Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Period\_\_\_\_\_

**Chapter 12 Meteorology**

**Objectives:**

1. I can compare & contrast weather and climate.
2. I can analyze how imbalances in the heating of Earth’s surface create weather. This means I can:
   1. Describe the angle and effect of solar radiation hitting different areas of the earth.
   2. Explain why the temperature of the various regions of the earth remain relatively constant.
3. I can describe air masses; their source regions and how and they form. This means I can:
   1. Define air mass.
   2. Tell the relative temperature, humidity and source location of mP, mT, cP, and cT air masses.
   3. Understand which air masses are usually associated with regions of the U.S.
   4. Describe air mass modification as a given air mass moves across a given location.
4. I can identify the four main types of fronts. This means I can:
   1. Identify types of fronts and direction of front movement based on map symbols.
   2. Identify the type of front based on temperature differences between the two colliding masses.
   3. Identify the type of front based on which the temperature of the air mass which is “on the move”.
   4. Contrast the speed of air rising, type of clouds formed, severity and length of precipitation usually associated with each.
5. I can compare and contrast high and low pressure systems. This means I can:
   1. Describe the usual weather or cloud cover with each.
   2. Contrast them according to air rising/sinking, moving in/out of the center, and direction of rotation.
6. I can analyze a basic surface weather chart. This means I can:
   1. Determine the wind direction and relative speed based on isobar spacing and numbers.
   2. Describe the weather at a specific city using the station model symbols when given a key.
   3. Use the following additional miscellaneous terms: isopleths, isotherm.

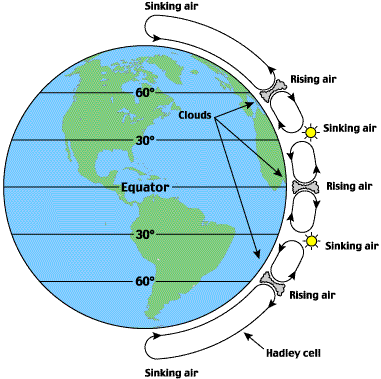
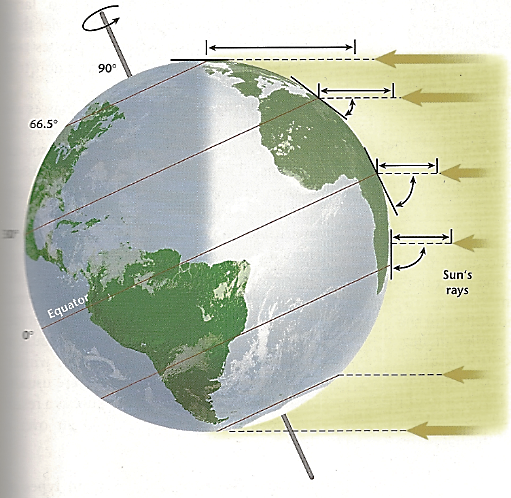
**Weather vs. Climate**

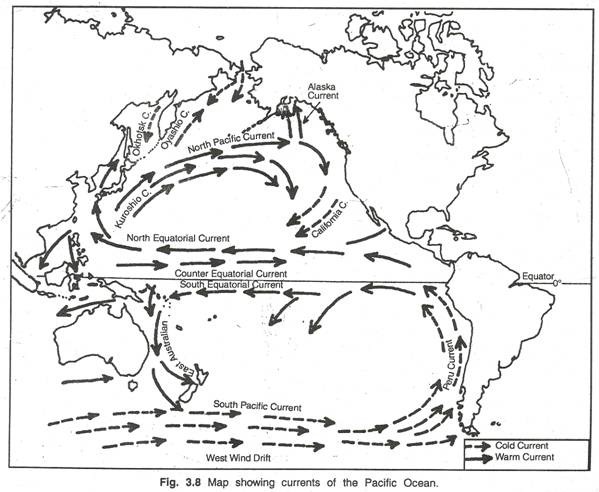
1. **Meteorology** is the study of atmospheric phenomena
2. **Weather** is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ state of the atmosphere
3. **Climate** is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ variation in weather for a particular area

