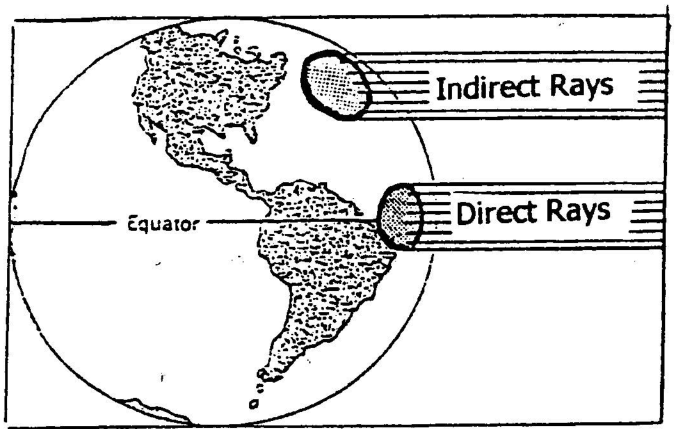
Meteorology

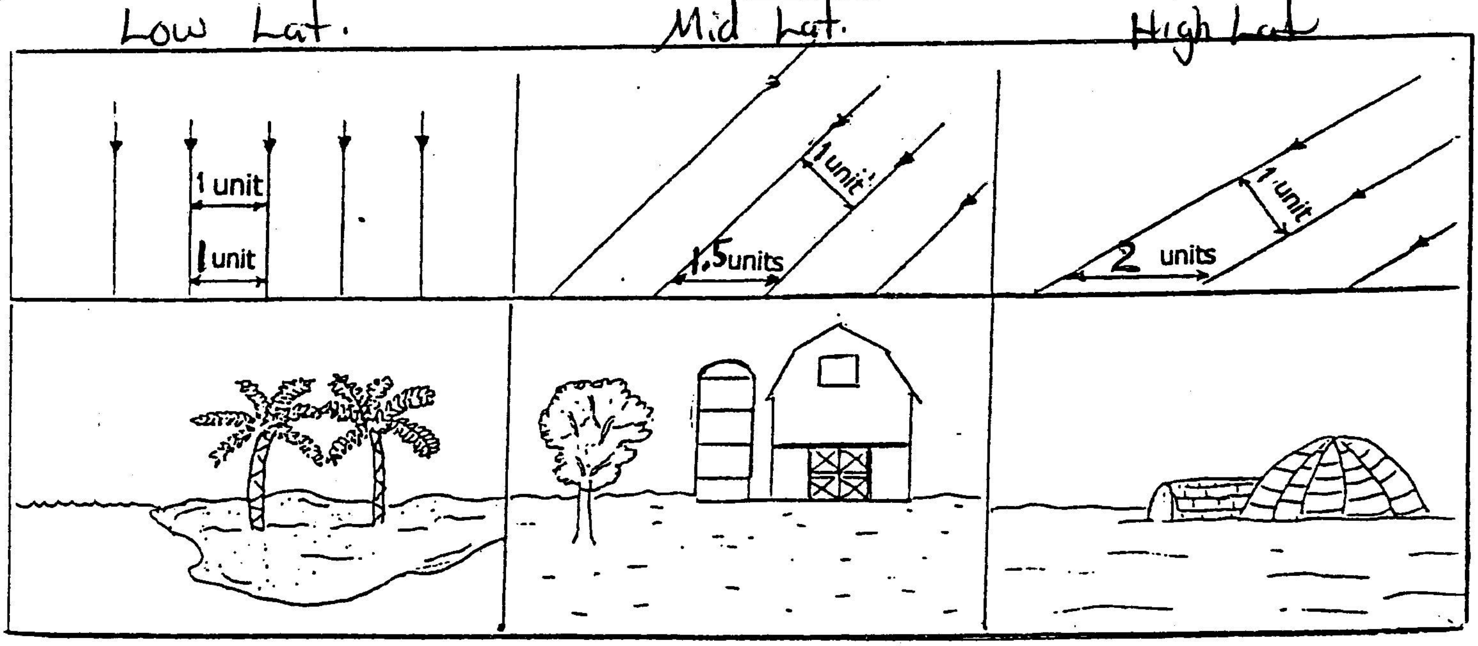
I. WEATHER = the state or condition of the variables of the atmosphere for a location at a given period of time.

A. Causes of Weather

1. Energy from the sun.

a. Through the seasons, it heats our world, some parts more and some less.





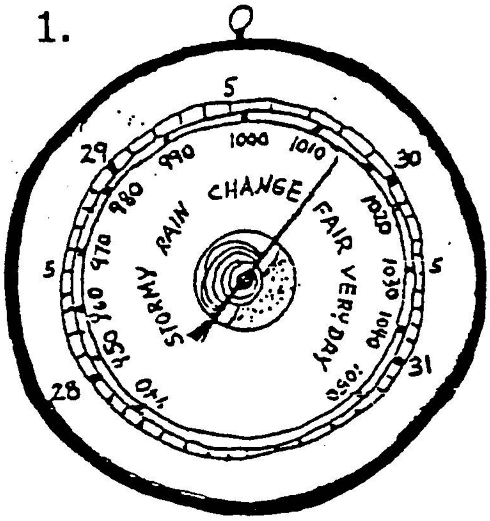
b. This uneven heating causes earth's atmosphere to react and become a gigantic engine that produces an infinite variety of weather.

B. Weather/Atmospheric Variables:

1. temperature
2. wind (speed + direction)
3. moisture (precipitation + humidity)
4. air pressure

C. Weather Instruments:

1.

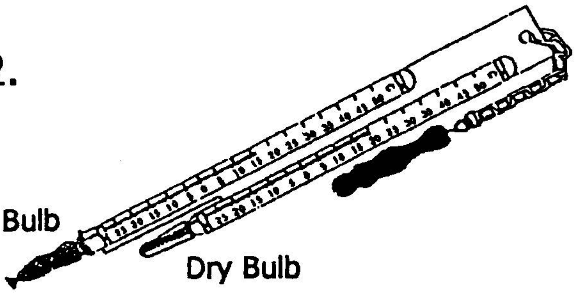


barometer

measures

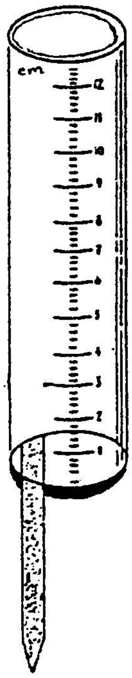
air pressure

2.



Wet Bulb

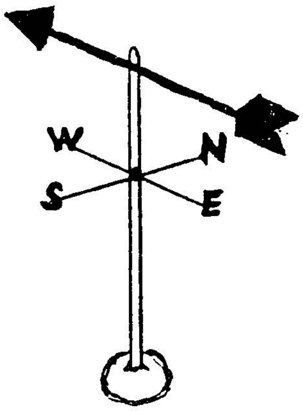
Dry Bulb

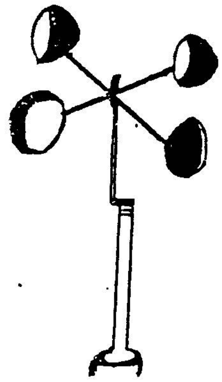


a. sling psychrometer
measures
relative humidy

b. rain gauge
measures
rainfall

3.

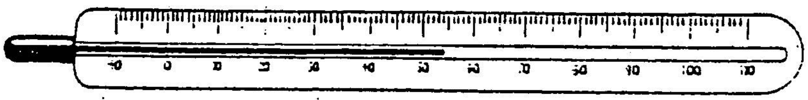




a. wind/weather vane
measures
wind direction

b. anemometer
measures
wind speed

4.



thermometer
measures
temperature

II. ATMOSPHERE = The envelope of air (mixture of gases) that surrounds Earth.

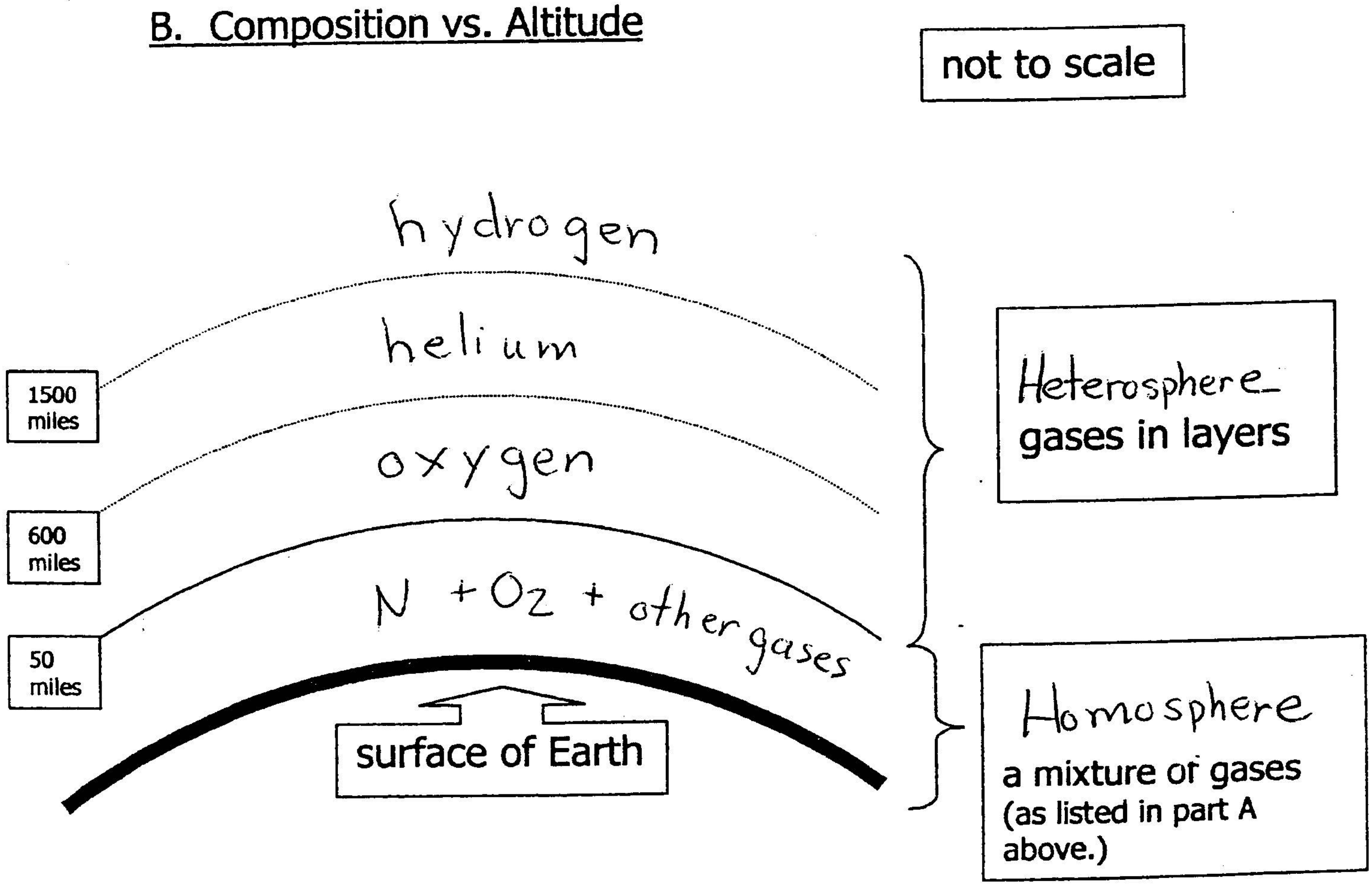
A. Composition of the atmosphere:

1. nitrogen (78%)- bacteria in the soil use this gas in the atmosphere to produce compounds called nitrates. Plants use nitrates in the soil to make plant proteins. In turn, animals get the materials they need to make proteins by eating plants.

2. oxygen (21%)- used by both plants and animals for respiration. During respiration, living things combine this gas with food. This breaks down the food and releases the energy needed by living things. This gas is also necessary for the combustion (burning) of fuels such as oil, coal and wood.

3. argon (.84%)
4. carbon dioxide (.03%)- this gas is an important raw material used by green plants to make food.
5. other gases (.01%)- which include:
helium, hydrogen, ozone
krypton, neon, xenon
6. Also: water vapor
dust particles

B. Composition vs. Altitude



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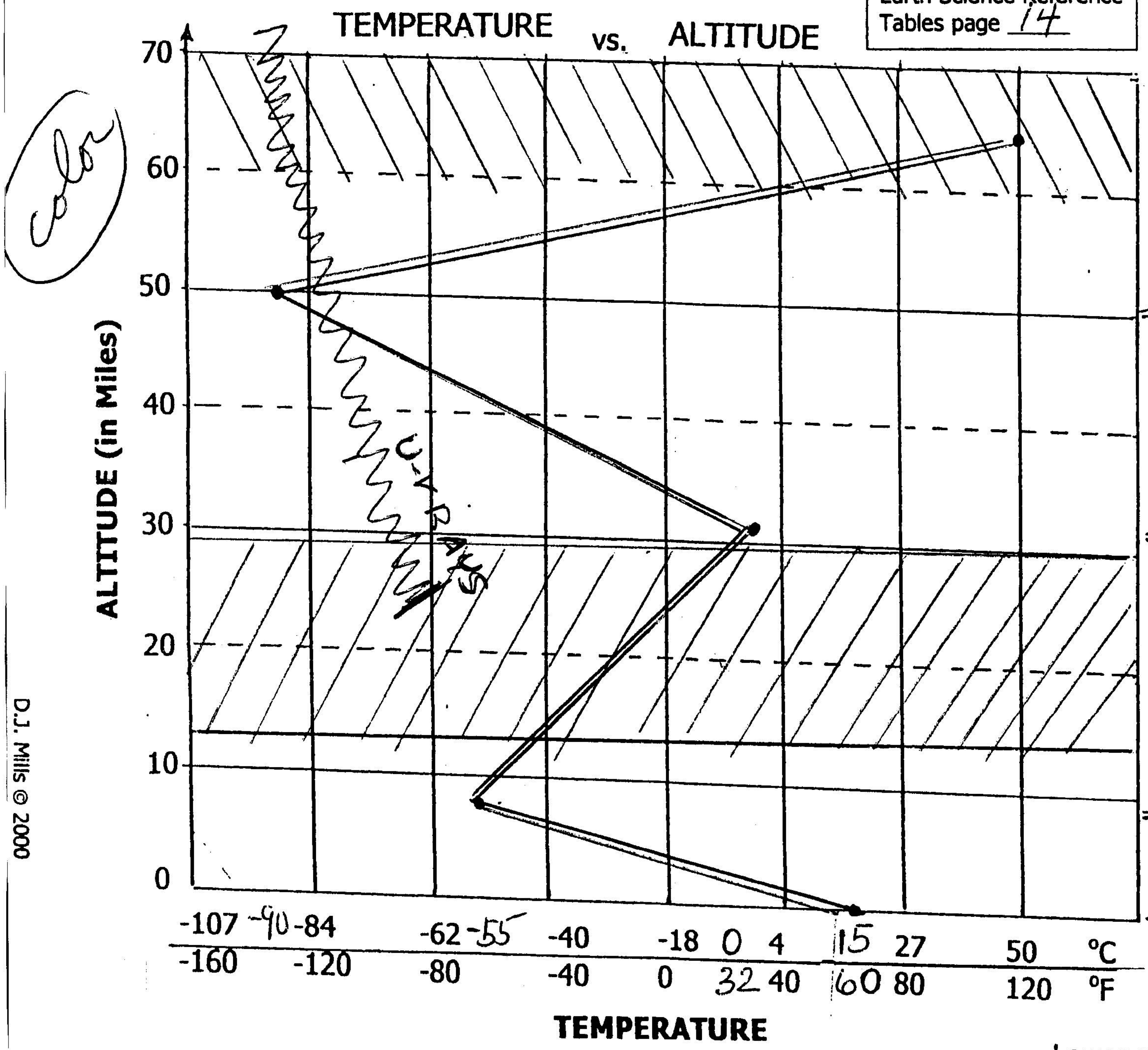


Layers of the Atmosphere

4. thermosphere

c. mesopause

3. mesosphere

b. stratopause

2. stratosphere

a. tropopause

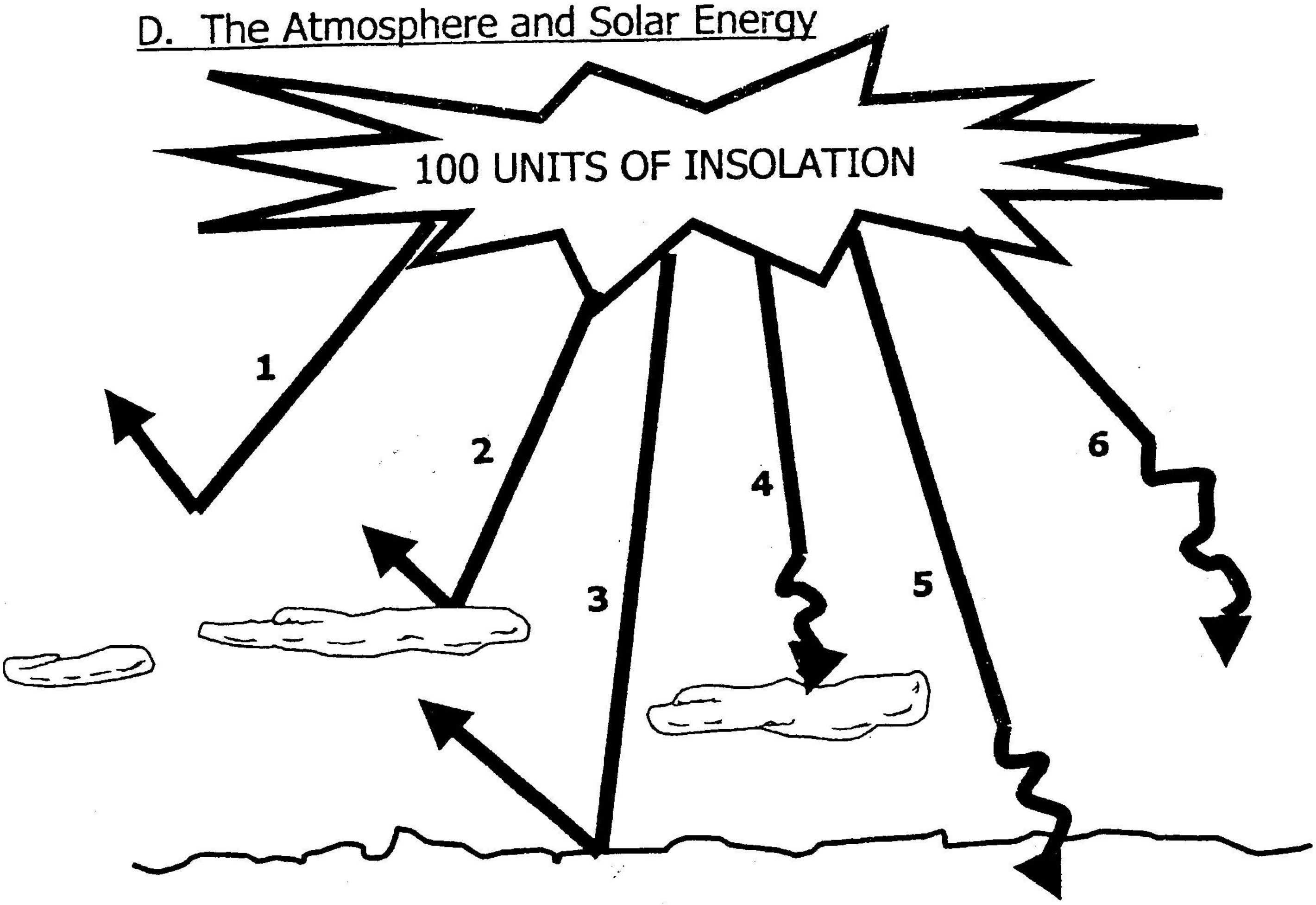
1. troposphere

Key

Ozone = O_3

Lower part of ionosphere =

D. The Atmosphere and Solar Energy



The diagram shows what happens to 100 units of sunlight entering Earth's atmosphere.

