK8LLWSIlm4">https://www.youtube.com/watch?v=HK8LLWSIlm4</a></p> <p>(explanation for kids)</p>

# Activity 15- Atmosphere- My little Greenhouse.

Activity	My little greenhouse
Objectives	Children will understand what is needed for a plant to grow and how can we provide those elements with a mini greenhouse.
Subject	Art
Age group	6-7
Individual or Group Activity	Group
Classroom or Field Activity	Could be done both indoors or outdoors
Duration of activity	Making of the mini greenhouse: 40 mins Observing and monitoring the seeds growth: 5–10 days
Materials	<ul style="list-style-type: none"> <li>• sandwich-sized resealable baggie</li> <li>• cotton balls</li> <li>• fast sprouting seeds (lima beans, sunflower, or marigolds work best)</li> <li>• tape</li> <li>• cup of water</li> </ul>
Method	<p>Instructions</p> <ol style="list-style-type: none"> <li>1. Soak the seeds of your choice in a cup of water overnight to speed up the germination process.</li> <li>2. Remove the seeds and place them on a paper towel. Next, dip four cotton balls in water and squeeze out the excess water. The cotton balls should be wet but not dripping.</li> <li>3. Place the cotton balls in the plastic bag with two to three seeds. Close the top securely.</li> <li>4. Cut out the center square of the little greenhouse.</li> </ol>

5. Turn the little greenhouse over and attach the plastic bag to the back using tape around the top and edges.

6. Place the little greenhouse on a sunny window using tape.

7. Check on the growth daily, and record notes in your observation log. It will take approximately one week for sprouts to appear.

8. After the seeds sprout, they are ready to be planted in pots or outside

Keep an observation log for 15 days and answer these questions:

1. How would the experiment have been different if you had kept the plastic bag in a different location? 2. What do you think would happen if you didn't plant the seeds and kept them in the plastic bag? 3. How are real-life greenhouses similar to what you created in the plastic bag

Observation log handout in appendix.