(Averaged over \_\_\_\_\_ years)

**Solar Radiation: Sun’s Angle and Earth’s Tilt**

1. The sun heats \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (radiation)
2. The tropics have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ concentrated & intense rays making the tropics \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. The poles have \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_intense rays
   1. The poles receive the same amount of energy as the equator, but the energy is more spread out & it is\_\_\_\_\_\_\_\_\_\_





1. **Why does the earth not get too hot at the equator?**
2. Air currents and ocean \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_currents constantly

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Air Mass**

1. An **Air Mass** is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_body of air that takes on the characteristics of the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it forms

1. **Source Region** is the region \_\_\_\_\_\_\_\_\_\_\_\_ which the air mass forms

**Air Mass Classification** Classification is designated with 2 letters. (See Fig 12-3 p. 303)

1. **Humidity** is represented by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ letter

* Maritime (m) is \_\_\_\_\_\_\_\_\_\_\_\_
* Continental (c) is \_\_\_\_\_\_\_\_\_\_\_

1. **Temperature** is represented by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ letter:
   * Tropical (T) is \_\_\_\_\_\_\_\_\_\_\_\_\_
   * Polar (P) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. **Arctic air** masses (A) represented by a single capital letter. Similar to \_\_\_\_\_\_\_ but much \_\_\_\_\_\_\_\_
3. Example: What would a cT air mass be like? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Source region?\_\_\_\_

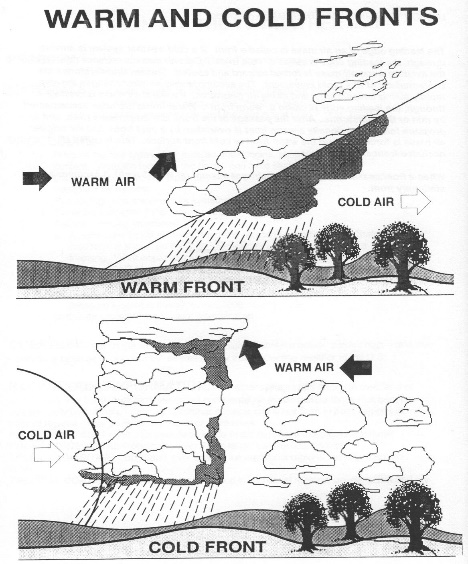
**Air Mass Modification**

1. Air masses move, change, become modified and more like the areas they move over
2. **Example:** Air masses can \_\_\_\_\_\_\_\_\_\_\_\_\_ moisture and take on \_\_\_\_\_\_\_\_\_\_\_\_characteristics if they move away from the body of water they formed over

**Example question:** A cool, wet air mass that brings cloudy, rainy weather to the Pacific NW is an example of what type of air mass?

1. Continental tropical
2. Maritime polar
3. Continental polar
4. Maritime tropical

**Fronts**

1. A **front** is a narrow region separating two air masses of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. **4 main types of fronts See Figure 12-7 p. 308 IMPORTANT)**
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_fronts
   2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fronts
   3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_fronts
   4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ fronts

**Cold Fronts**: Cold air is “on the move” and doing the “pushing”

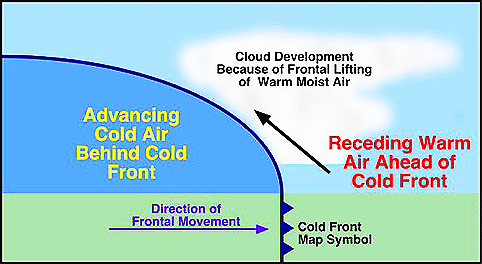
1. In cold fronts, cold, dense air is moving & forces \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Very \_\_\_\_\_\_\_\_\_\_\_\_ slope, air rising quickly

\_

1. Wall of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_clouds and a \_\_\_\_\_\_\_\_\_\_\_\_\_\_ line of

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ thunderstorms

1. Temperature \_\_\_\_\_\_\_\_\_\_\_\_\_\_ after the front passes
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_line with \_\_\_\_\_\_\_\_\_triangles pointing in the direction the front is moving