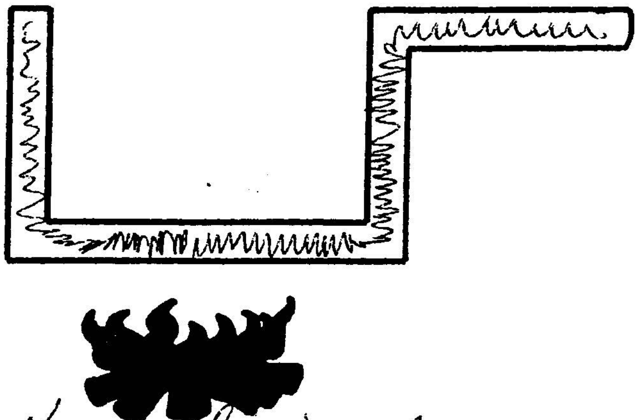
1. Reflected by aerosals (dust particles, water droplets) 6%
2. Reflected by clouds 20%
3. Reflected by Earth's surface 4%
4. Absorbed by clouds 3%
5. Absorbed by Earth's surface 51%
6. Absorbed by ozone, water vapor + dust 16%

III. TEMPERATURE AND HEAT

A. Heat Transfer

1. Conduction

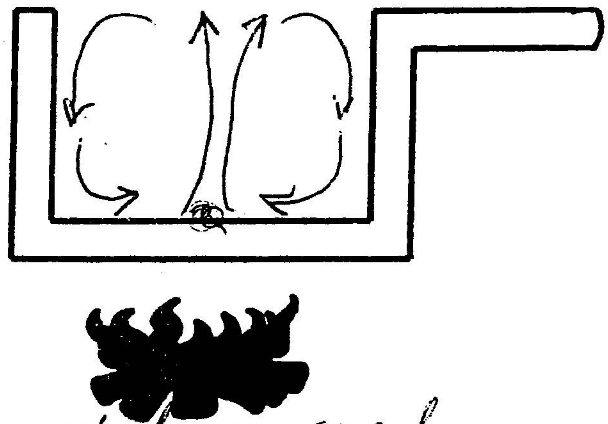
The flame's heat causes molecules in the pan's bottom to vibrate faster making it hotter. These vibrating molecules collide with their neighboring molecules, making them vibrate faster too. After a while, molecules in the pan's handle are vibrating so fast that it is too hot to touch.



The transfer of heat by the collision of molecules. Occurs best in solids – molecules closer together (solids more dense)

2. Convection

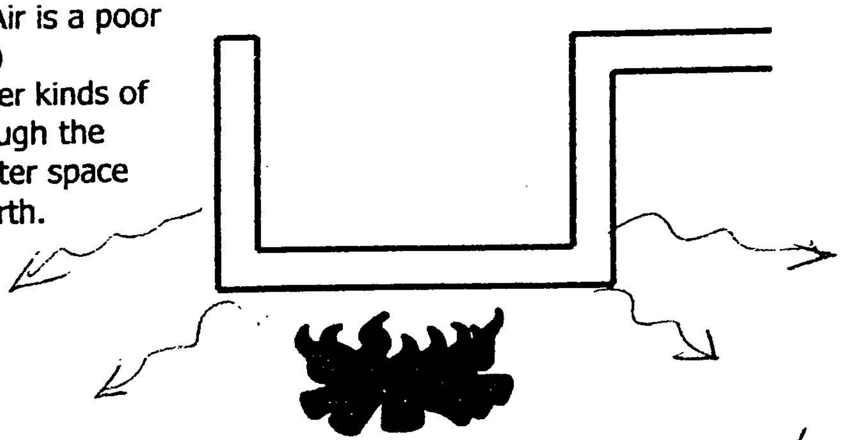
The heat in the pan, especially near the flame, causes the molecules of water at the bottom of the pan to vibrate faster, making it hotter. This hotter water becomes less dense and rises, and surrounding cooler, more dense water sinks to replace it. A circular pattern of movement develops within the water. This up and down movement eventually heats all of the water.



The transfer of heat by actual movement of the heated fluid (gas or liquid)

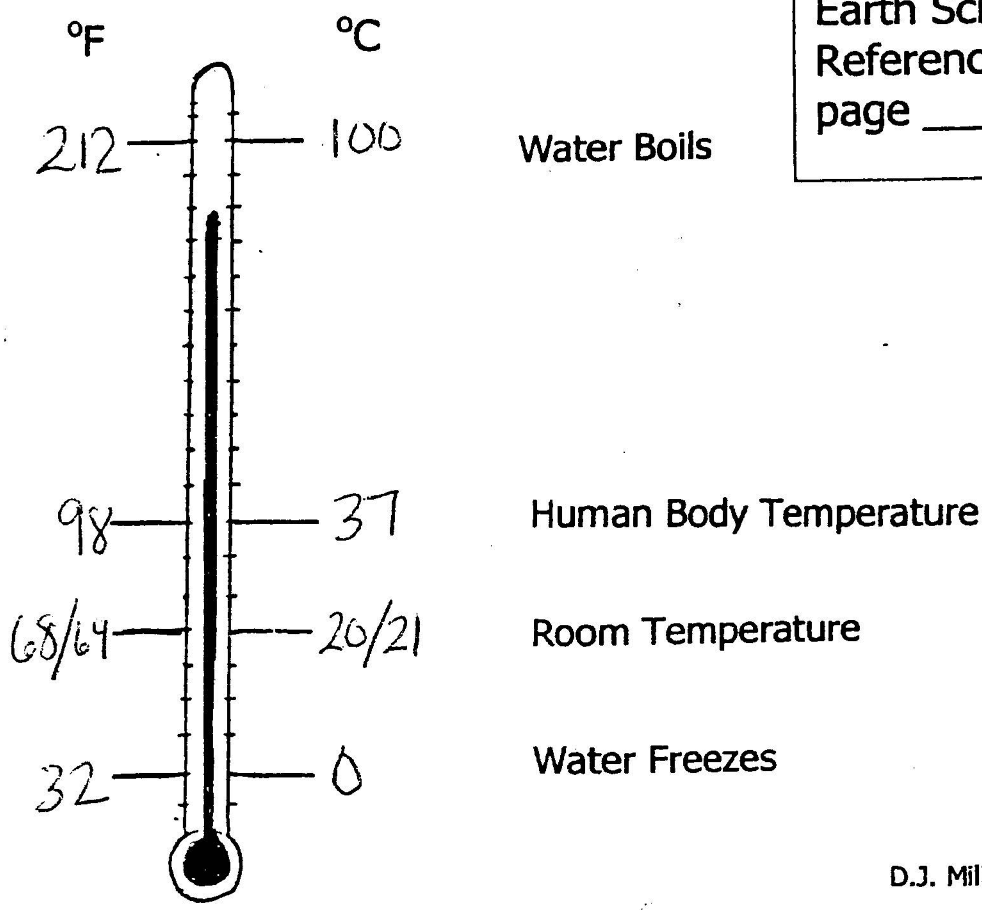
3. Radiation

The heat in the pan radiates heat in the form of waves to the surrounding air. (Air is a poor conductor of heat.)
Heat, light and other kinds of waves radiate through the near vacuum of outer space from the sun to Earth.



the transfer of heat by wave motion, through air (transparent material) or a vacuum (space)

B. Measuring Temperature



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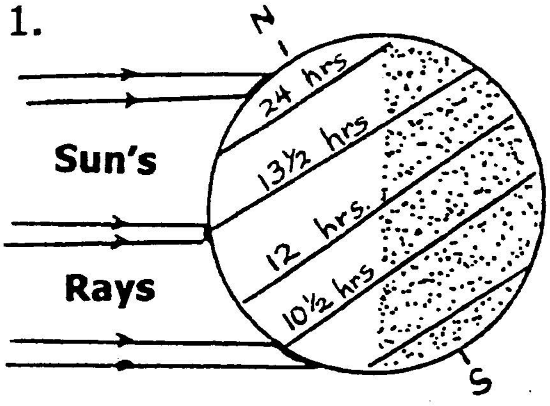
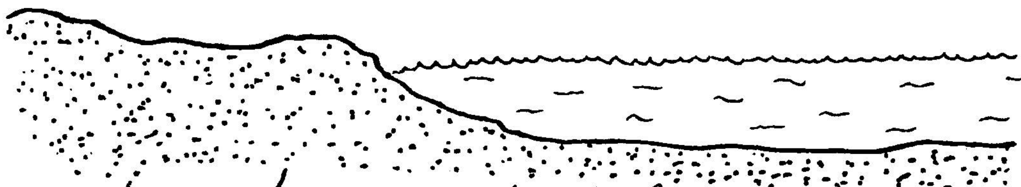
C. Factors That Effect the Amount/Rate of Heating

1.



Angle
and
Duration
of insolation

2. Land vs. Water



Land heats and cools faster than water

3. Color

Black/dark vs. white/light

Black heats faster than white

4. Texture

smooth vs. rough

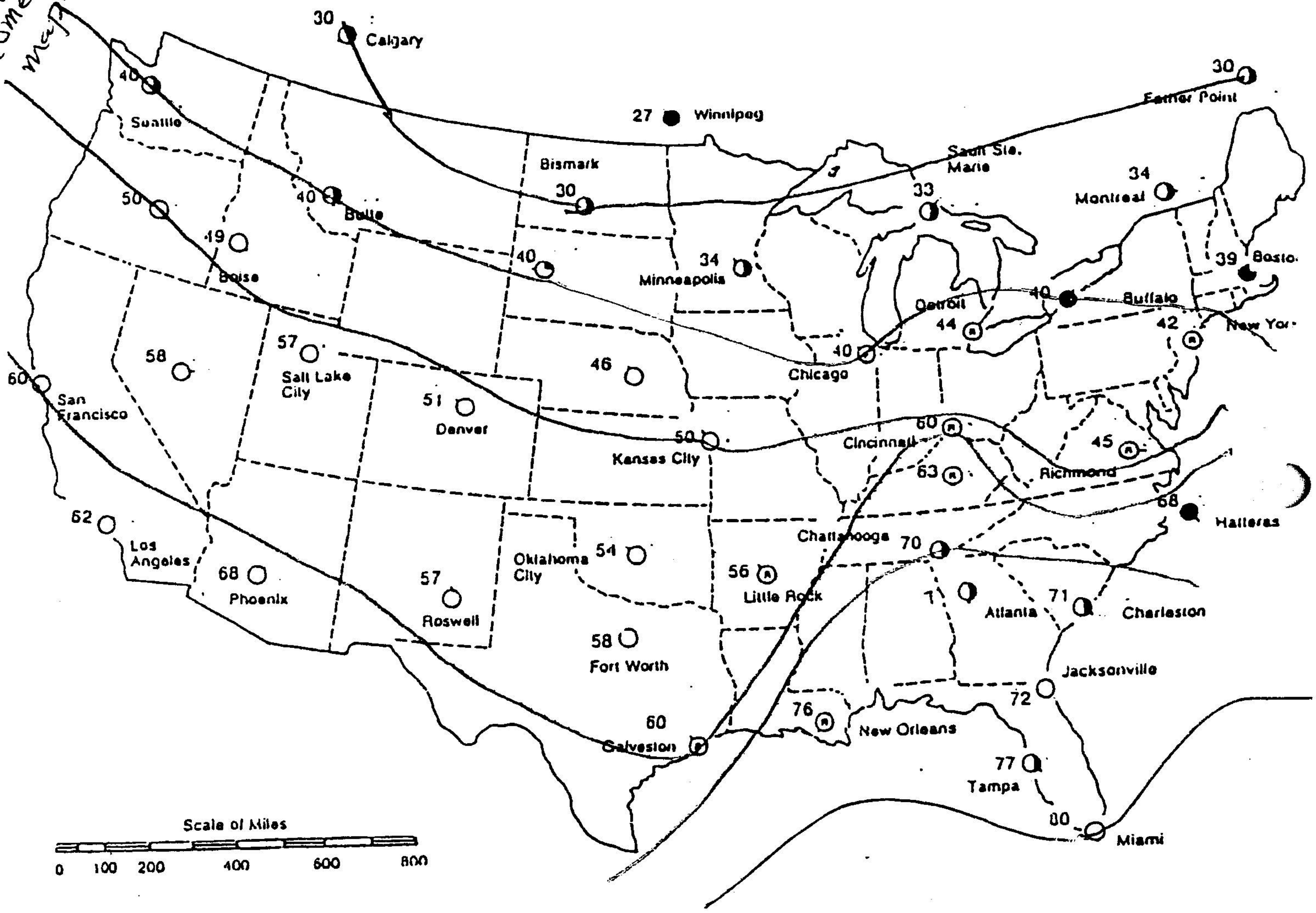
Rough surfaces heat faster.

D. Mapping a Temperature Field

Have students come-up to complete map

1. Isotherms are lines that connect points of equal temperature. Showing temperature distribution in this way making patterns easier to see.

DRAW ISOTHERMS AT 10^0 INTERVALS (30^0, 40^0, 50^0, 60^0, 70^0, AND 80^0)



2. The greatest temperature gradient is between Richmond and Hatteras which is indicated because the isotherms are closest Together

3. Temperature gradient calculation from Cincinnati to Chicago:

$$G = \frac{60° - 40°}{250\text{ mi.}} = \frac{20°F}{250\text{ mi}} = .08\ °F/\text{mi.}$$

E. General Information – Heat/Temperature

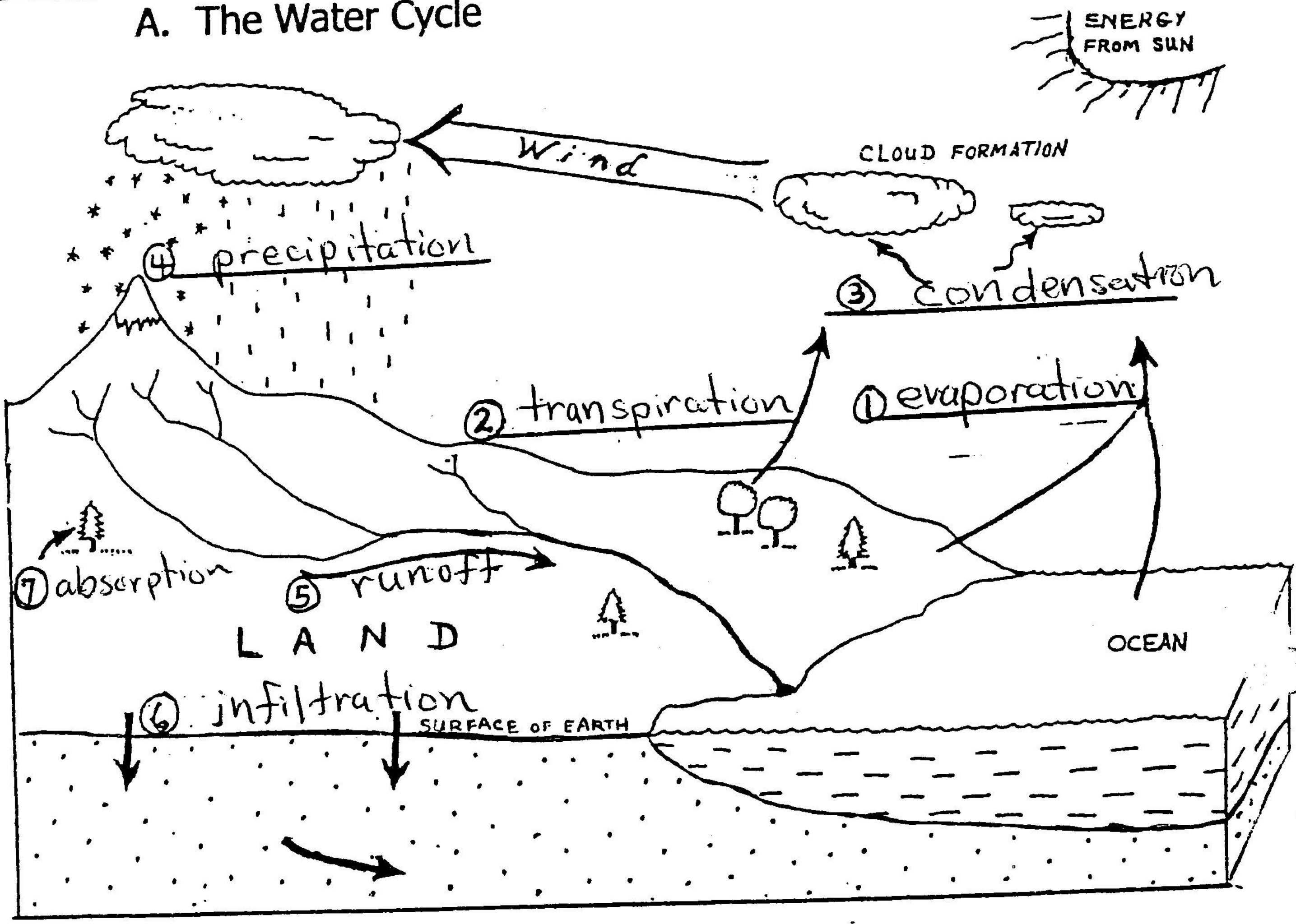
wind chill

chart

2. Heat affects the body- When your body is overheated, the additional stress can cause medical problems.
   a. Your body's thermostat, the SKIN determines that the body is too warm.
   b. PERSPIRATION increases in an effort to carry heat from deep inside the body to the surface of the skin.
   c. If WATER lost by sweating is not replaced, dehydration and heat exhaustion can result.
   d. High humidity can interfere with the BODY'S ABILITY TO PERSPIRE A PROCESS that carries away large amounts of heat.

