**Local Weather 2**

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

**Content: Page 202-205**

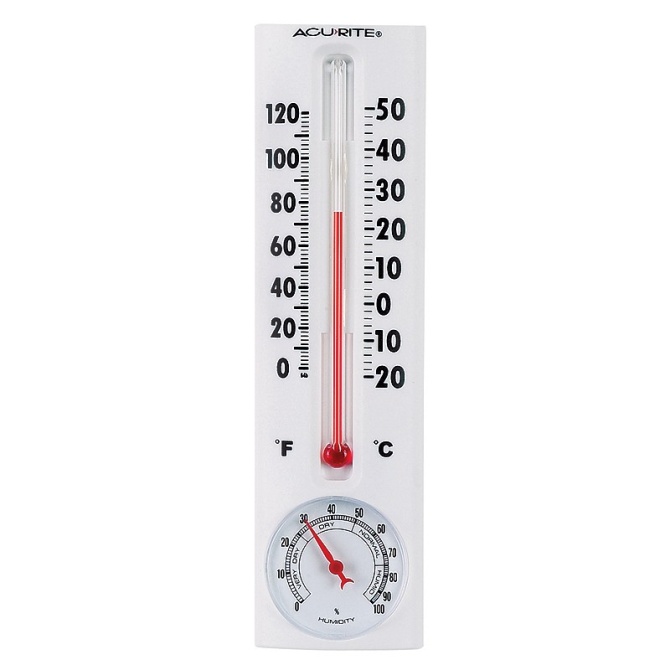
## **Build a Weather Station:**

* 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.

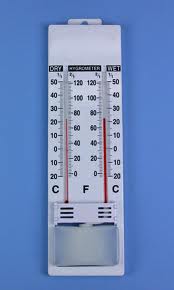
#### **1. Thermometer:**

* + A thermometer is a device used to measure the outside air temperature.
  + [](http://www.google.ca/url?sa=i&rct=j&q=thermometer&source=images&cd=&cad=rja&docid=GxG3zGQltFJ9qM&tbnid=_fsPw6npin7QrM:&ved=0CAUQjRw&url=http://www.acurite.com/weather/humidity/8-5-thermometer-with-hygrometer-00339.html&ei=M7YTUfC0O8a2yAH364H4Dw&bvm=bv.42080656,d.aWc&psig=AFQjCNFfQDYRETzxMbSrldO194E1GP5IGg&ust=1360332682639822)
  + 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.

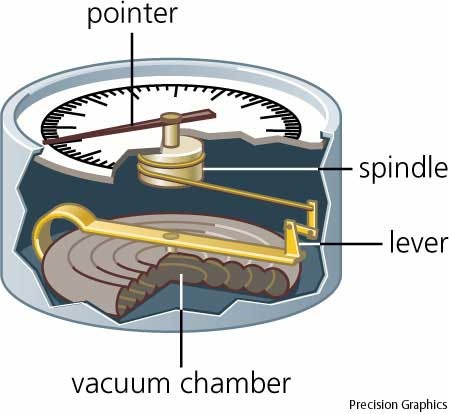
#### **2. Hygrometer:**

* Device used to measure the humidity of the air.
* [](http://www.google.ca/url?sa=i&rct=j&q=hygrometer&source=images&cd=&cad=rja&docid=KLxFf0ynTmVuAM&tbnid=S1z2M1cKh21sCM:&ved=0CAUQjRw&url=http://www.fine-tools.com/hygrometer.html&ei=ZLYTUfToNvHAyQGjsYHgAw&bvm=bv.42080656,d.aWc&psig=AFQjCNGWBddb9rhC4edp4viuneZuop_TFw&ust=1360332756261552)
* **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.
* [](http://www.google.ca/url?sa=i&rct=j&q=psychrometer&source=images&cd=&cad=rja&docid=aseWdotEmEfusM&tbnid=sLKvZm4S_WaNoM:&ved=0CAUQjRw&url=http://www.ebay.com/itm/PSYCHROMETER-WET-DRY-BULB-HYGROMETER-/330488989831&ei=prYTUceBHaqfyAHvlYHoBw&bvm=bv.42080656,d.aWc&psig=AFQjCNEPPuckYaMEQWn9M1_dIirgd53t_g&ust=1360332813696706)
* **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?

