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Anemometer
#4-1000

Warning:

- **Not a toy; use only in a laboratory or educational setting.**
- **California Proposition 65 Warning: This product can expose you to chemicals including styrene, nickel, and lead, which are known to the State of California to cause cancer, birth defects, or other reproductive harm. For more information go to www.P65Warnings.ca.gov**

Introduction

Anemometers are simple tools for gauging wind speed. The next page details how to set up and use your anemometer. First, however, it is important to have some grasp on wind and what forces affect it.

Wind, or the largescale flow of gases in the atmosphere, is primarily caused by differences in **atmospheric pressure** across the globe. Other forces behind the generation and behavior of wind include **convection**, the **Coriolis force**, and **friction**.

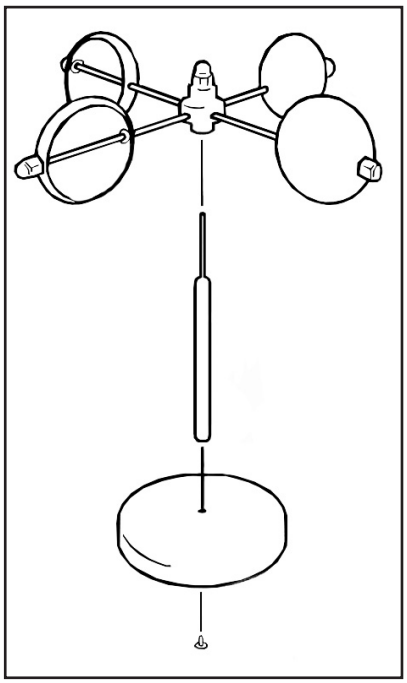
Atmospheric pressure and **convection** are closely related. Convection in this context refers to the rising of warm air and the falling of cold air. As warm air rises, it leaves behind a region of low pressure, while, on the other hand, sinking cold air creates regions of high pressure. The term cold front refers to the cold air that follows a region of warm air, while a warm front is the opposite. These changes in air temperature and pressure (which we know are related because of the **Ideal Gas Law**) are caused by uneven heating across Earth's surface (especially between the equator and the poles) and its varied geography. High pressure areas always flow into areas of low pressure.

The **Coriolis force** and **friction** player lesser, but still important, roles in wind behavior. The Coriolis force is the inertial force caused by the rotation of the earth. This is caused by air and land rotating around the equator much faster than air and land at the poles. As for friction, wind near the Earth's surface moves more slowly than the wind above it due to friction from the features on the ground and the higher concentration of air molecules. This effect is more pronounced near more uneven land features, like forests or mountains, while the opposite is true for smoother features, like plains or bodies of water.

Wind Speed Reference

- **Smoke rises without drift.....[0 mph]**
- **Leaves rustle .....[4 to 7 mph]**
- **Tree limbs sway .....[19 to 24 mph]**
- **Makes walking difficult .....[39 to 46mph]**
- **Trees uprooted.....[55 to 63 mph]**
- **Hurricanes, Tropical Storms, Blizzards.....[75 mph and up]**

Assembly



1. Place the threaded end of the screw into the bottom of the base (the top side of the base will be flat and level) so that the threads are pointing up.

2. Screw the threaded end of the rod onto the screw coming out of the base. A screw driver will make this step easier.

3. Set the head of the anemometer onto the needle end of the rod. The head of the anemometer will be free spinning and should move with little to no resistance.

4. Check to make sure that the "cups" on the head of the anemometer are all facing in the same direction with their cups facing perpendicular to the ground.

How to Use

1. Set up your anemometer as described above.

2. Place your anemometer outside onto a flat surface (*e.g.* table, stool, etc...). **(Note:** This device works best at least four feet off the ground and away from any obstacle obstructing incoming wind.**)**

3. Set a timer for one minute.

4. Start your timer. Count every time the red cup on the anemometer passes in front of you. Using a handheld clicker/counter (not included) can make keeping count of the anemometer's rotations easier. After the minute has expired, mark down the number of rotations for that minute.

5. Repeat the above process at least two more times. Find the average of all the data acquired above by adding up each number you found and dividing that sum by the number of times you did the experiment.

6. Repeat the entire experiment again over a period of several days, weeks, or years depending on the span of time you are looking at. **(Note:** It can also be interesting to take note of the weather conditions at the time of each data collecting session. See if you notice any trends.**)**