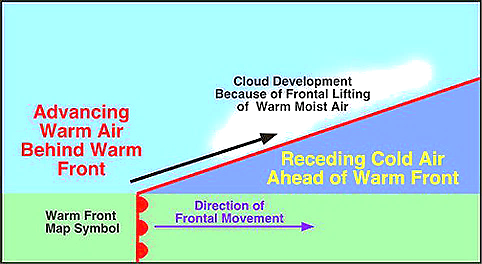


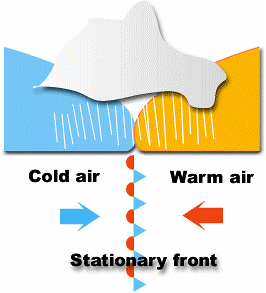
**Warm Fronts:** Warm air is “on the move” and doing the “pushing”

1. Warmer air \_\_\_\_\_\_\_\_\_\_\_\_\_\_ advances \_\_\_\_\_\_\_\_\_\_\_cooler air
2. Much \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ slope as air is rising slowly
3. This causes \_\_\_\_\_\_\_\_\_\_\_\_\_ band of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rainfall.
2. Temperature\_\_\_\_\_\_\_\_\_\_\_ after the front passes.
3. \_\_\_\_\_\_\_\_ line with \_\_\_\_\_\_\_\_\_\_ semicircles pointing in the direction the warm front is moving.

****

**Stationary Fronts**

1. Stationary fronts occur when two air masses of similar

temperature and density collide but \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ each

other because the temperature difference is \_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Not moving (“stationary”). AKA “Stalled Front”. The air mass that is slightly warmer rises & stalls over the cooler air mass.
2. \_\_\_\_\_\_\_\_\_weather for days. May have constant \_\_\_\_\_\_\_\_clouds &

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_rain depending on amount water vapor present.

1. Combo of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ diagrams with short segments of

\_\_\_\_\_\_\_\_\_\_\_\_\_blue triangles & red semicircles pointing in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ directions

**Occluded Fronts**

1. Occluded Fronts occur when a cold front PASSES a warm air mass & hits a cold air mass

moving in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

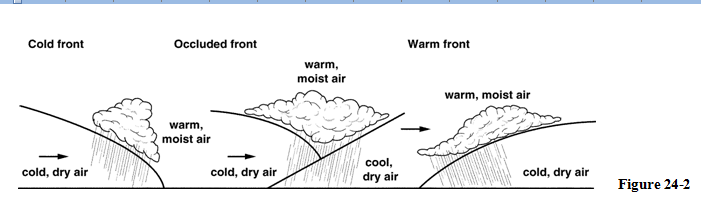
* Cold fronts move faster than warm fronts….so they catch up and overtake them.

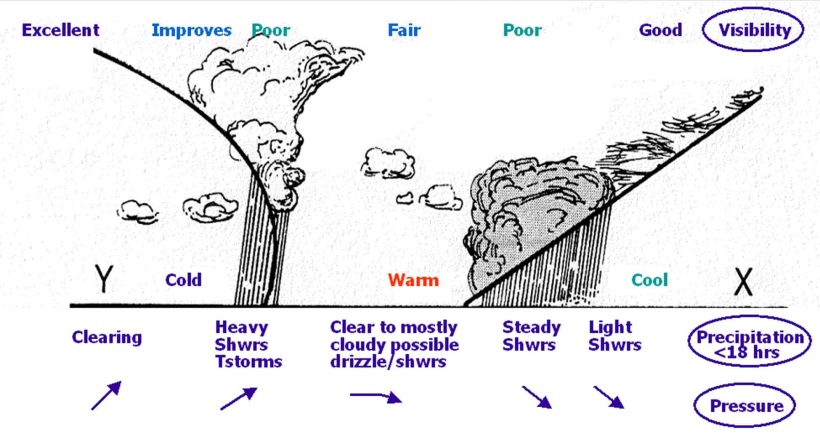
1. Forces all of the warm air \_\_\_\_\_\_\_\_\_\_\_\_\_and then two cold air masses \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Varied clouds & precipitation because both warm & cold fronts involved:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. \_\_\_\_\_\_\_\_\_\_\_\_\_line with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ triangles and semicircles on SAME SIDE of the line.