IV. MOISTURE

A. The Water Cycle



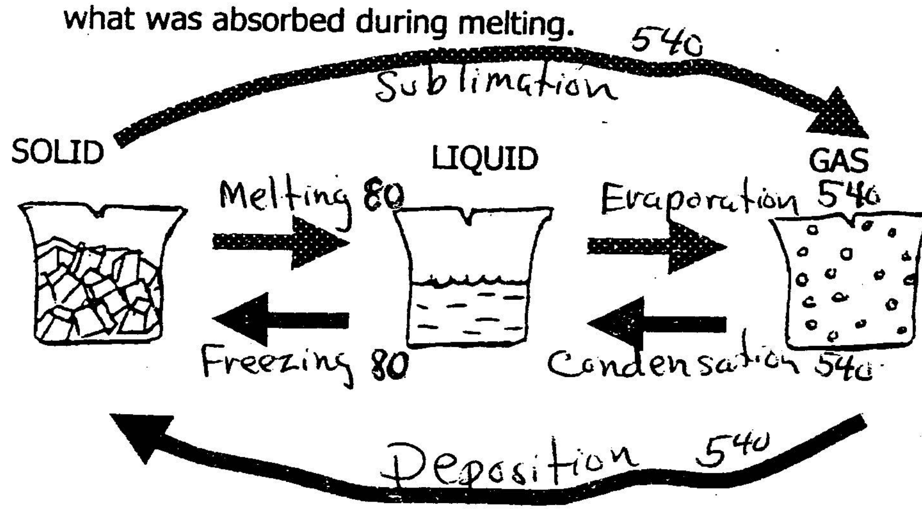
8. The primary source of energy for the water cycle is the ___sun___.

9. ___Transpiration___ is the process by which plants release water into the atmosphere; 2 in the diagram.

10. ___Precipitation___ is falling liquid or solid water from the clouds to Earth's surface; 4 in the diagram. Examples:
    a. ___rain___
    b. ___snow___
    c. ___hail___
    d. ___sleet___

B. Changes in State

1. evaporation - liquid changing to a gas
   a. It requires 540 cal. of energy (heat) to convert 1 gram of liquid water to water vapor.
   b. Evaporation is a cooling process since it absorbs heat from the environment.
2. condensation - water vapor changing into a liquid
   a. Water molecules release energy equivalent to what was absorbed during evaporation.
   b. Condensation in the atmosphere results in the formation of clouds and dew/fog/frost.
3. melting - solid changing to a liquid
   a. It requires 80 cal. of energy/heat to convert 1 gram of ice to liquid water.
   b. Melting is a cooling process.
4. freezing - liquid changing to a solid
   a. Water molecules release energy equivalent to what was absorbed during melting.
5.



KEY: ▬ =ABSORBS HEAT ▬ =RELEASES HEAT

6. Sublimation - solid changing directly to a ~~liquid~~ GAS

Examples: moth balls and dry ice (CO_2)

7. Deposition - gas changing directly to a solid

B. Moisture in the Atmosphere

1. The primary source of moisture for the atmosphere is the ocean.

Other sources include: lakes, rivers, soil, plants

2. Moisture in the atmosphere exists in all three states/phases.

a. gas - known as water vapor

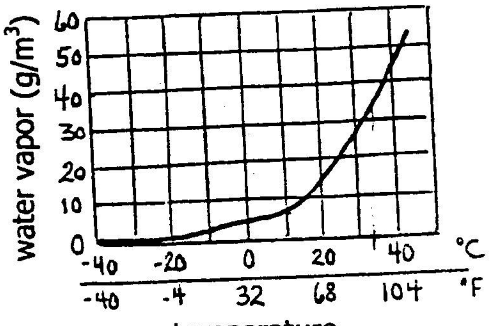
b. liquid - tiny droplets suspended in the air that forms clouds.

c. Solid - tiny crystals suspended in the air that form clouds.

3. Humidity is the general term used to describe the amount of water vapor in the air

4. Temperature determines the amount of water vapor the air can hold.

a.



b. As air temperature increases, the amount of water vapor the air can hold increases.

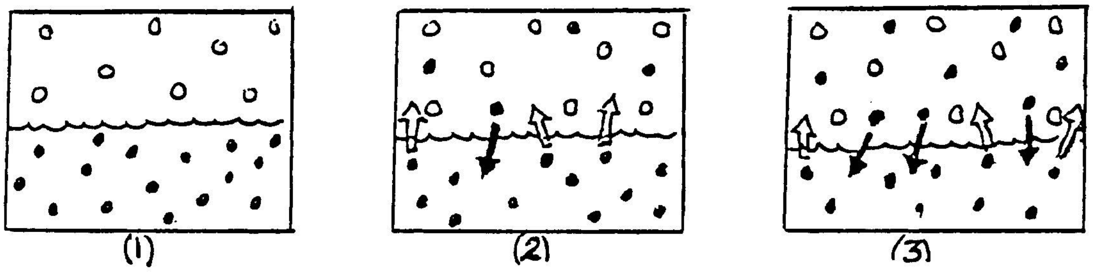
c. At 35°C, a cubic meter of air can hold 35 grams of water vapor.

5. Saturation - When air holds as much water vapor as it can at a certain temp.

6. Saturation occurs when Evaporation = Condenstation

KEY: o air molecule ⟹ evaporation

• water molecule ➞ condensation



a. At 1, no evaporation has occurred.

b. At 2, evaporation is proceeding faster than condensation.

c. At 3, the rate of evaporation equals the rate of condensation. Equilibrium has been reached and the air is Saturated.

7. Factors Affecting the Rate of Evaporation

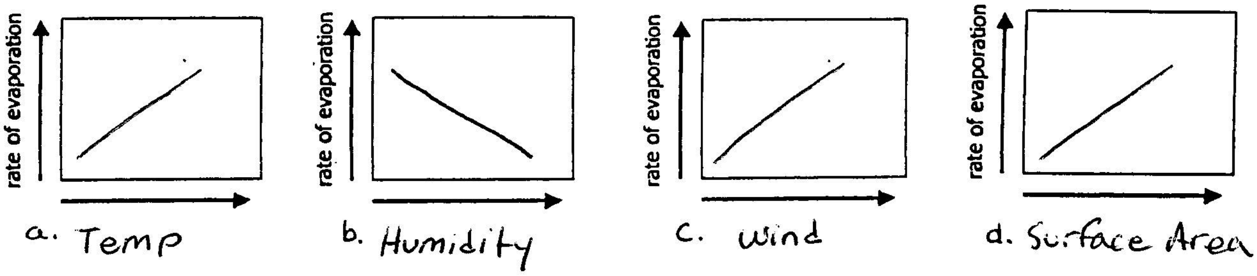
a. Temp - As temp. increases, rate of evaporation increases

b. Humidity - As humidity increases rate of evaporation decreases.

c. Wind - As wind increases rate of evaporation increases

d. Surface Area - As surface area increase, rate of evaporation increases

8.



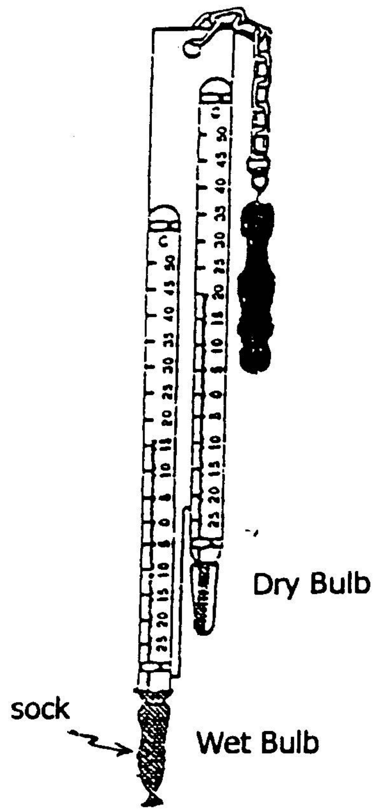
9. Dew Point Temp - the temp. to which air must be cooled to reach saturation

a. Using a Sling Psychrometer to Measure the Dew Point Temp.

A sling psychrometer consists of two thermometers mounted on a narrow frame which has a handle used to whirl the thermometer always remains dry (the dry bulb). The other has a cloth sock or wick over its bulb that is moistened before it is used (the wet bulb).

After a psychrometer is whirled around for a little less than one minute, both thermometers should be read.

Evaporation of water from the wick will have lowered the temperature reading on the wet-bulb (if the air is not saturated). Remember: evaporation absorbs heat and is a cooling process.



b. The drier the air, the faster / more evaporation will occur resulting in greater / more cooling. In turn, the difference in temperature between the dry bulb and wet bulb will be greater / more

c. The more humid the air, the less evaporation will occur resulting in less cooling of the wet bulb thermometer. In turn, the difference is temperature between the dry bulb and wet bulb will be smaller.

d. At saturation, the temperature difference between the dry bulb and wet bulb would be 0.

e. Determine the dew point temperature for the following data:

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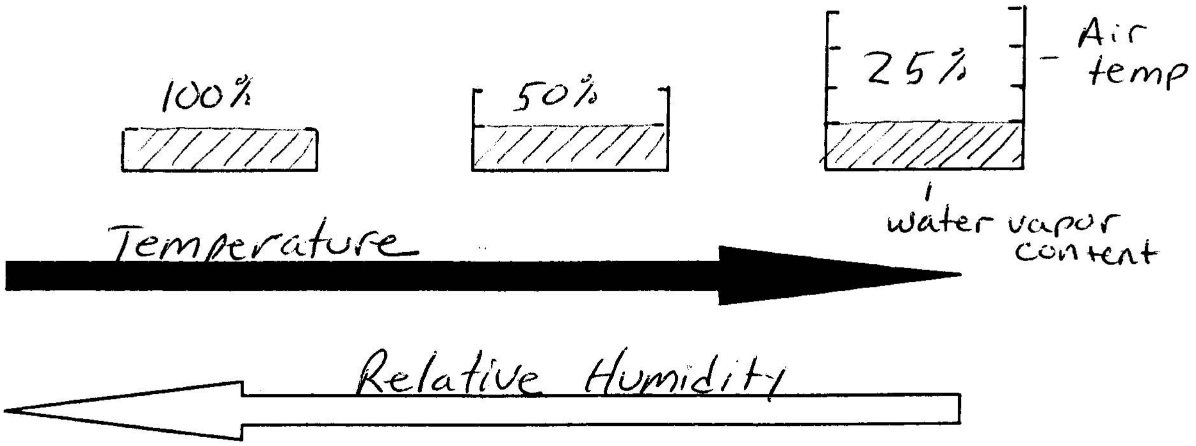
DRY BULB TEMP.	22°C	22 °C	20 °C	15 °C	9 °C	8 °C	17 °C
WET BULB TEMP.	20°C	13 °C	14 °C	12 °C	3 °C	6°C	17 °C
dew point	19°	5°	10°	10°	-7°	3°	17°C

10. Relative Humidity - the ratio (comparison) between the actual amount of water vapor in the air to the maximum amount of water the air can hold at a given temp.

a. Changing Air Temperature

(1)



(2) If temp. increases, and moisture in the air remains the same, relative humidity will decrease

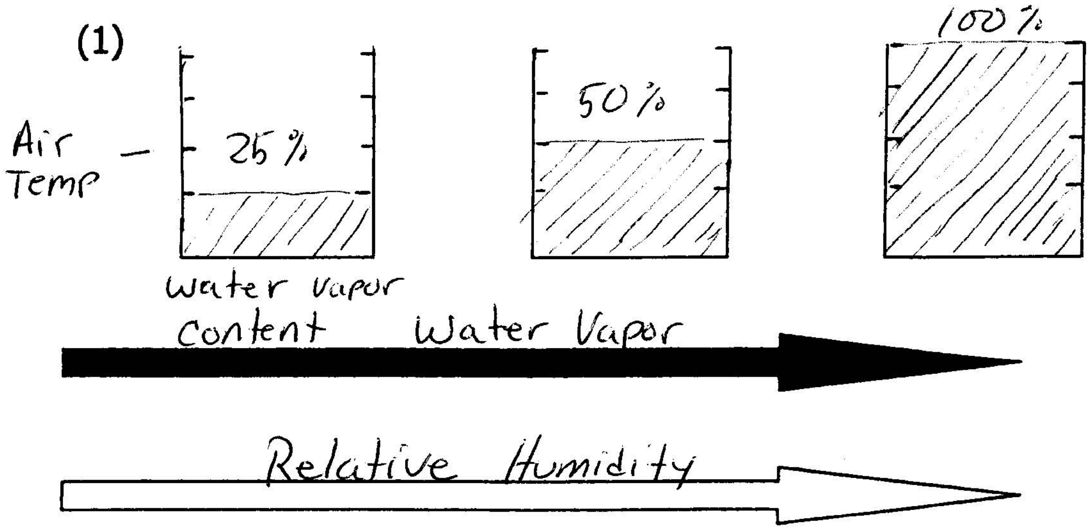
(3) Time of Day:

(a) Highest Relative Humidity = coolest time of day - 5:00 am

(b) Lowest Relative Humidity = warmest time of day - 3:00 pm.

a. Changing Absolute Humidity (actual water vapor content)

(1)



(2) If moisture content of the air increases, and temperature remains the same, relative humidity will increase

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(3) Determine the relative humidity for the following data:

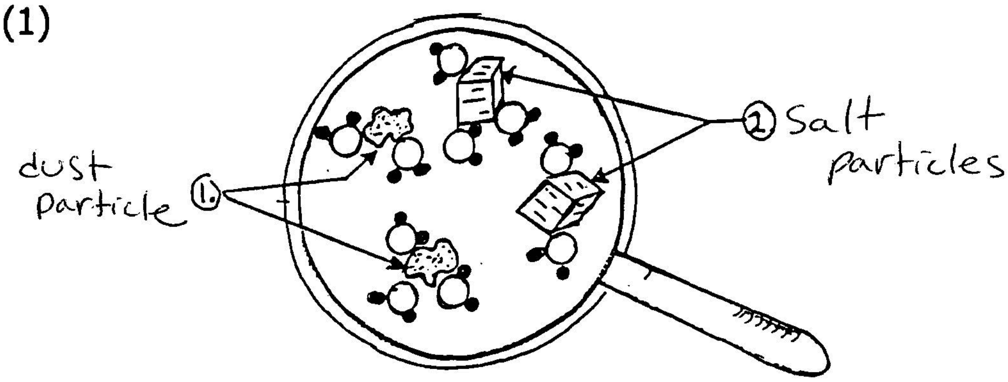
Dry Bulb Temp.	20°C	8°C	22°C	22°C	15°C	15°C	3°C
Wet Bulb Temp.	14°C	6°C	13°C	20°C	12°C	15°C	-1°C
Relative Humidity	51%	74%	33%	83%	70%	100%	39%

11. Clouds

a. Clouds are tiny droplets of liquid water or tiny ice crystals suspended in air.
b. Combination of conditions needed for a cloud:
(1) Moisture in the air
(2) cooling temperatures
(3) dust particles or "condensation Nuclei"

c. Condensation Nuclei = Aerosals in the atmosphere which provide a surface for water molecules to condense on

(1)

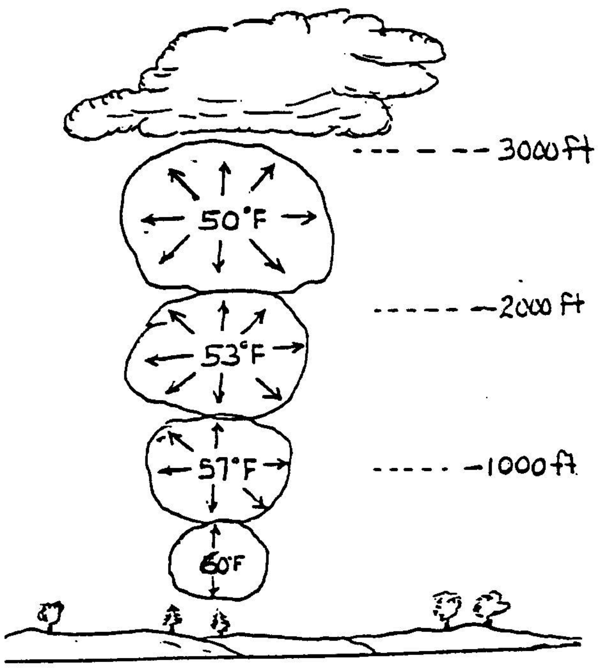


= water molecule

(2) Condensation in cloud formation incorporates some of the aerosols as condensation nuclei, and thus, these aerosols are removed from the atmosphere during precipitation. Precipitation therefore cleans the air

d. Cooling in the Atmosphere – Adiabatic Cooling

As air rises, the atmospheric pressure surrounding the parcel of air decreases. Therefore, the parcel of air expands in volume ~~and~~ as it rises. As it expands, it becomes cooler. When the temperature of this parcel of air falls to its dew pt. temp, the water vapor in the air condense and a cloud appears in the sky.



