General Meteorology	**Laboratory #1**
Name _____	Date _____
Partners _____	Section _____

Surface Observations and the Station Model

Purpose:

Develop the ability to perform a standard surface observation.
Be able to generate and interpret a WMO station model.

Equipment:

Station Thermometer	Min./Max. Thermometer
Anemometer	Barometer
Psychrometer	Rain Gauge
Psychometric Tables	Barometric Correction Tables

Background:

The goal of a standard surface observation is to quantify the following properties of the atmosphere at regular intervals.

Temperature	Sea Level Pressure	Sky Cover
Dew Point Temperature	Altimeter Setting	Cloud Height
24 hr Max. Temperature	Wind Direction	Surface Visibility
24 hr Min. Temperature	Wind Speed	Precipitation
		Weather & Obstructions

Airports routinely collect this data due to the impact that atmospheric conditions have on air travel. Surface observation are performed every hour, are coded into an aviation report, and distributed for use world wide. Although the US historically used the SA report, we have switched over to the METAR which is used world wide.

In this particular lab we will focus on measurements related to temperature and humidity. We will make some of the other standard measurement; however, we will wait until later labs to discuss the finer points of pressure measurement, visibility, and cloud type and height.

Procedure:

I. Perform a surface observation

The following procedure will be followed to perform a surface observation. The order of the steps are not important; however, all portions must be completed and the appropriate spaces on the observation sheet must be filled in.

1. Read the station thermometer for the current air temperature. All temperatures will be measured in Fahrenheit.
2. Read the min. and max. thermometer for the extremes of temperature over the last 24 hours. Once the measurement is taken, reset the two thermometers.
3. Measure the wet bulb and dry bulb temperature using the sling psychrometer. Using the psychometric tables determine the dew point temperature. The tables are in Celsius and our measurements are in Fahrenheit. You will need to do a conversion before and after you use the tables.
4. Determine the wind speed and direction using an anemometer. The wind speed is measured in knots. We will use either the radio stations anemometer or a hand held device which gives a rough value for the magnitude of the wind speed.

1 knot = 1.15 mi/hr = 0.51 m/s

5. Read the station pressure using a barometer. We will wait until next week to calculate sea level pressure and the altimeter setting.
6. Read the rain gauge and empty it. Since we do not have a rain gauge available at this time, we will use an alternate source of information for this part of the report.
7. Observe the sky cover and estimate the cloud height. This estimate will be very crude at this time. We will say low level clouds have a height between 0 and 6,500 ft, middle level clouds have a height between 6,500 and 23,000 ft, and high level clouds have a height between 16,000 and 43,000 ft. Notice that the measurement is made in feet not in meters.
8. Check the surface visibility using landmarks in the area. Since the clear line of site on campus is limited, we will have to resort to rough estimates or alternate sources of information.
9. Record the current weather and any special occurrences.

II. Experimental determination of dew point temperature

Since the calculation for dew point temperature is somewhat involved, it would be nice to verify our calculations with an experimental procedure. Follow these instructions and compare your results with the dew point calculated during the surface observation.

1. Begin with a beaker filled half way full of water.
2. Place a thermometer in the beaker and add several cubes of ice.
3. Stir the beaker of water to keep the water mixed at a constant temperature.
4. Watch the sides of the beaker and look for condensation.
5. When you see condensation, record the temperature of the water. This temperature is the dew point temperature.

Dew Point Temperature from the surface observation T_{so} = _____

Dew Point Temperature from the experiment T_{exp} = _____

Average of the two measurements

$$T_{ave} = \frac{T_{so} + T_{\exp}}{2}$$

T_{ave} = _____

Percent difference between the two measurements

$$\%diff = \frac{T_{so} - T_{\exp}}{T_{ave}} \times 100\%$$

%diff = _____

Question 1: Thinking only about the experimental procedure, would you expect the experimental result to be greater than or less than the actual dew point temperature?

Question 2: In light of Question 1 list two things you could do procedurally to reduce the amount of error in your measurement of the dew point temperature? (You can not suggest using a different thermometer.)

1.

2.

III. The Station Model

A compact method of displaying weather information is through the use of the station model. The simple version of the model records temperature, dew point temperature, wind speed, wind direction, sky cover, pressure, pressure tendency, and precipitation. More elaborate versions of the WMO station model include visibility, cloud type, cloud height, and precipitation amount. Using Appendix B of the book perform the following exercises.

1. From the station models given on the surface plot determine the weather conditions at the following stations.

DAY

Temperature	_____	Wind Speed	_____
Dew Point	_____	Wind Direction	_____
Pressure	_____	Present Weather	_____
Sky Cover	_____		

JKL

Temperature	_____	Wind Speed	_____
Dew Point	_____	Wind Direction	_____
Pressure	_____	Present Weather	_____
Sky Cover	_____		

YSB

Temperature	_____	Wind Speed	_____
Dew Point	_____	Wind Direction	_____
Pressure	_____	Present Weather	_____
Sky Cover	_____		

UGN

Temperature	_____	Wind Speed	_____
Dew Point	_____	Wind Direction	_____
Pressure	_____	Present Weather	_____
Sky Cover	_____		

2. Generate the station model for each of the following observations.

CITY	**SKY/WX**	**TEMP**	**DEWPT**	**RH**	**WIND**	**PRES**	**REMARKS**	
CLEVELAND	PTSUNNY	77	51	40	SW20G32	30.02		◯
INDIANAPOLIS	PTSUNNY	75	50	41	SW24G31	30.00		◯
ELYRIA OH	PTSUNNY	76	53	45	SW28G37	30.00		◯
PADUCAH	PTSUNNY	73	51	46	S16G24	30.04		◯

3. Generate a station model for today's observation. ◯