**Local Weather 2**

**Outcome: (114-6), (212-8)**

**Content: Page 202-205**

## **Build a Weather Station:**

* One of the best ways to learn about the weather is to build and use your own weather station.
* In order to build a weather station, some of the important factors that affect the weather must be considered.
* Some of the factors that must be measured or at least be able to detect a change include;
	+ Air temperature,
	+ Humidity,
	+ Wind direction,
	+ Wind speed,
	+ And air pressure.

**Measuring devices commonly used in a weather station:**

1. Thermometer
2. Hygrometer
3. Psychrometer
4. Aneroid barometer
5. Wind vane
6. Anemometer
7. Rain gauge.

#### **1. Thermometer:**

* + A thermometer is a device used to measure the outside air temperature.
	+ 
	+ How does a thermometer work?
	+ The mercury (or alcohol) in the bulb is mostly located in the bulb of the thermometer
	+ When the temperature rises, the liquid expands and rises up the tube, which is marked (calibrated) to show the actual temperature outside
	+ Does it matter if the thermometer is placed in the sun or shade?
	+ The thermometer will obviously show a colder temperature in shade than in the sun, therefore this must be considered when placing the thermometer
	+ Temperature is considered an important weather factor because it will determine the type of precipitation (rain /snow) we may get.
	+ Temperature is also related to our level of comfort.
	+ If it is cold outside, we may wear a heavy coat to keep us warm.
	+ On a hot summer day we would dress quite differently.

#### **2. Hygrometer:**

* Device used to measure the humidity of the air.
* 
* **Humidity** is a measure of the how much moisture (water vapour) is in the air.
* Have you ever seen your breath on a cold day?
	+ That's moisture in your breath, just like the water in clouds, rain, or moisture in the air.
* **What does humidity have to do with the weather?**
	+ Warm air can hold more water than cold air.
	+ The more water that is in the air the greater the chance for precipitation (rain or snow).
	+ So warm, wet air is usually associated with wet, stormy weather.
	+ The hygrometer can detect a change in humidity and thus predict a change in the weather.
* **Here are the observations and their meanings.**
	+ **When a Warm Front moves in:**
		- When a warm front (mass of warm air) approaches, the humidity of the surrounding air begins to rise as the warm front moves in.
		- The humidity stays high while the warm air is around, and then the humidity slowly drops as the warm air moves away.
	+ **When a Cold Front moves in:**
		- When a cold front (mass of cold air) approaches, the humidity doesn’t change much as the cold air moves in.
		- When the cold front arrives the humidity will rise quickly and stay high while it is there.
		- As the cold fronts moves away the humidity will drop quickly.
	+ **So by measuring the change in humidity we can tell if a warm front or a cold front is approaching.**
* This type of hygrometer just shows that humidity is changing.
* In order to get an actual number value on humidity levels you will have to build a psychrometer.

#### **3. Psychrometer:**

* Device that measures the amount of **relative humidity** in the air.
* 
* **Relative humidity** is a measure of the amount of water vapour that is in the air compared to the maximum amount of water vapour that the air can hold.
	+ The air can hold a maximum amount of water.
	+ If we can measure how much water is actually in the air we can then figure out its percentage or relative humidity.
* A psychrometer is made up of two thermometers mounted together.
* One thermometer is ordinary **(dry bulb**) and the other has a cloth wick (skate lace) over its bulb.
* The one with the wick over it is called a **wet-bulb thermometer**.
* When you are ready to take a reading, dip the wick (skate lace) in water and then fan air over the thermometers.
* When the air is blowing over the wick the water evaporates and has a cooling effect on the wet-bulb thermometer.
* After a few seconds you take a reading of the temperatures of both thermometers.
* **Understanding the Reading:**
	+ If the surrounding air is dry, more water evaporates from the wick.
	+ The more water that evaporates the cooler the reading will be.
	+ There will be a large difference between the dry bulb and the wet bulb.
	+ If the surrounding air is very damp then only a small amount of water will evaporate and the two bulbs will be about the same.
	+ **The smaller the difference the greater the humidity.**
	+ If the surrounding air is holding as much moisture as possible (if the relative humidity is 100%) there is no difference between the two temperatures.
* As we know the higher the humidity (the more water that there is in the air) the greater the chance of rain or snow.
* Meteorologists have made up charts of these differences between the wet and dry bulbs at each temperature.  By using the chart you can find relative humidity. **(Table 1 Page 203)**
* Example: A psychrometer reading gives the dry bulb reading of 20oC and a wet bulb reading of 18oC.  What is the relative humidity?

#### **4.  Aneroid barometer:**

* Device used to measure surrounding air pressure.
* 
* **Air pressure** is the force that air pushes down on the earth.
* Cold air is denser (thicker and heavier) than warm air.
* Recall that cold matter contracts (shrinks) therefore as air cools, it begins to get squeezed together.
* The colder the air, the more we can squeeze into the same size air mass.
* As a result cold air is heavier than warm air.
* The rising of the air pressure tells that a **high-pressure system** is moving in.
	+ The high-pressure system is made up of cool, dry air. So a high barometric pressure is usually associated with cool, clear, dry air – fine weather.
* If the air pressure begins to drop that means a **low-pressure syste**m is moving in.
	+ A low-pressure system is usually warmer, moist air - poor weather on the way.

#### **5.  Wind vane:**

* Tool that measures the direction of the wind.
* 
* A typical wind vane would have a pointer that can spin with one end larger than the other and compass bearing.
* The part of the vane that turns into the wind is usually shaped like an arrow.
* The other end is wide so it will catch the smallest breeze.
* The breeze turns the arrow until it catches both sides of the wide end equally.
* The arrow always points into the wind.
* **The arrow tells you the direction that the wind is coming from.**
* If the wind is blowing from the south, the wind is usually warm.
* If the wind is blowing from the north, the wind is usually cooler.
* The weather associated with wind direction depends a great deal on your local geography.
	+ For instance, on the east coast of the Island an easterly wind is generally off the water and is cool and wet, usually bringing fog and rain.
	+ Where as, on the west coast of the island a westerly wind would be blowing off the water.

####   **6. Anemometer:**

* Used to measure the speed of the wind.
* 
* The simplest of all anemometers is the **ping-pong ball anemometer.**
* 
	+ When the wind blows the ping-pong ball suspended on the end of a string is moved.
	+ The angle of the string is recorded and then the speed of the wind can be estimated.
* The **pressure anemometer** is another simple device used to measure wind speed.
	+ Has a small plastic bead in a glass tube.
	+ When the wind blows over the top of the tube it creates a vacuum that sucks up the small plastic bead.
	+ The higher the bead rises, the higher the wind speed.
* A **rotation anemometer**
	+ Consist of a windmill, or a propeller, or three or more cone shaped cups.  As it spins, you can count the rotations (number of spins) that it makes in ten seconds.

 

* + This homemade anemometer cannot not tell the wind speed in kilometres per hour; but it can give you an idea of how fast the wind is blowing.
* More precise Weather forecasters' anemometers have the propeller connected to a small generator and computer that can accurately count and calculate the revolutions per minute into kilometres per hour. (km/h).

#### **7. Rain gauge:**

* Tool, which collects and measures the amount of rainfall.
* 
* It is simply a bottle or can with a millimetre scale.
* As it rains, the bottle fills and then you go out and measure the height of the water in the bottle (in mm).
* Snow is measured the same way but is measured in cm.

**Homework: Page 205: # 2, 3, 4**