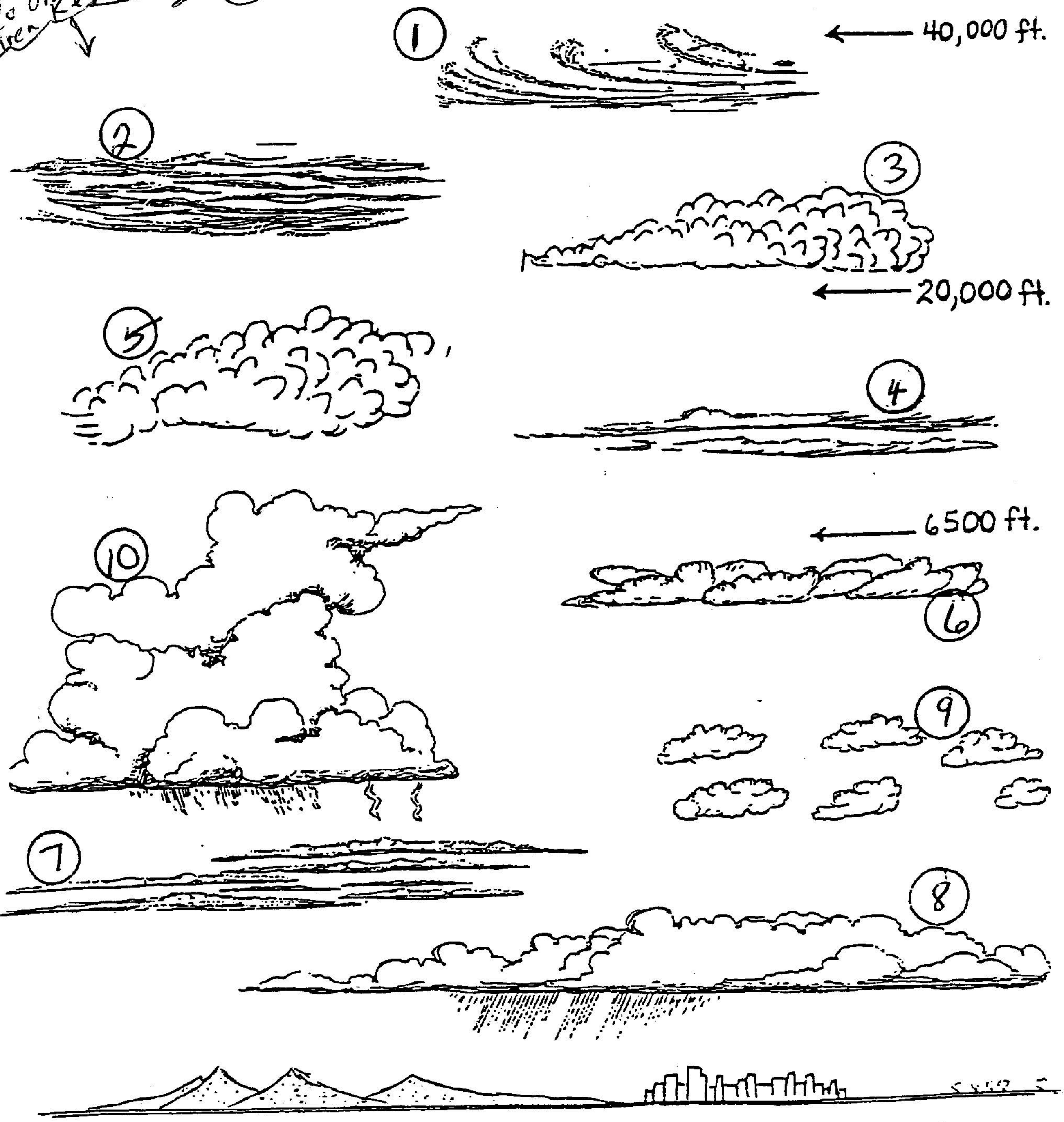
12. Cloud Types

a. Key meanings:

(1) cirrus - wisps or curls
(2) stratus - spread or layered
(3) cumulus - heaps or piles
(4) alto - prefix meaning "high"
(5) nimbus - rain-bearing or snow-bearing

Have students do once given key

b. Establish a key on page 21 and then identify these:



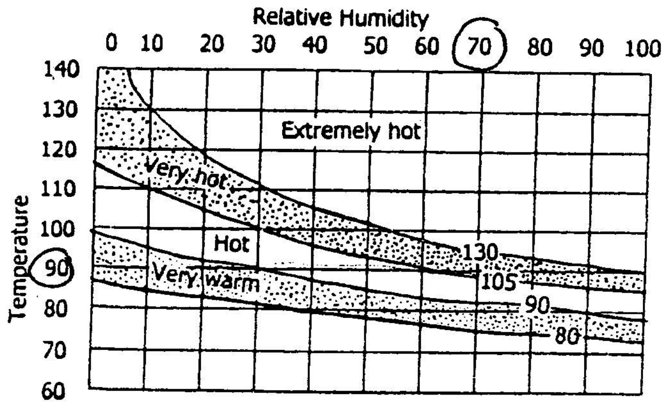
c. Classification of Clouds:

FAMILY	AVERAGE HEIGHT (range)	TYPE (name)	SYMBOL	KEY TO PG.20 DIAGRAM
HIGH CLOUDS	20,000 ft.- 40,000 ft.	Cirrus	Ci	1
		Cirro stratus	Cs	2
		Cirro cumulus	Cc	3
MIDDLE CLOUDS	6,500 ft. - 20,000 ft.	Alto stratus	As	4
		Alto cumulus	Ac	5
LOW CLOUDS	1,600 ft. - 6,500 ft.	Strato cumulus	Sc	6
		Stratus	St	7
		Nimbo stratus	Ns	8
VERTICAL DEVELOPMENT	1,600 ft.- 40,000 ft.	Cumulus	Cu	9
		Cumulo nimbus	Cb	10

13. Humidity and Temperature

a. The combination of high heat and humidity makes people feel warmer than the actual temperature alone. When the humidity is high, less sweat evaporates. Evaporation is a cooling process. If less sweat evaporates, the body doesn't cool – feels warmer.

b. How hot does it feel when the air temperature is 90° and the relative humidity is 70%? 105°F



Example: Temperature 100 °F and relative humidity of 60%. The apparent temperature is 130° of the edge of the "extremely hot" range.

Health Dangers:

Extremely Hot = heatstroke is imminent

Very Hot = Heatstroke possible with prolonged exposure. Heat cramps and heat exhaustion likely.

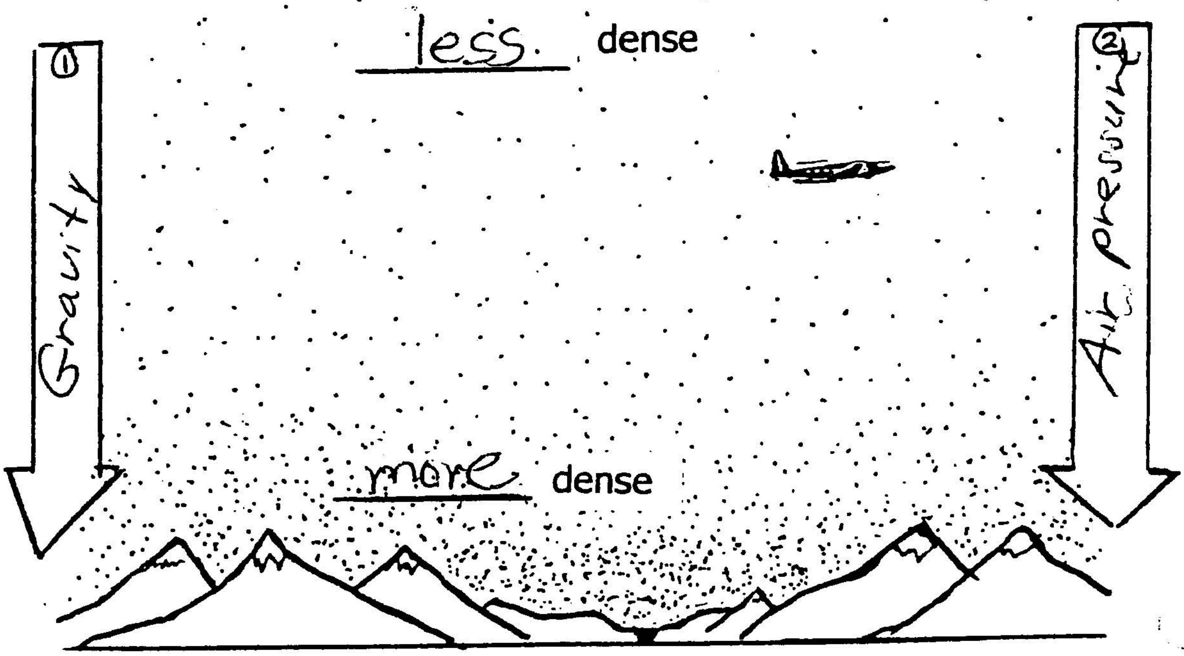
Hot = Heat cramps and heat exhaustion possible with prolonged exposure.

Very Warm = Physical activity could be more fatiguing than usual.

V. AIR PRESSURE

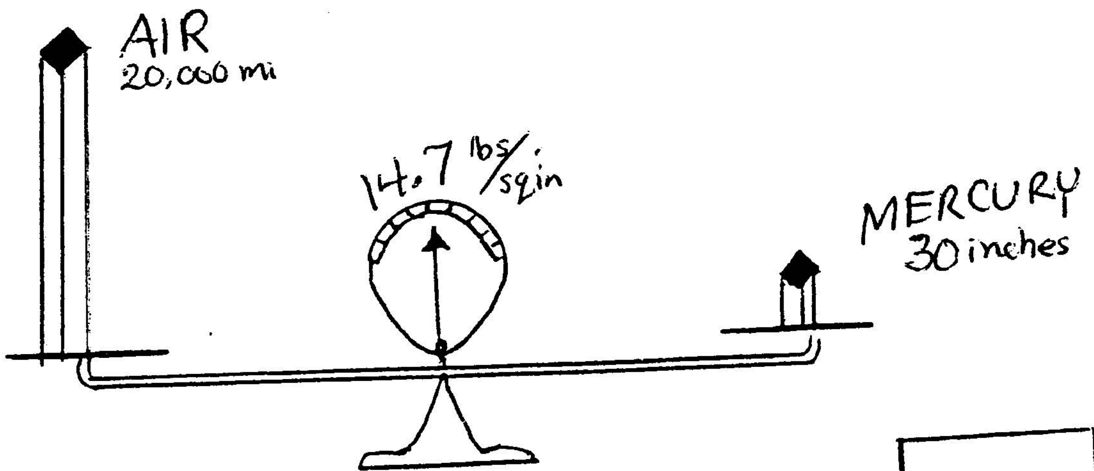
A. Cause of Air Pressure

1. The force of gravity causes the air to have weight - this creates air pressure.

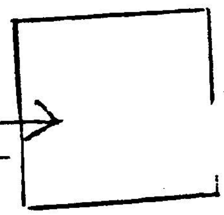


2. Air pressure acts equally in all directions; it also exists within any object containing air like a building, the human body and "empty" bottles.

3.

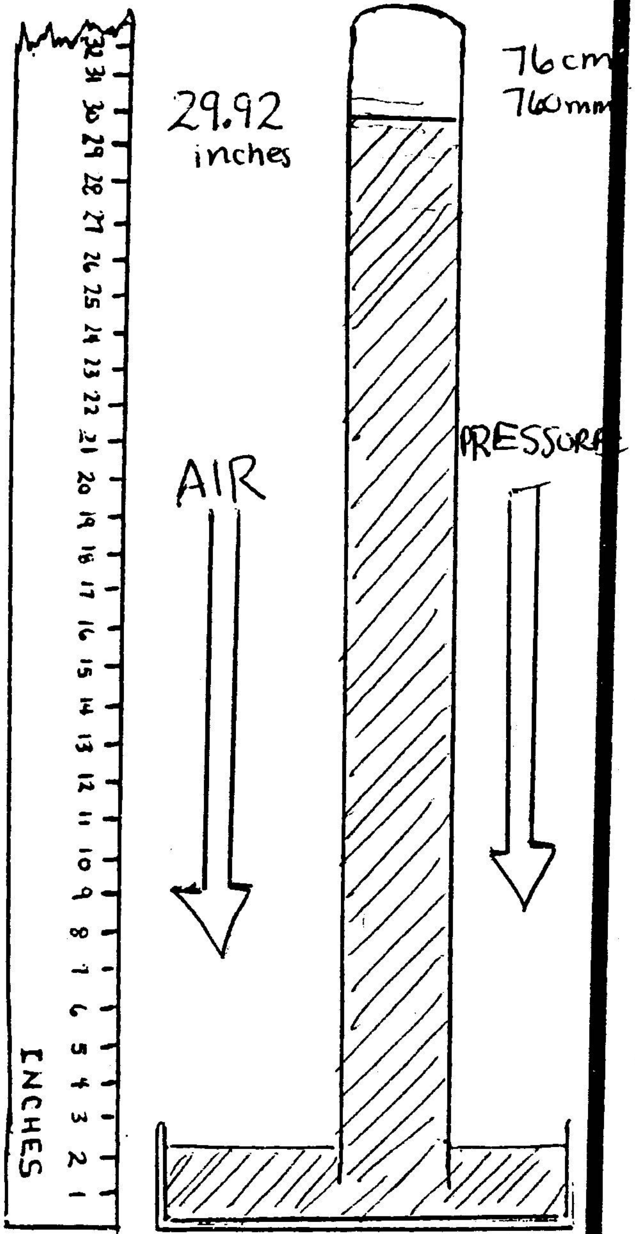


4. Air pressure at sea level is 14 lb/in² →

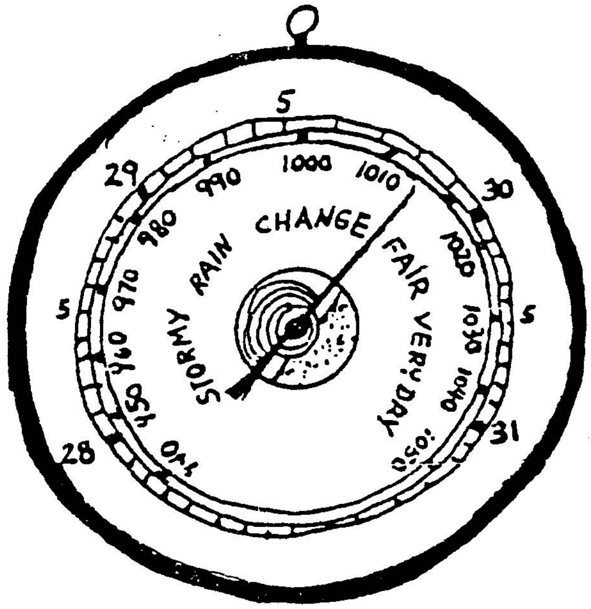


B. Measuring Air Pressure

(1) Mercury barometer (2) Aneroid barometer



Dish of Mercury



An aneroid barometer consists of an air tight metal box from which most of the air has been removed.

A change in air pressure causes a small metal disk on the side or top to bend. A spring is attached to the metal disk. The bending of the metal disk causes the spring to move. A needle attached to the spring indicates the changing air pressure on the dial.

3. Units for measuring air pressure

inches (of mercury) | millibars

C. Atmospheric Pressure Scale

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1. Standard sea level atmospheric pressure is:

one atmosphere or 29.92 in. or 1013.2 mb

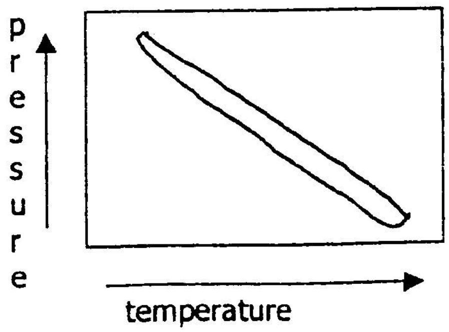
2. Conversions:

(1)	997 mb	=	29.44
(2)	1021	=	30.15 in.
(3)	1006 mb	=	29.71
(4)	982 mb	=	29.00
(5)	1000	=	29.53 in.
(6)	1023	=	30.21 in.
(7)	1019 mb	=	30.09

D. Changes in Atmospheric Pressure

1. Factors/variables that cause atmospheric pressure to change: (a) Temperature
   (b) Moisture
   (c) Altitude
2. Effect of temperature on air pressure:

As air temperature increases; (air molecules move farther apart / become less dense) the air pressure decreases

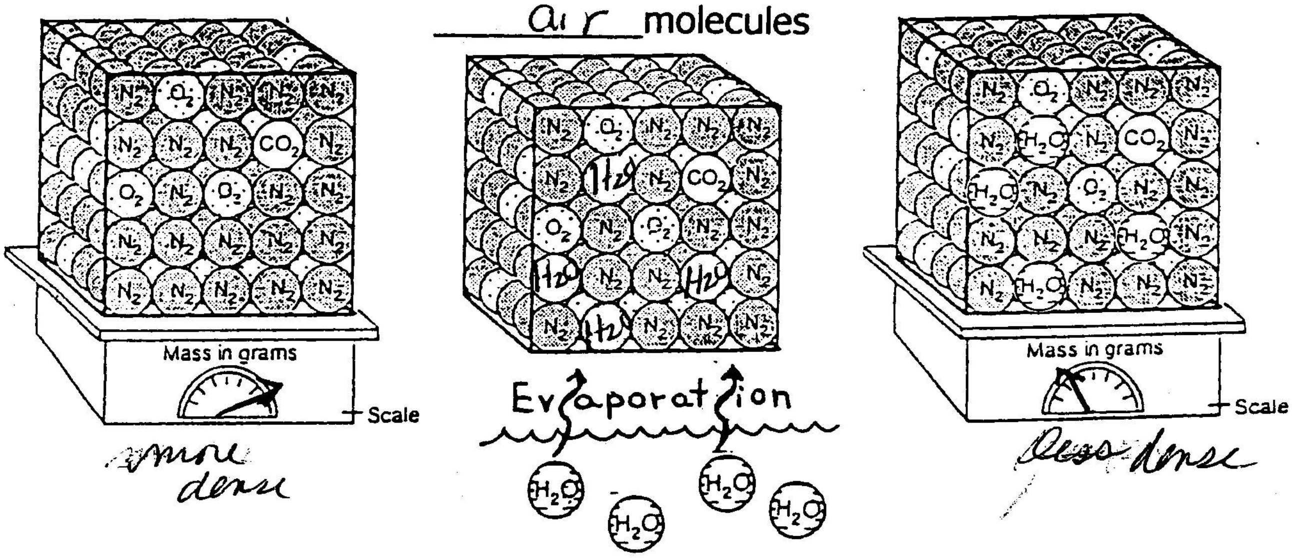


3. Effect of moisture on air pressure:

a. The diagrams represent a specific volume of air in three different circumstances. They show how the density or mass of this volume of air changes when water vapor enters the air.