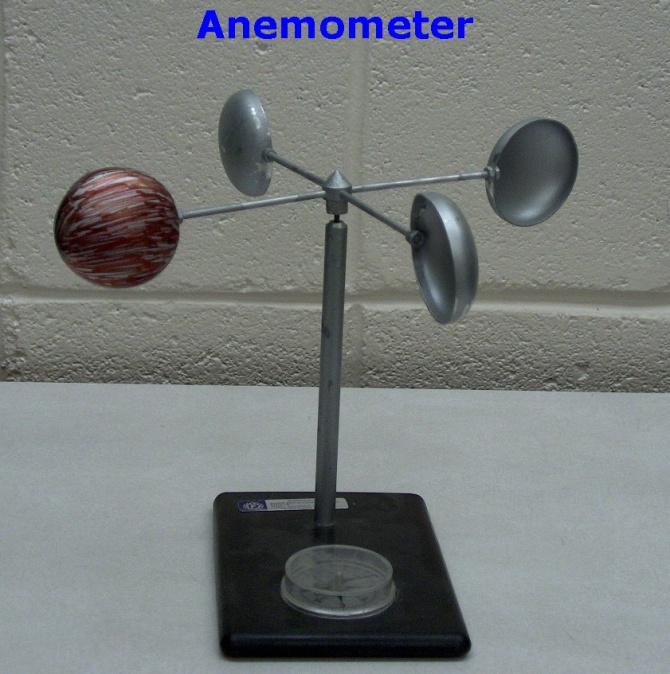
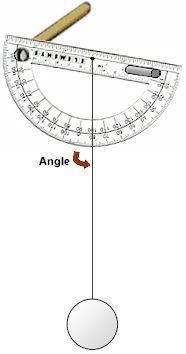
#### **4.  Aneroid barometer:**

* Device used to measure surrounding air pressure.
* [](http://www.google.ca/url?sa=i&rct=j&q=aneroid+barometer&source=images&cd=&cad=rja&docid=wizTjvC-_9gfxM&tbnid=CKB3RDGy13SYIM:&ved=0CAUQjRw&url=http://images.yourdictionary.com/aneroid-barometer&ei=CrcTUdfaOYHzyAH88IHQBw&bvm=bv.42080656,d.aWc&psig=AFQjCNGx9Am561sUKICmcrGDtccqjugxdw&ust=1360332912290161)
* **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.
* [](http://www.google.ca/url?sa=i&rct=j&q=wind+vane&source=images&cd=&cad=rja&docid=I2pepFP6PfwSyM&tbnid=1lFDI9h1fwkzDM:&ved=0CAUQjRw&url=http://www.pottsoft.com/titanic/ballarat_rotunda.html&ei=OrcTUfGhL5G6yAHD-4CYCA&bvm=bv.42080656,d.aWc&psig=AFQjCNGSxCmgsy1VE_V4amoBQH8jxXGwmw&ust=1360332972308186)
* 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.
* [](http://www.google.ca/url?sa=i&rct=j&q=anemometer&source=images&cd=&cad=rja&docid=WZmm4DuJj2VKlM&tbnid=vKtuoY9mzTqRVM:&ved=0CAUQjRw&url=http://dev.cdli.ca/sci2200-04/unit02/section01/lesson02/3-lesson-e.htm&ei=a7cTUc35A4KMygHmiYDgCg&bvm=bv.42080656,d.aWc&psig=AFQjCNEVXeXHYk-z1i1wxPDwF0HIkwQl6A&ust=1360333023608546)
* The simplest of all anemometers is the **ping-pong ball anemometer.**
* [](http://www.google.ca/url?sa=i&rct=j&q=homemade+anemometer+for+kids&source=images&cd=&cad=rja&docid=3zBM7DZwxvBiXM&tbnid=mvD17D4Y6RC5FM:&ved=0CAUQjRw&url=http://www.salemclock.com/weather/ping-pong.htm&ei=qLcTUf26EYeXyAHvxYCADw&bvm=bv.42080656,d.aWc&psig=AFQjCNGyNzGmjMQXnLYDaxR0u6s_d_rlew&ust=1360333086116948)
  + 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.

[](http://www.google.ca/url?sa=i&rct=j&q=rotating+anemometer&source=images&cd=&cad=rja&docid=OVaLzmPFHlLODM&tbnid=0eWLBTdKUkc-7M:&ved=0CAUQjRw&url=http://www.process-controls.com/EEProcess/TSI/VelociCalc-5725-rotating-vane-anemometer.html&ei=zrgTUbvlOejQyAHi8YHoDA&bvm=bv.42080656,d.aWc&psig=AFQjCNGBTdRVRycK_7Rj-99czUugX2WhNg&ust=1360333342785040)

* + 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.
* [](http://www.google.ca/url?sa=i&rct=j&q=rain+gauge&source=images&cd=&cad=rja&docid=p3ZBy3trX_PDJM&tbnid=MCN-AoDnDg_ByM:&ved=0CAUQjRw&url=http://www.compleatnaturalist.com/mall/professional_rain_gauge.htm&ei=9LgTUb-pMrH7yAGBw4HACw&bvm=bv.42080656,d.aWc&psig=AFQjCNHPUH3_b-TknMb7-JoECBow2dZS4g&ust=1360333419631971)
* 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**