**Occluded Front Development:**



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**Web Links to Animations of Fronts:**

1. Good Animation of All 4 fronts <http://www.phschool.com/atschool/phsciexp/active_art/weather_fronts/>
2. Short animation and explanation of Cold & Warm fronts: <http://www.youtube.com/watch?v=huKYKykjcm0>

**Pressure Systems**

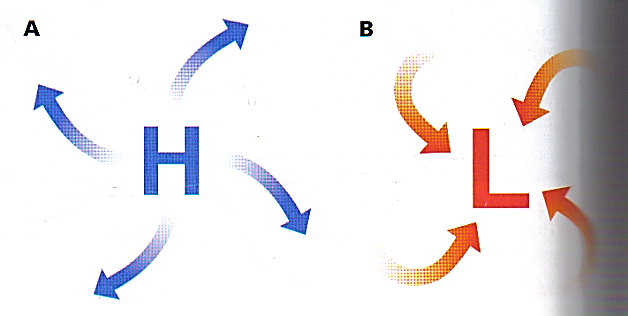
**\*\*\*Think of hands on your back when you are lying on the ground.**

* If the hands rise off your back, do you feel pressure?
* If the hands “sink” and push onto your back, do you feel pressure?

1. High pressure is associated with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ air
2. Low pressure is associated with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_air
3. Pressure = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

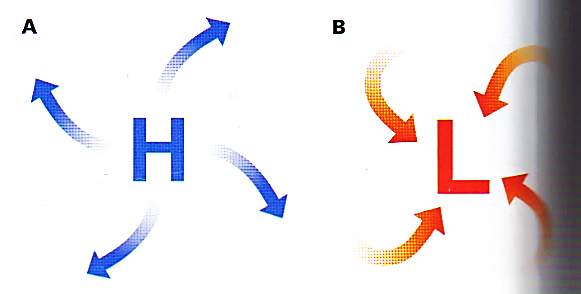
**High-Pressure Systems**

1. In high-pressure systems, dense air falls to the earth’s surface and



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. Spins (rotates) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the Northern hemisphere
2. Air is “spun” \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_ weather (\_\_\_\_\_\_\_\_\_\_\_\_\_\_ clouds)