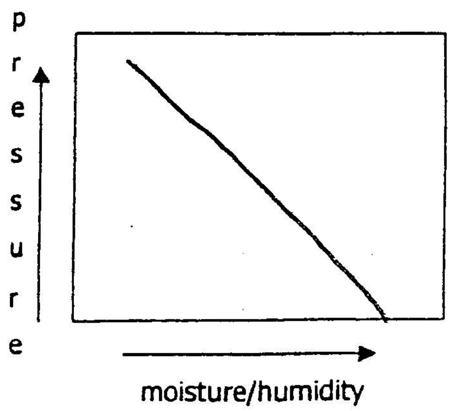
DATA TABLE		
Molecule Symbol	Gas	Mass
N_2	Nitrogen	28 g
O_2	Oxygen	32 g
CO_2	Carbon Dioxide	44 g
H_2O	Water Vapor	18 g

1. DRY 2. Water vapor molecules replace air molecules 3. Humid



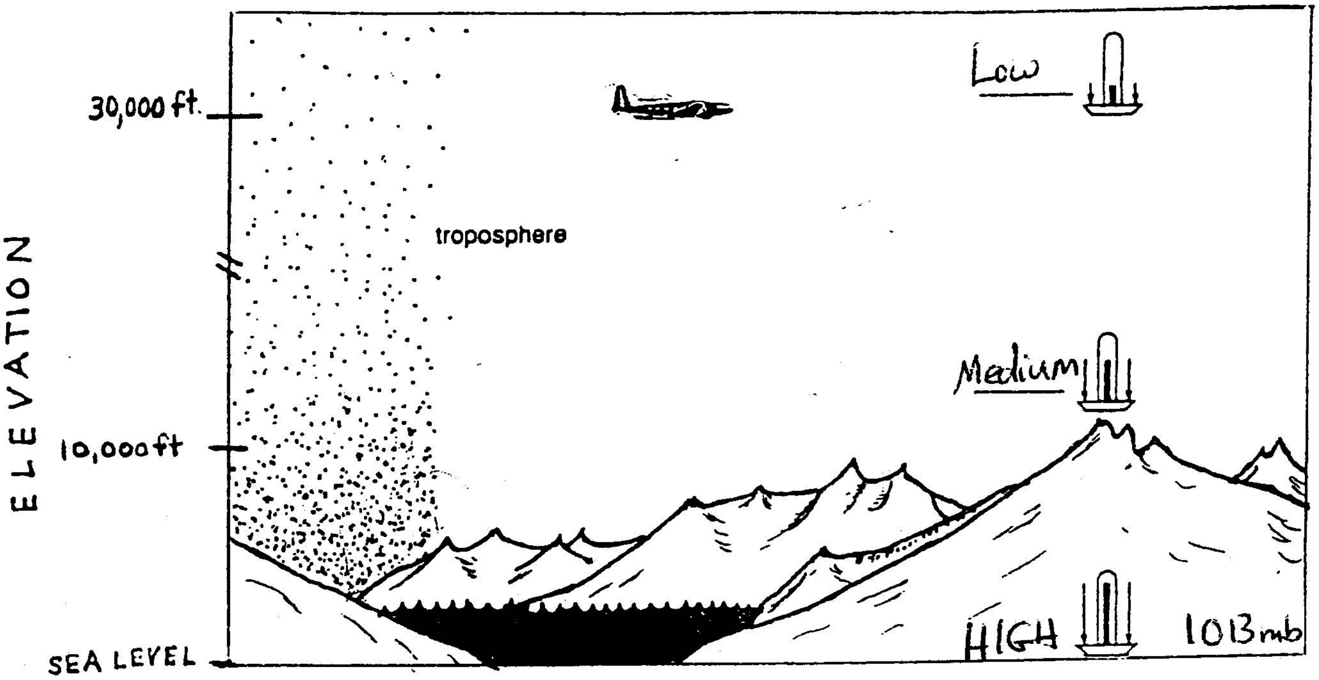
more dense   less dense

b. As humidity increases, air pressure decreases — because when water vapor molecules enter the air, they replace heavier air molecules



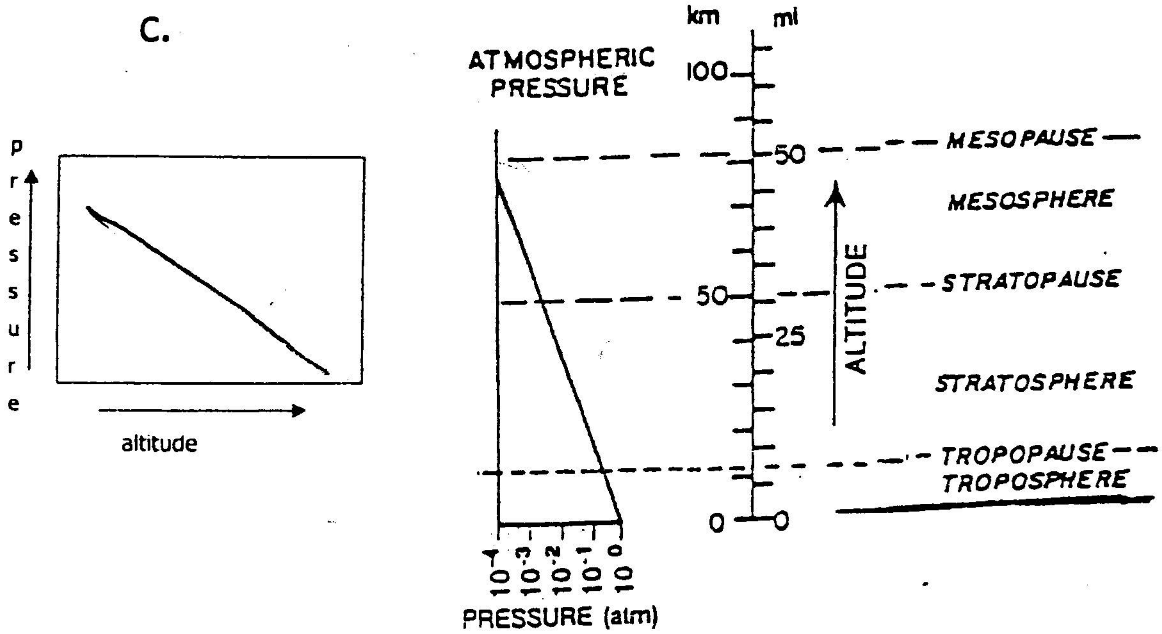
4. Effect of altitude on air pressure:

a.



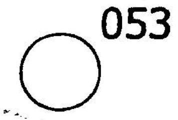
b. As altitude increases, air pressure decreases. (less air is above AND air is less dense)

c.



E. Mapping An Air Pressure Field

1. Isobars are lines that connect points of equal air pressure. Showing air pressure distribution in this way makes patterns easier to see.
   On U.S. Weather Bureau maps, the interval between isobars is 4mb.
2. On weather maps, barometric pressure is represented by a three-digit number to the upper right of a circle; this circle represents a city on the map.

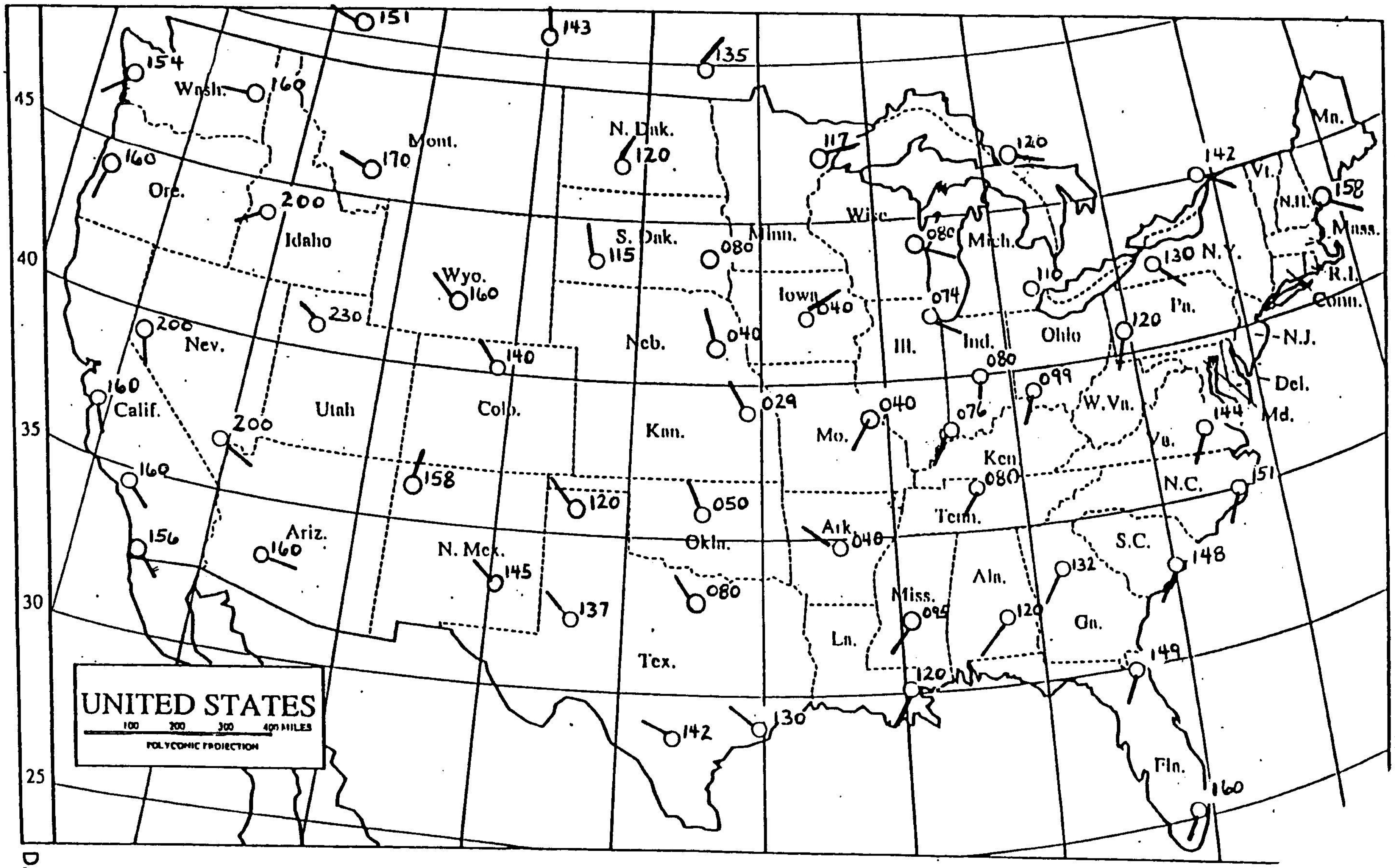


   a. Rules to follow to determine the value of this number:
      1. A decimal point is omitted between the last two digits on the right.
      2. The number 9 or 10 is omitted in front of this number. If the original number is above 500, place a 9 in front. If it is below 500, place a 10 in front. (Hint: use whichever will give a result closest to 1000 mb.)

      Example: 053 → 1005.3

      Special note: The determined value of this number should be on the pressure scale (millibars) on pg. 14 of the Earth Science Reference Charts
3. a. On the map on the next page, draw isobars for 1004, 1008, 1012, 1016, and 1020 millibars.
   b. Identify the center of the high pressure region by placing an **H** on the map.
   c. Identify the center of the low pressure region by placing an **L** on the map.

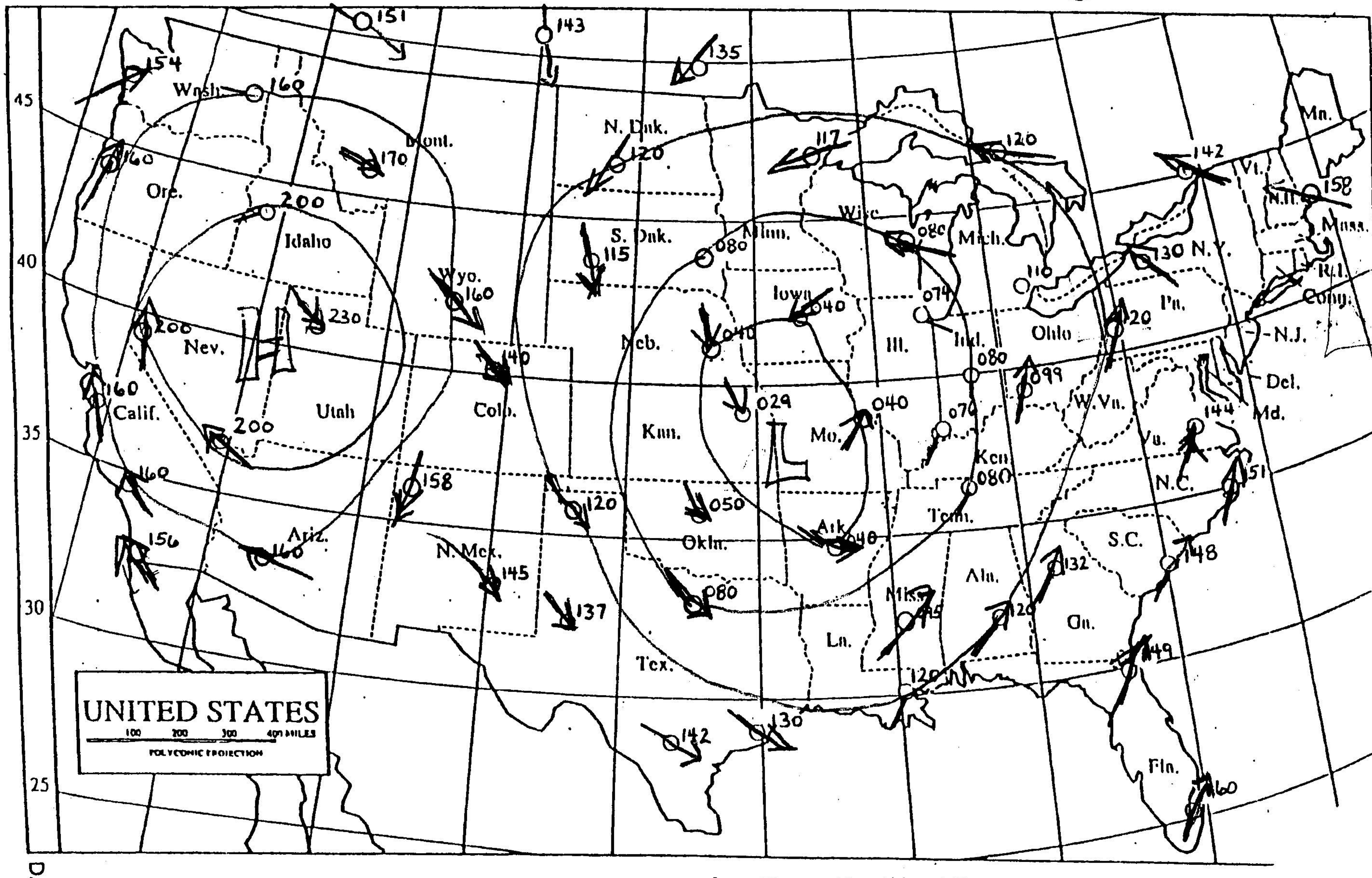
4. Isobars, Air Pressure and Winds



KEY: Millibars	Map Abbreviation	Millibars	Map Abbreviation
1024.0	240	1012.0	120
1020.0	200	1008.0	080
1016.0	160	1004.0	040

* Have students complete map by individuals coming-up to overhead

4. Isobars, Air Pressure and Winds



KEY:

Millibars	Map Abbreviation	Millibars	Map Abbreviation
1024.0	240	1012.0	120
1020.0	200	1008.0	080
1016.0	160	[illegible]	040

VI. WIND - the horizontal movement of air parallel to Earth's surface

A. Causes of Winds (What makes the wind blow?)

1. uneven heating of Earth's surface

2. Examples;

   a. land vs. water

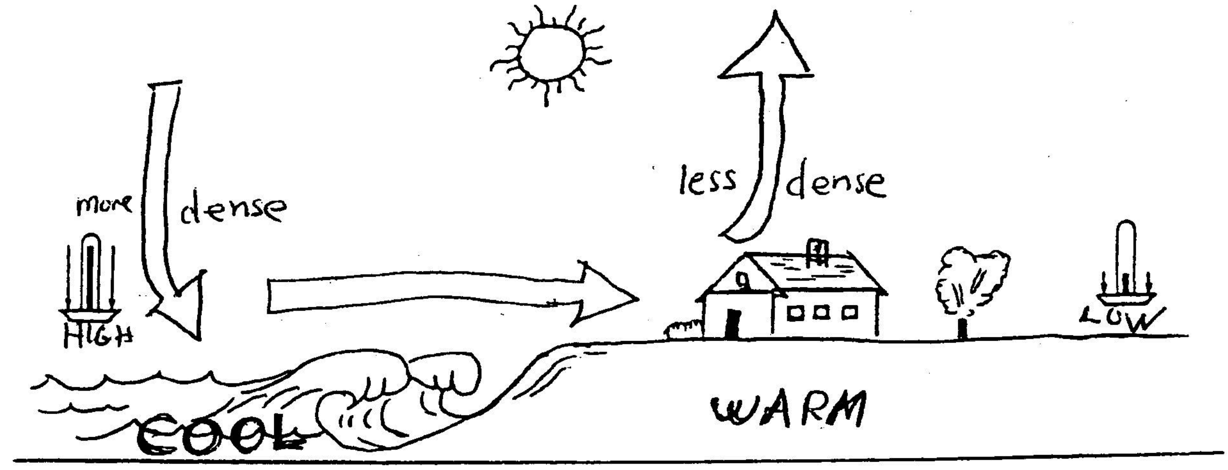
   b. poles vs. equator

   c. dark forest vs. snow field

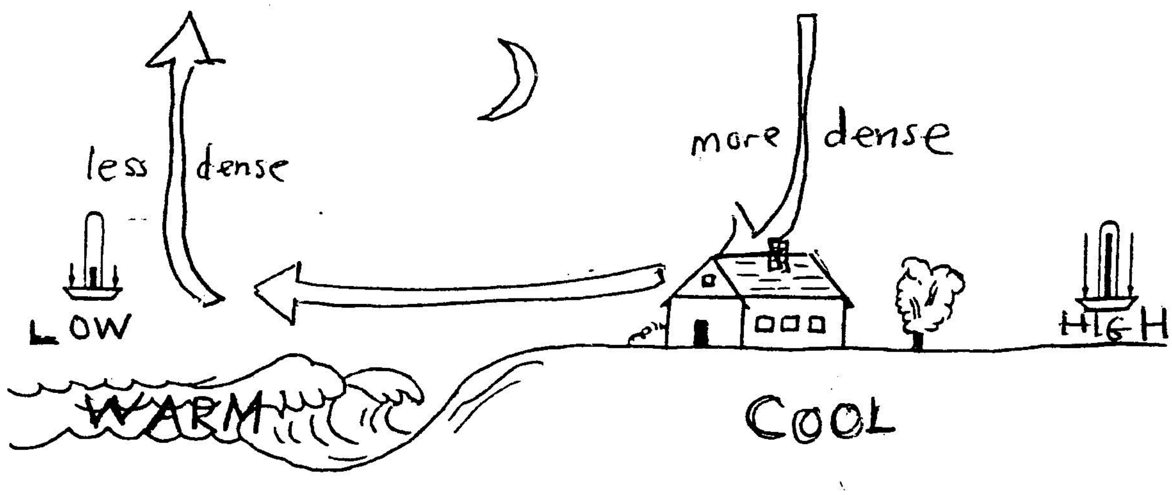
3. Winds help to distribute energy from regions of surplus energy to regions of energy deficit.

B. Sea Breeze/ Land Breeze

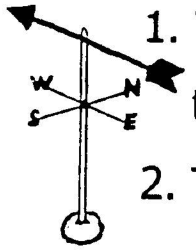
1. SEA breeze



2. LAND breeze

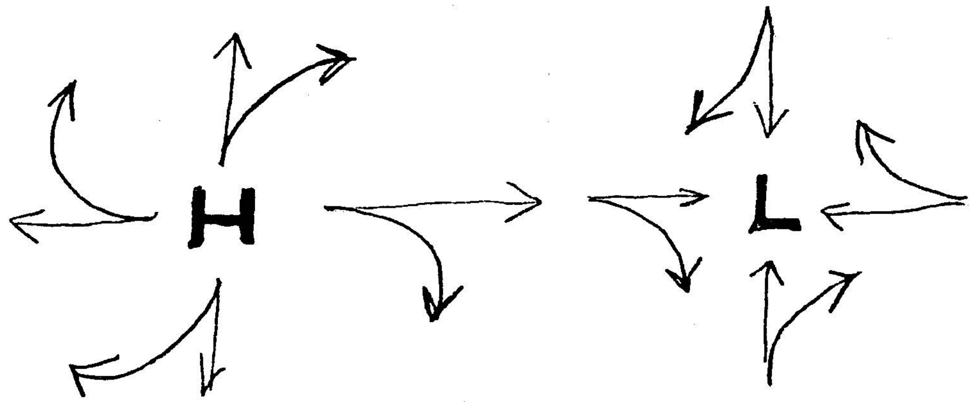


C. Wind Direction

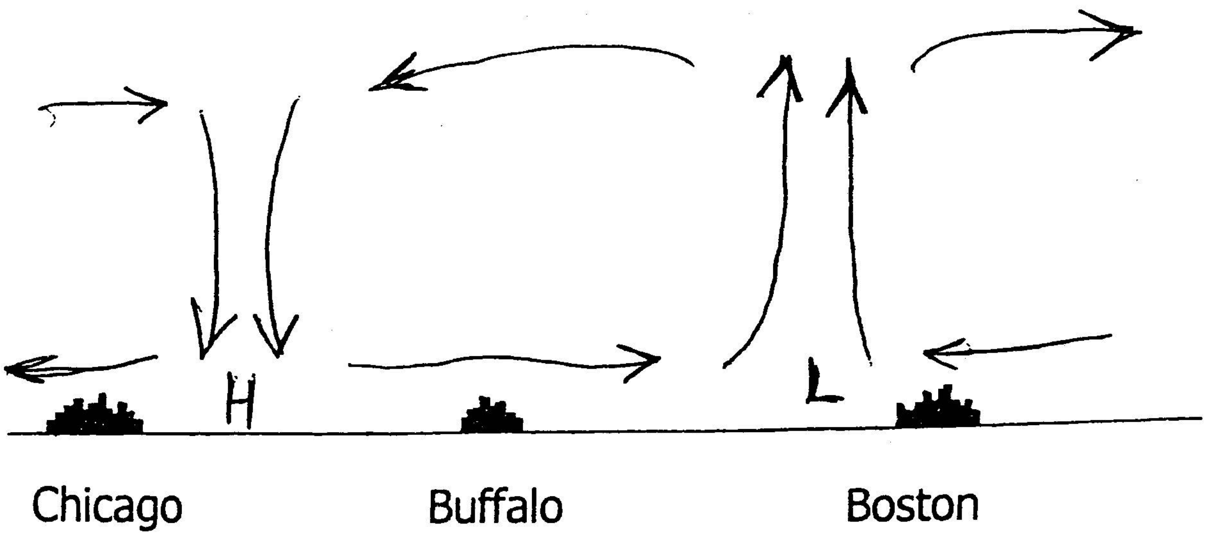


1. Winds always blow from regions of high pressure to regions of ~~pressure~~ Low pressure.
2. THE CORIOLIS EFFECT – Earth's rotation on its axis causes winds to be deflected to the right in the northern hemisphere and to the left in the southern hemisphere.

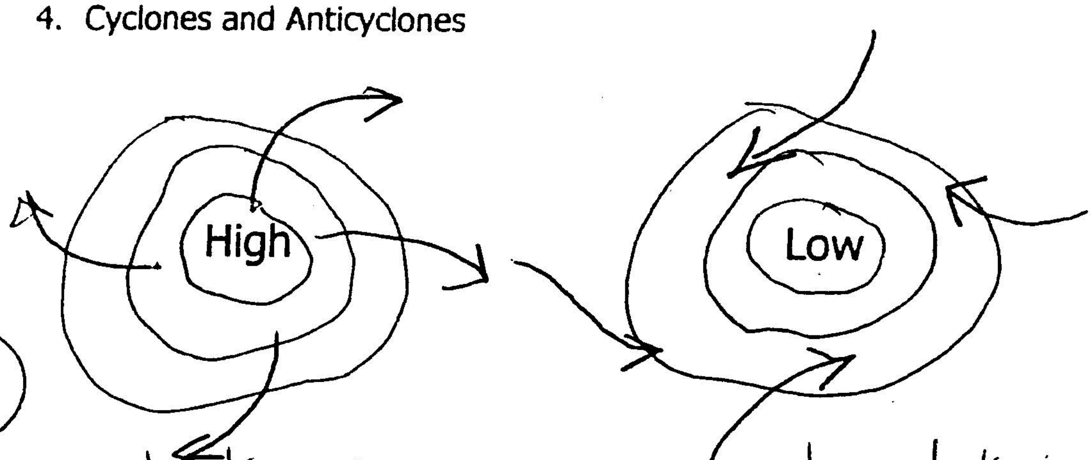
3.a. map view:

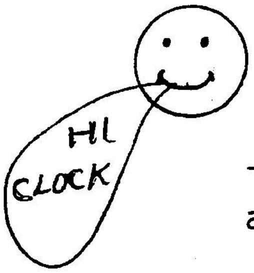


b. side/profile view



4. Cyclones and Anticyclones





clockwise _______ counter clockwise

a. Winds move in a clockwise outward spiral around a high pressure system

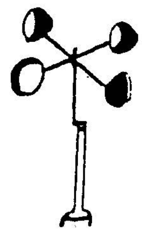
b. Winds move in a counterclockwise inward spiral around a low pressure system

Activity: On the map on page 28,

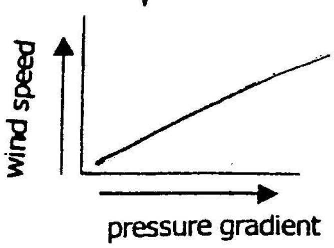
a. for each station model, extend the shaft of the wind arrow and draw the head of the arrow to show the "direction the wind is blowing"

b. draw larger arrows to show the general direction of airflow.

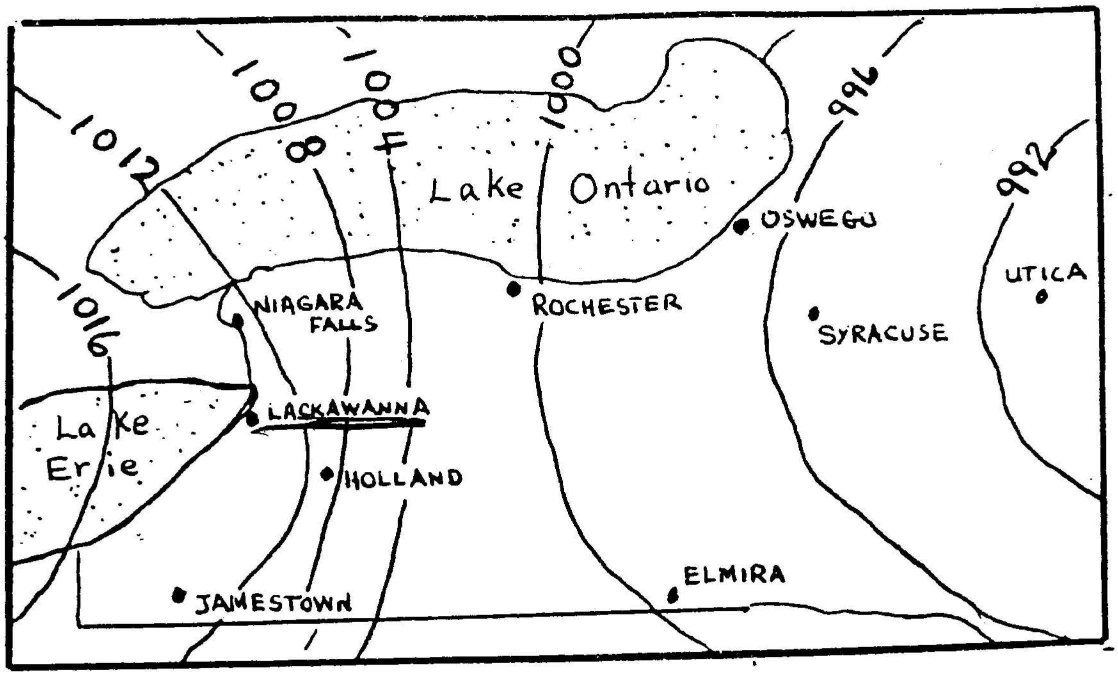
D. Wind Speed



1. The speed of the wind is determined by the difference in air pressure
2. Pressure gradient - difference in air pressure between two places
3. As the pressure gradient increases, wind speed increases



4.



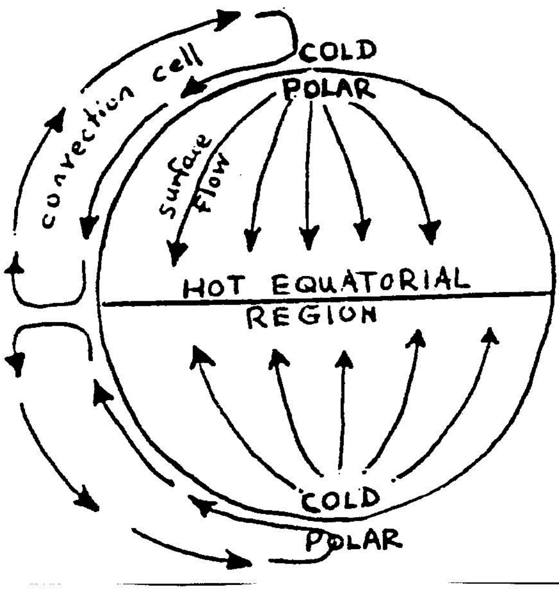
a. Where is the pressure gradient the greatest? near Holland

b. Where are the winds strongest/highest wind? near Holland

E. Global Winds

The unequal distribution of solar energy (insolation), in terms of both intensity and duration, causes unequal heating of Earth. Differences in temperature cause differences in pressure which result in winds.

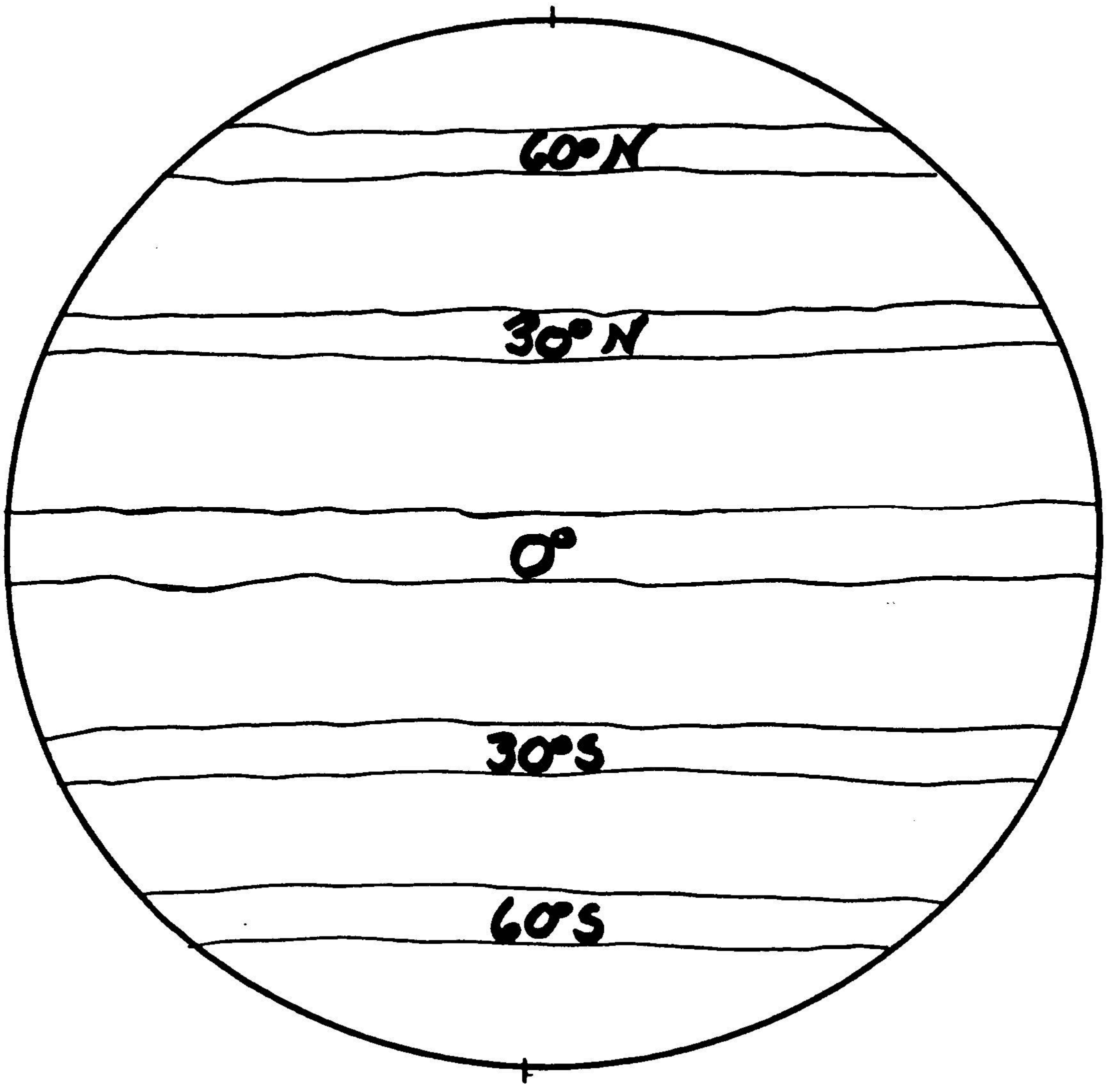
Cooler air, being denser, sinks toward Earth due to gravity. This causes warmer, less dense air to rise.



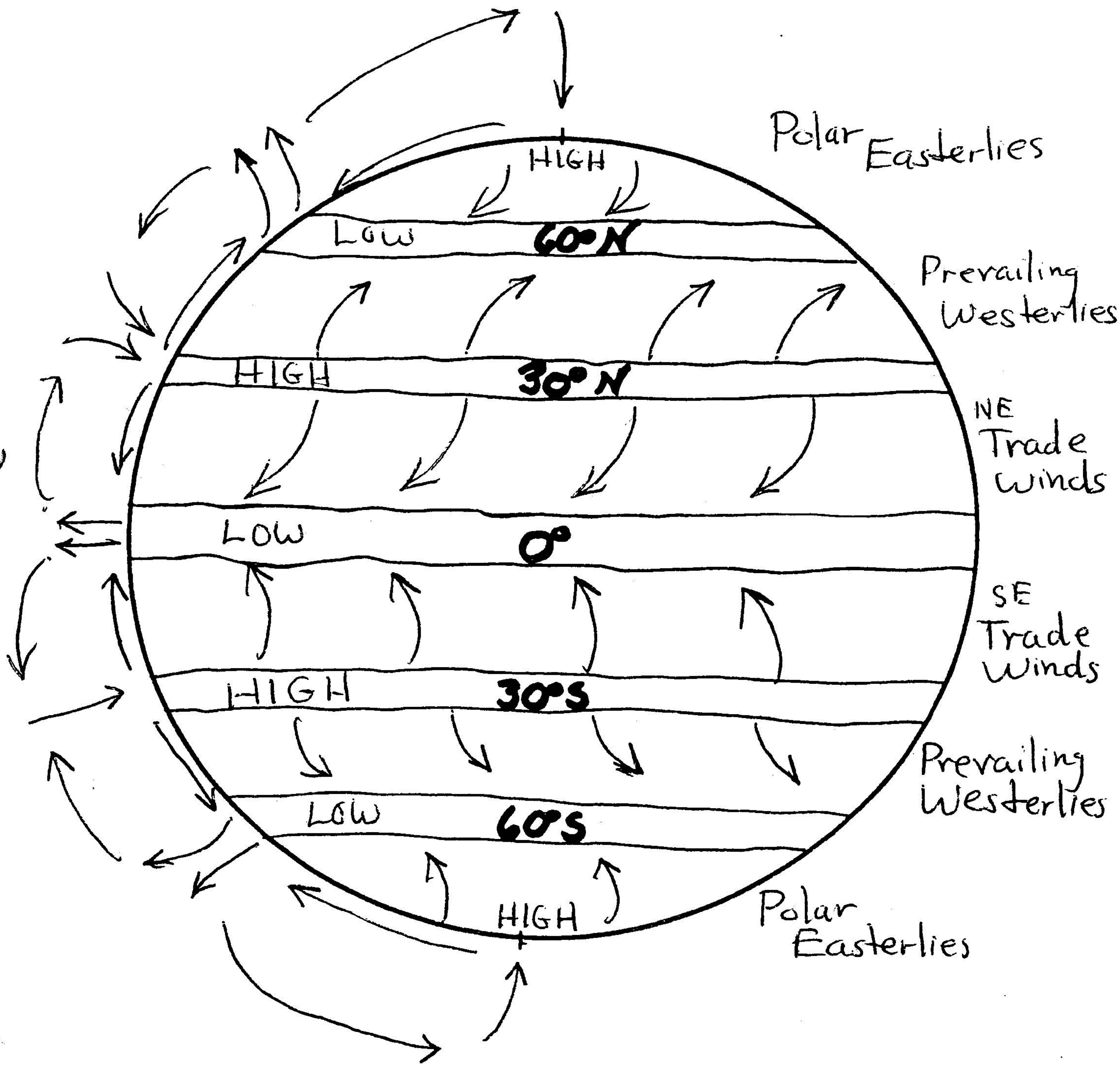
Global winds, or circulation, on a non-rotating Earth

Earth's rotation causes the "Coriolis Effect" which results in the three (or six) cell circulation of winds as illustrated on the next page.