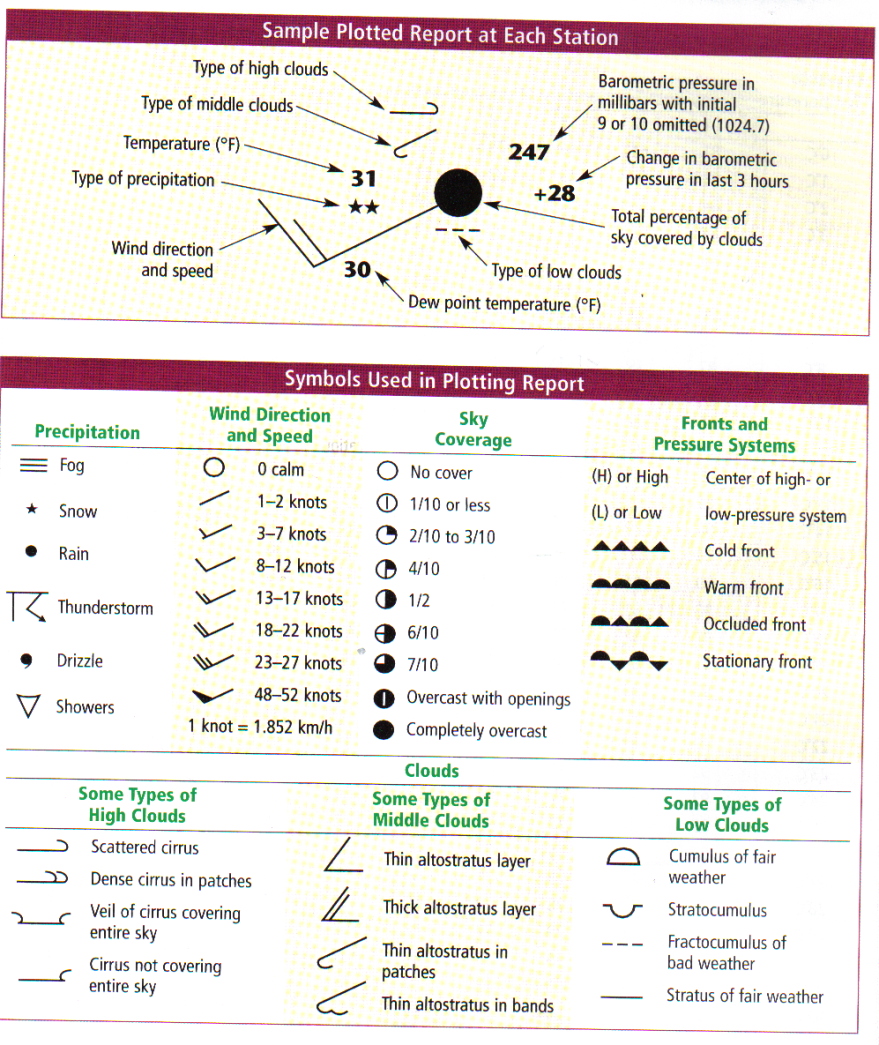
**Low-Pressure Systems**

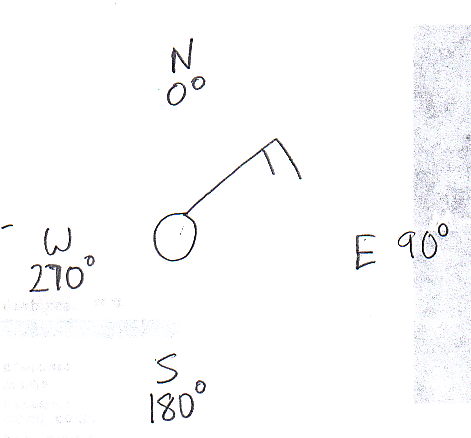
1. In low-pressure systems, less dense surface air \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. To fill in the “hole” that then forms in the center, air from around it must move inwards
2. Rotates \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in Northern Hemisphere
3. Rising air causes \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. May form “wave cyclones”-bad weather in the mid-latitudes like us: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Gathering Weather Data: Station Model**

1. **Station model** is a record of weather data for a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. FYI Windspeed: 1 knot = 1.15mph = 1.9 km
3. See Appendix E p.915 for weather `symbols





**Additional Terms Used on National Weather Maps**

1. **Isopleths** are lines that connect points of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ values
   1. **Isobars** are lines of equal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * What do you think many isobars that are close together mean? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Far apart?
      * Isobars show the locations of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ systems
      * See Fig 12-16 p.319
   2. **Isotherms** are lines of equal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Shows temperature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
      * Identifies \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ systems (Fronts occur where isotherms are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_; big temp difference marking the boundary between 2 air masses)

**Bellwork #1 Prior Knowledge**

1. What is the difference between weather & climate?
2. List some terms used by meteorologists.

**Bellwork #2: Review Air Masses**

1. Write the symbols for the following AND list an location where that type of air mass would form:
   1. Cold & dry air mass
   2. Cold & humid
   3. Warm & dry
2. “It’s raining”. Is that a statement of weather or climate? Explain.

**Bellwork #3: Section 12.1 Assessment p. 304**

**Bellwork #4: Temperature & Season Causes**

1. What factors warm a particular spot on Earth?
2. What causes seasons to occur?

**Bellwork #5 Type of Front??**

|  |  |  |
| --- | --- | --- |
|  | Type of front | List 3 things seen in the diagram that support that type of front. |
| Top Picture |  |  |
| Bottom Picture |  |  |

**Bellwork #6 Miscellaneous Review**

1. Draw a symbol for both a high pressure and a low pressure system, including arrows showing the direction of wind at the surface.
2. Compare **and** contrast isobars & isotherms?
3. As an air mass moves away from where it was formed, its characteristics change. What is the vocabulary term to describe this change?