Earth Science
Reference Charts
page______



Earth Science
Reference Charts
page 14



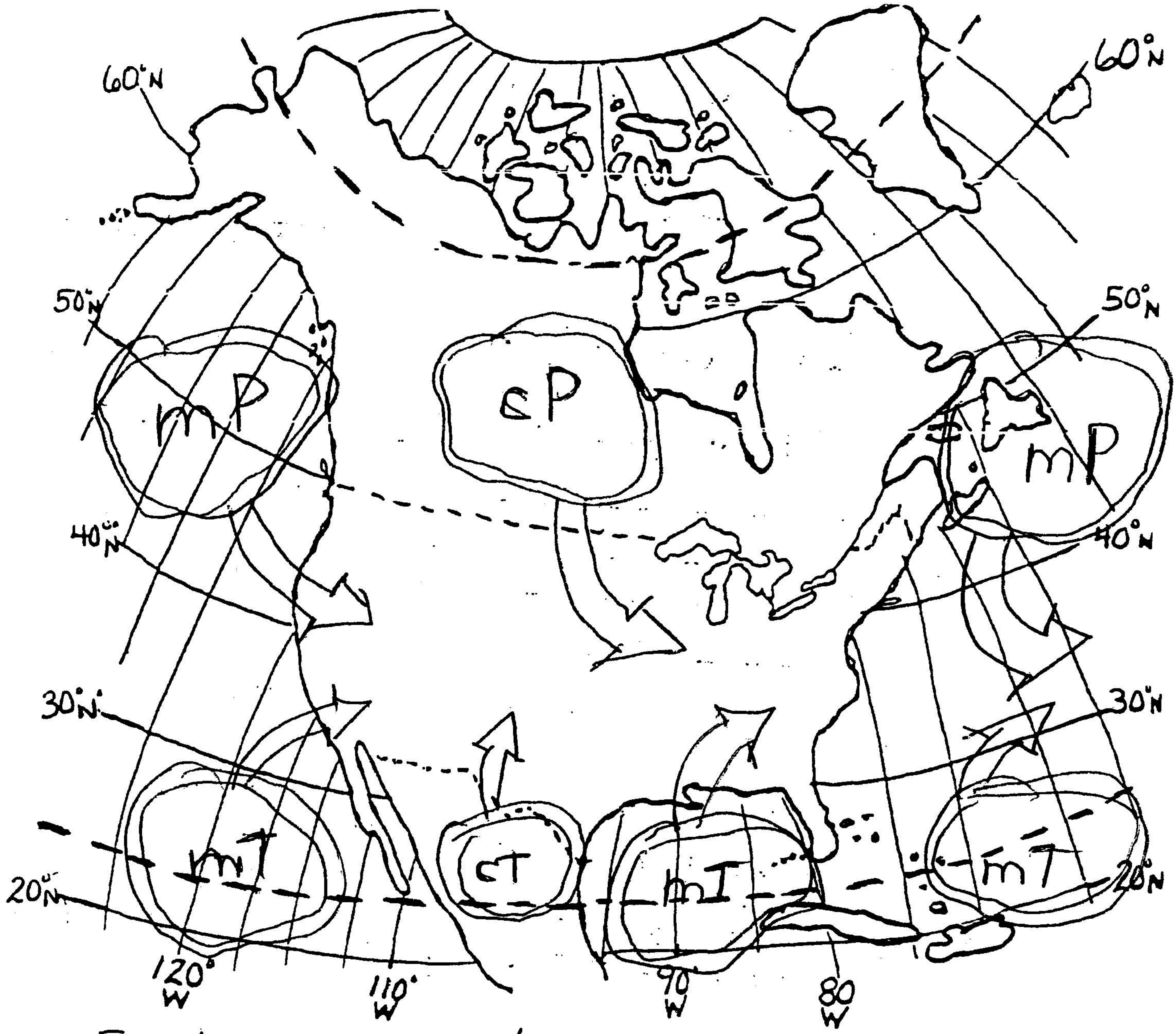
VII. AIR MASSES AND FRONTS

A. Air mass - a large body of air in the troposphere with similar characteristics of: temperature moisture pressure

1. source region = a geographic region where an air mass forms (develops)
   This happens as air stagnates (sits) over a particular part of Earth's surface for a period of time acquiring the temperature and/or moisture characteristics of the surface.
2. Types of air masses
   a. Tropical - originates in the tropics (low latitudes). It is characterized by high temp.
   b. Polar - originates in polar regions (high latitudes). It is characterized by low temp.
   c. Arctic - originates in ice covered arctic regions (in winter only). It is very cold (dry).
   d. Equatorial - originates in the doldrums near the equator. It is very hot and humid. This type of air mass almost never influences weather in the United States.
   e. Continental - originates over land masses. It is dry.
   f. Maritime - originates over water. It is wet.
3. Air masses are a combination of temperature and moisture conditions.

SYMBOL	NAME OF AIR MASS	CHARACTERISITICS
cP	continental polar	cold + dry
mT	maritime tropical	warm + moist
cT	continental tropical	hot + dry
mP	maritime polar	cool + moist

4. Illustrated below are the source regions of air masses that affect the weather of North America. The arrows indicate the tracks/paths that these air masses usually follow.



B. Front - a boundary between air masses

1. Types of Fronts — Map Symbol

a. cold

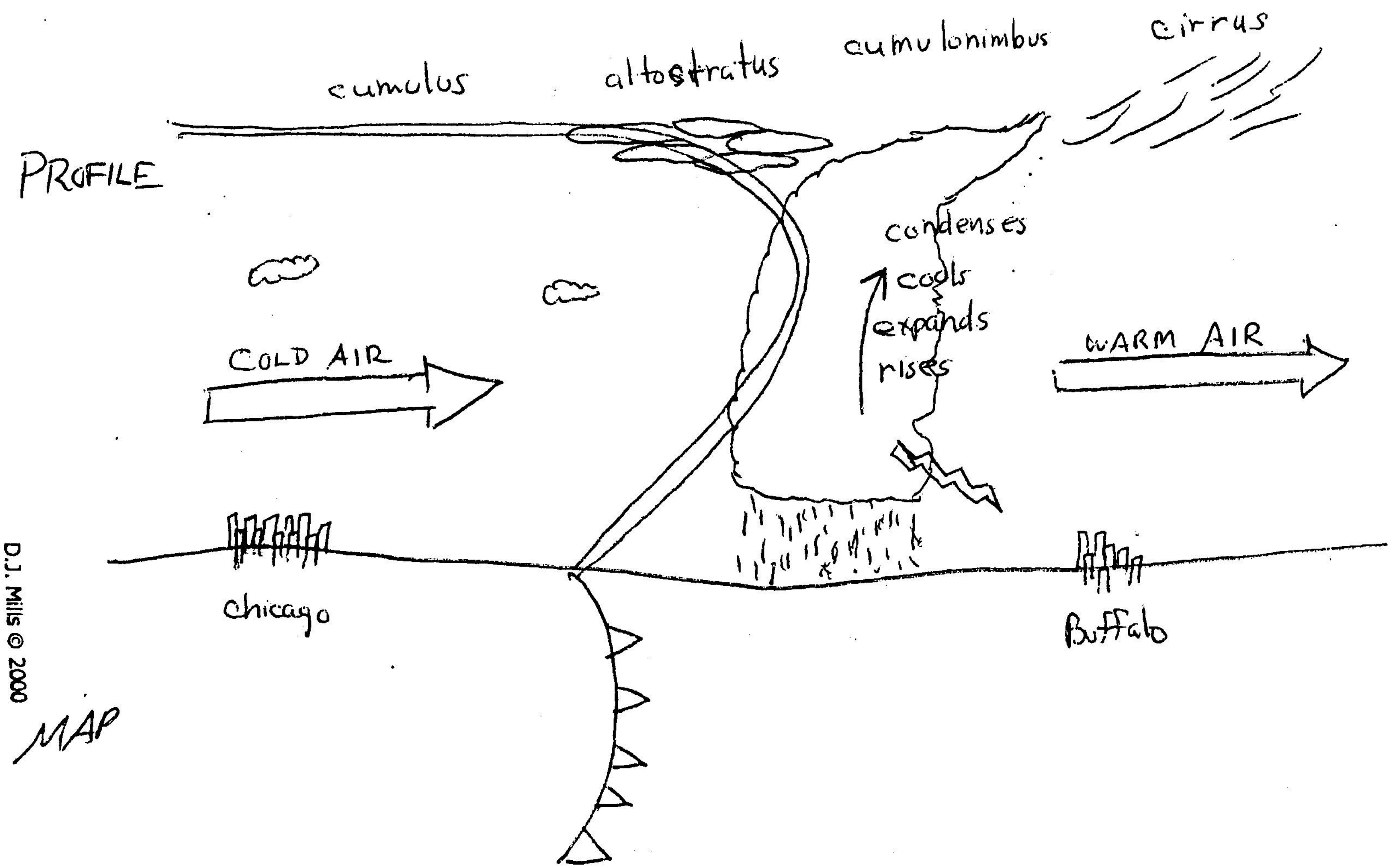
b. warm

c. stationary

COLD FRONT

...the leading edge of cold air that is advancing and displacing warmer air.

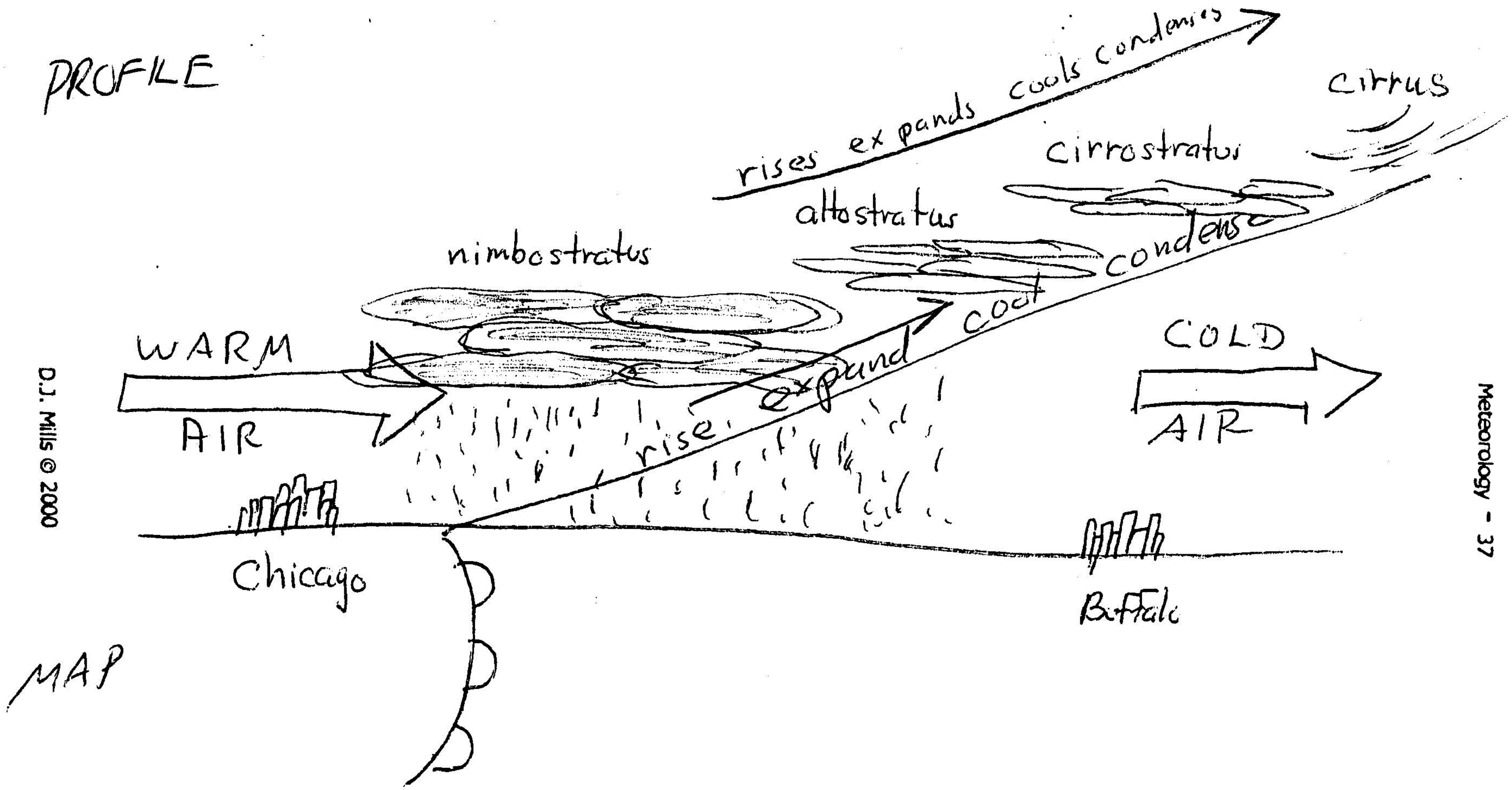
a narrow band of heavy rain (R) usually precedes a cold front



WARM FRONT

...the leading edge of warm air that is advancing and displacing colder air.

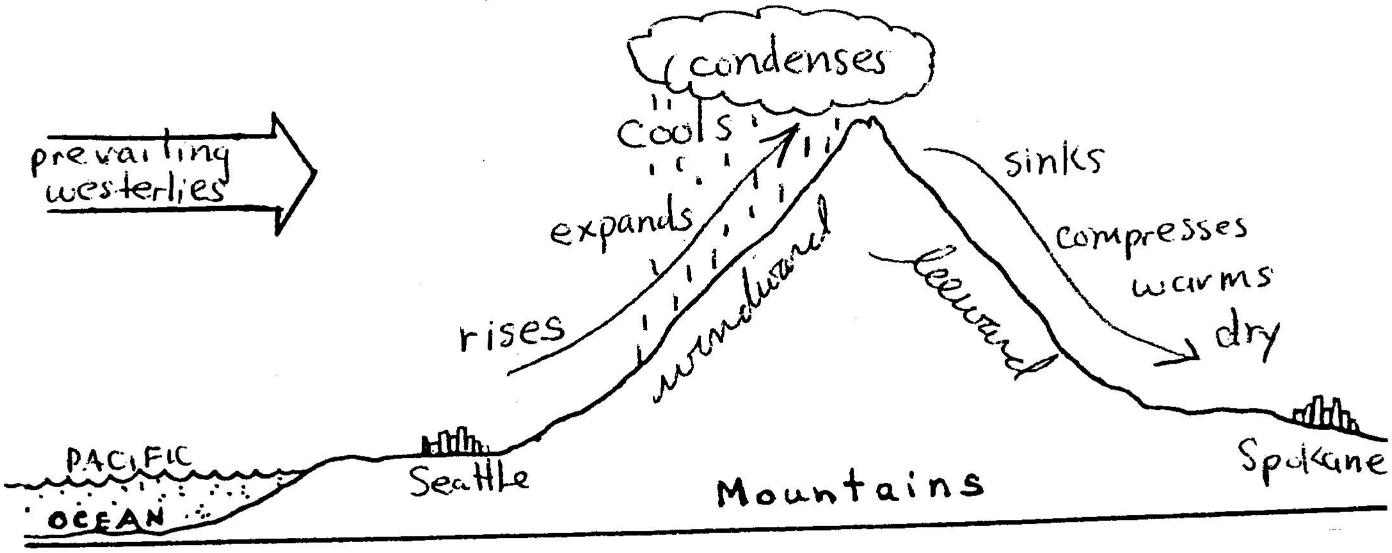
a wide band of light steady showers precedes a warm front



VIII. AREAS OF RAINFALL

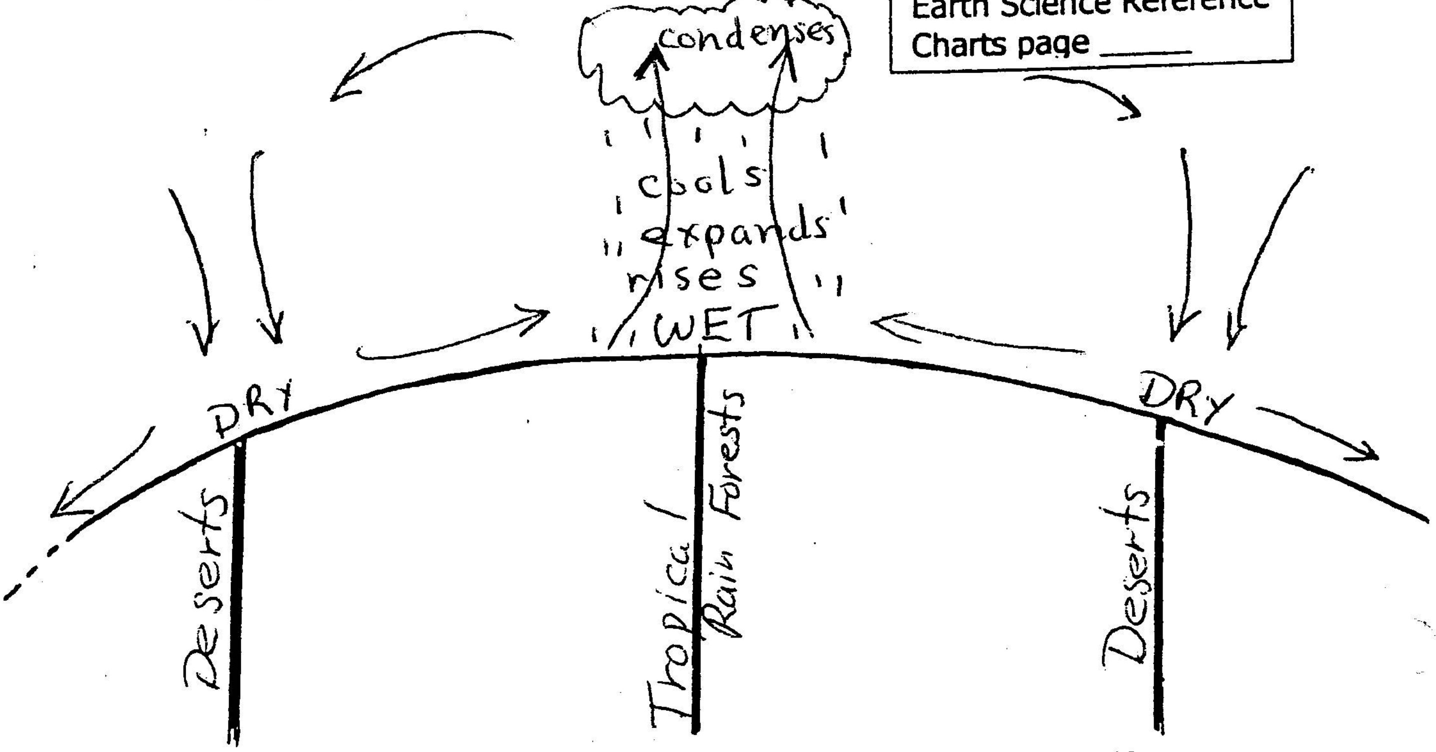
A. Regions on Earth where air rises, expands, cools (to dew pt. temp), condenses, clouds + precipitation

1. Windward side of a mountain

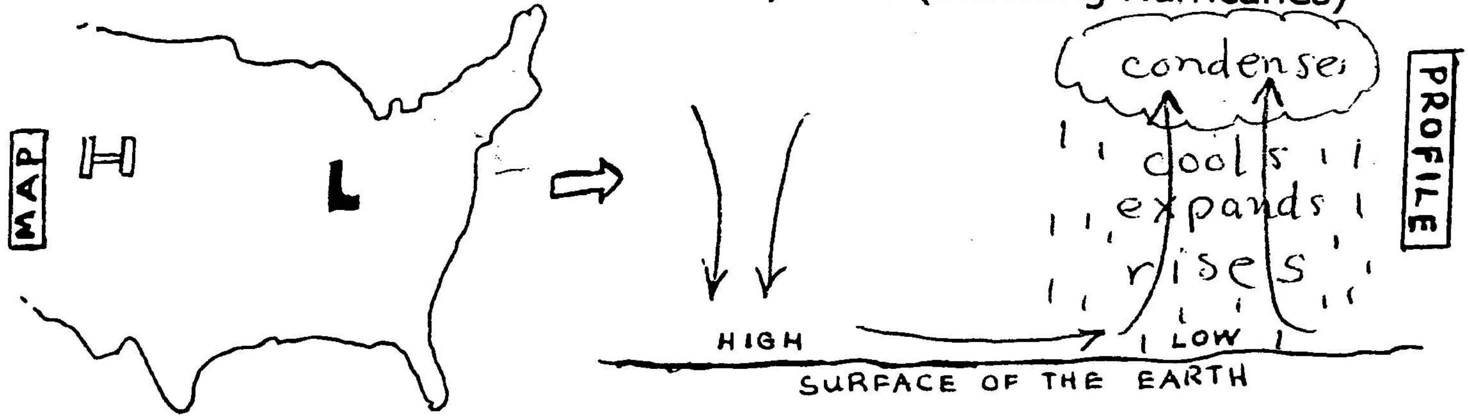


2. Doldrums - the equatorial region where warm humid air rises as a result of convection. This produces thunderstorms almost daily.

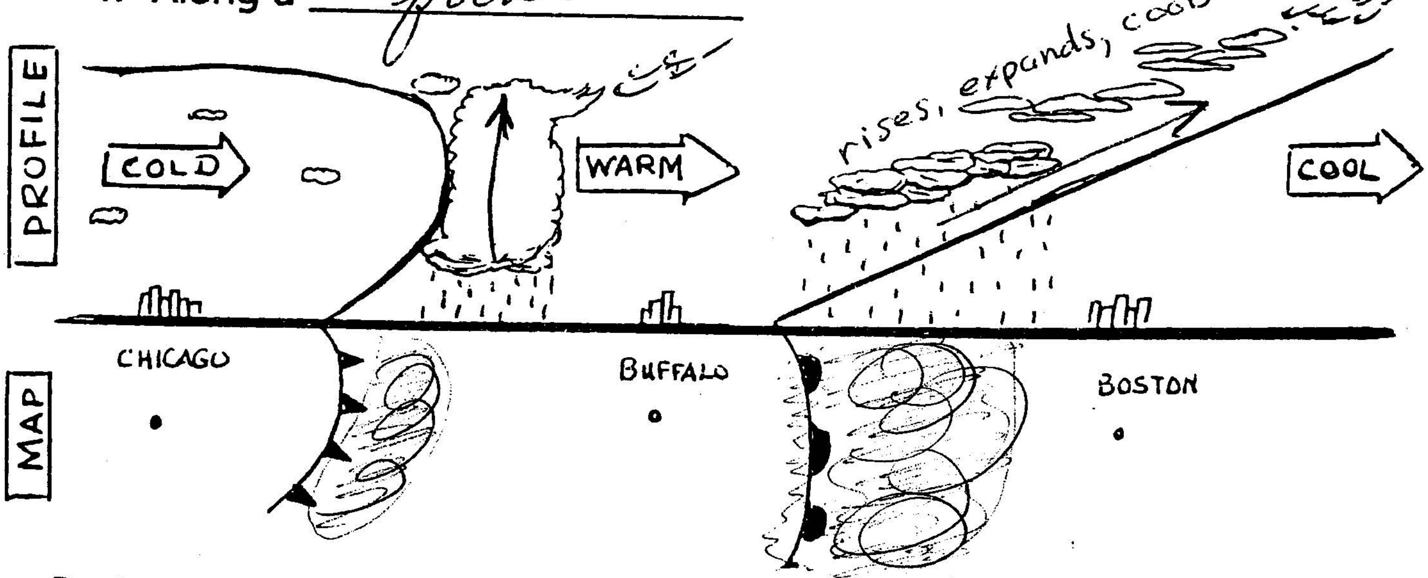
Earth Science Reference Charts page ______



3. Low Pressure Systems (including Hurricanes)



4. Along a front



B. <u>Areas of Little Precipitation</u> – regions on Earth where air is sinking, compresses, warms and becomes less humid or drier.

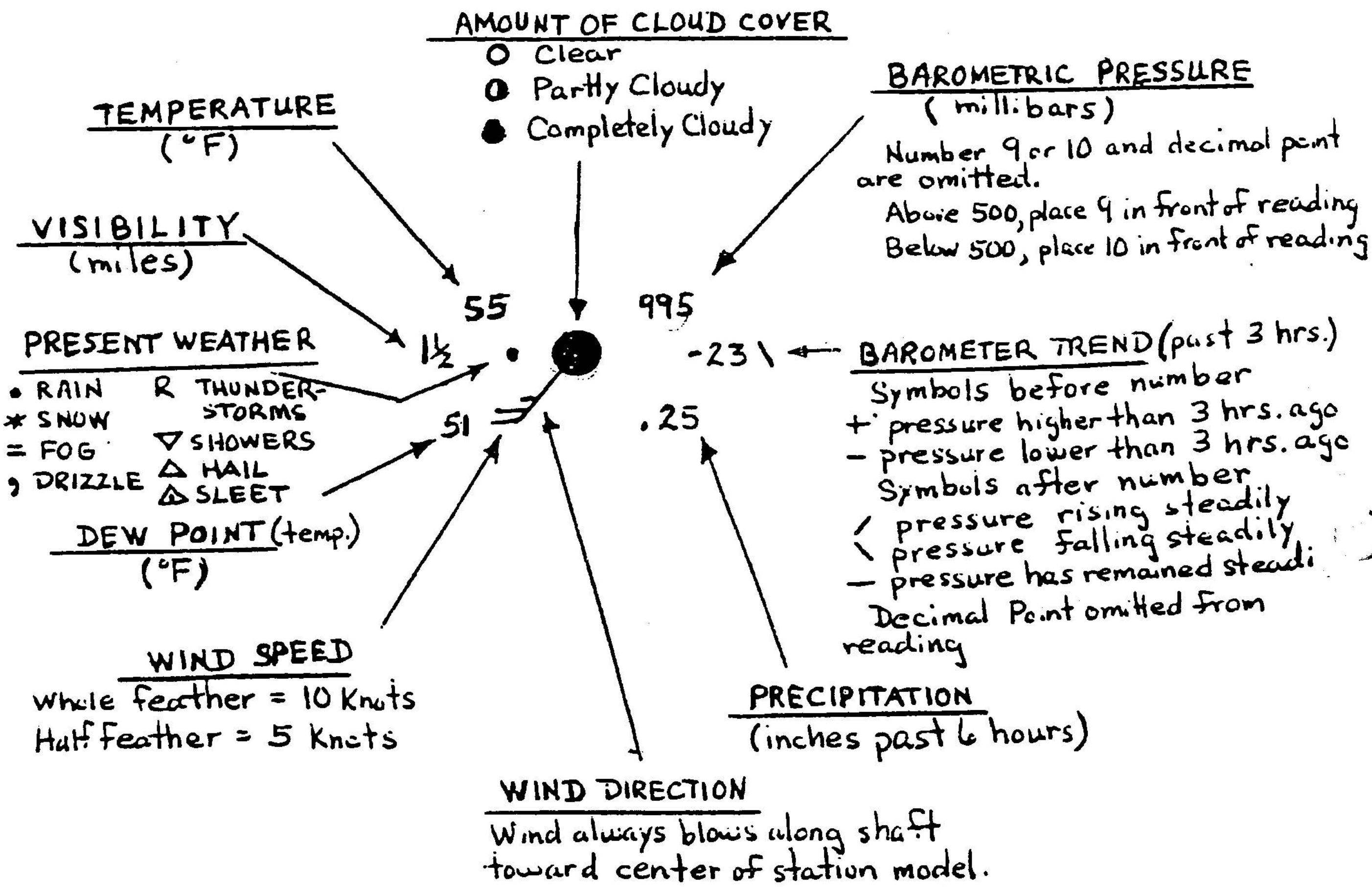
1. leeward side of mountain
2. horse latitudes
3. high pressure systems

C. <u>Rainfall Comparisons:</u>

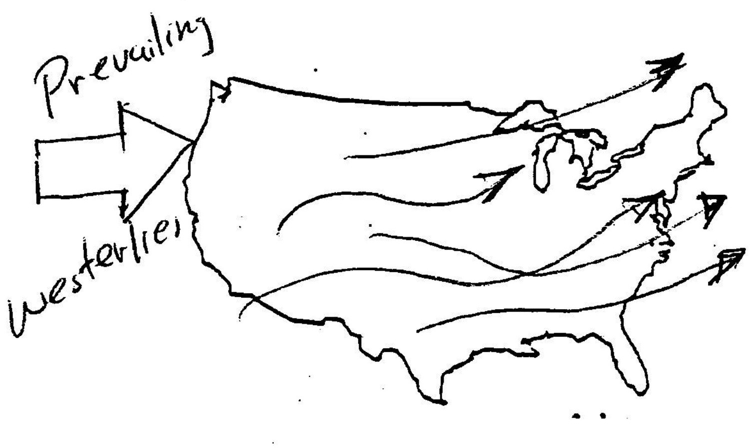
1. Death Valley, California – average rainfall 1 inch per year.
2. Cherrapunja, India – average rainfall 457 inches per year.
3. Amazon Valley in Brazil – it may rain every day.
4. Deserts of Peru (South America) – it does not rain for years at a time.

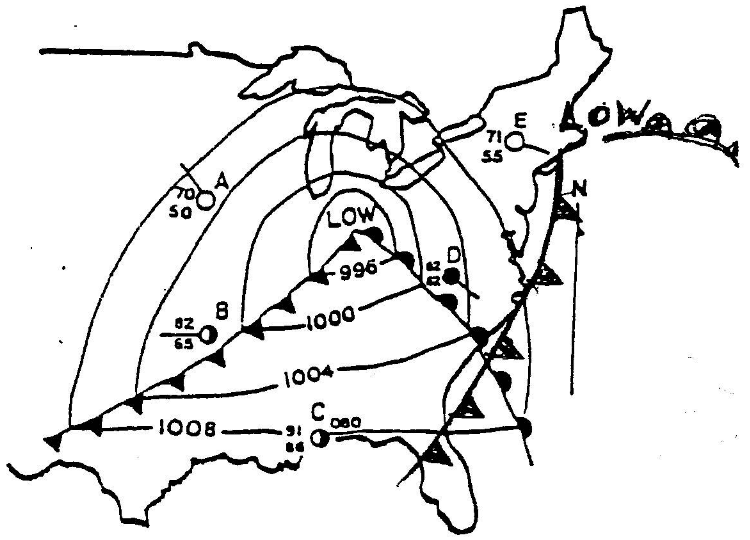
IX. Weather Maps

A. Station Models – On weather maps the weather conditions for each weather station are shown by symbols arranged in and around a small circle. These symbols and the circle makeup a station model, which gives the latest readings for the most important weather variables.

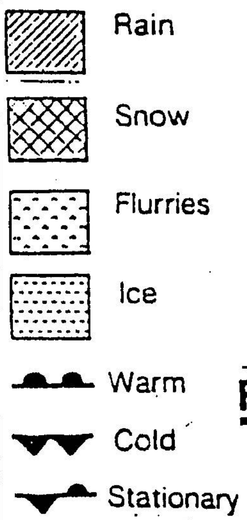


B. Storm Tracks



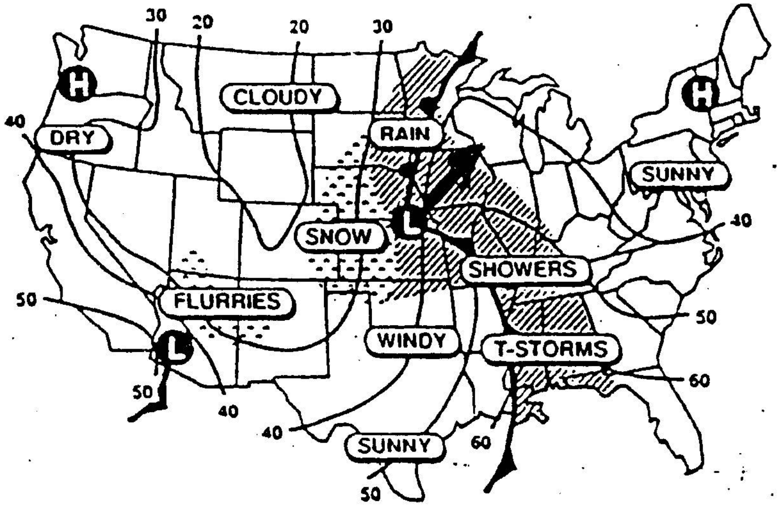


KEY



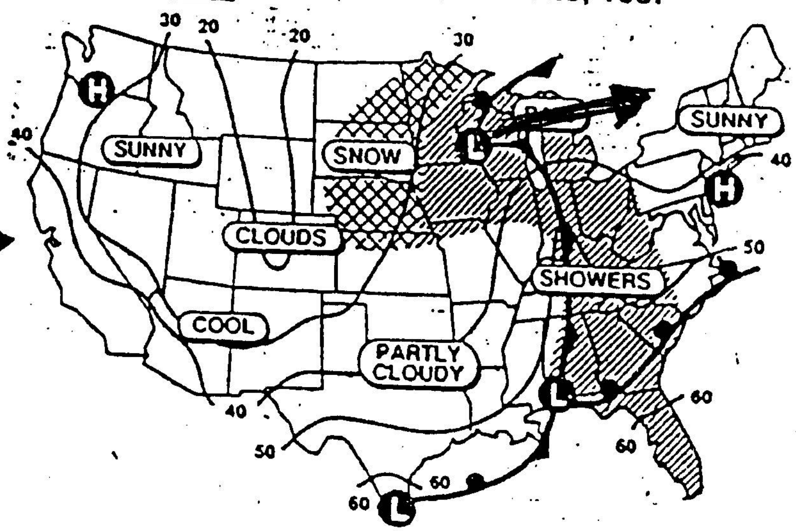
FORECAST 8 a.m., March 24, 1987

①



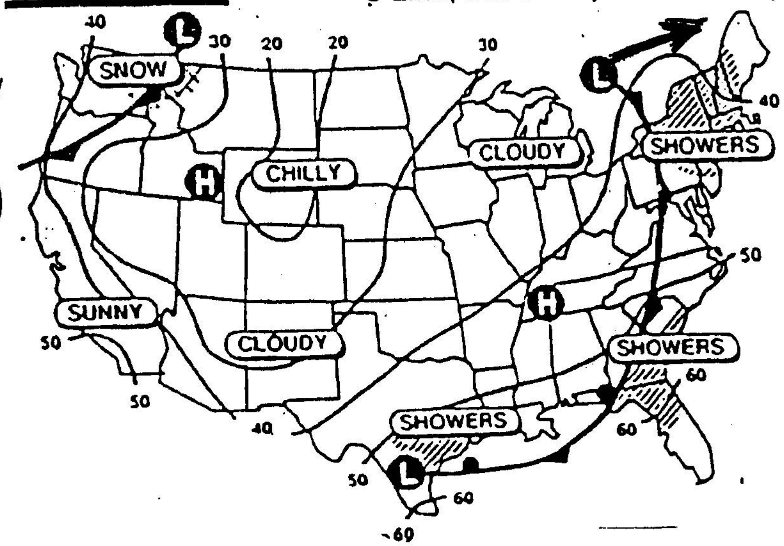
FORECAST 8 a.m., March 25, 1987

②



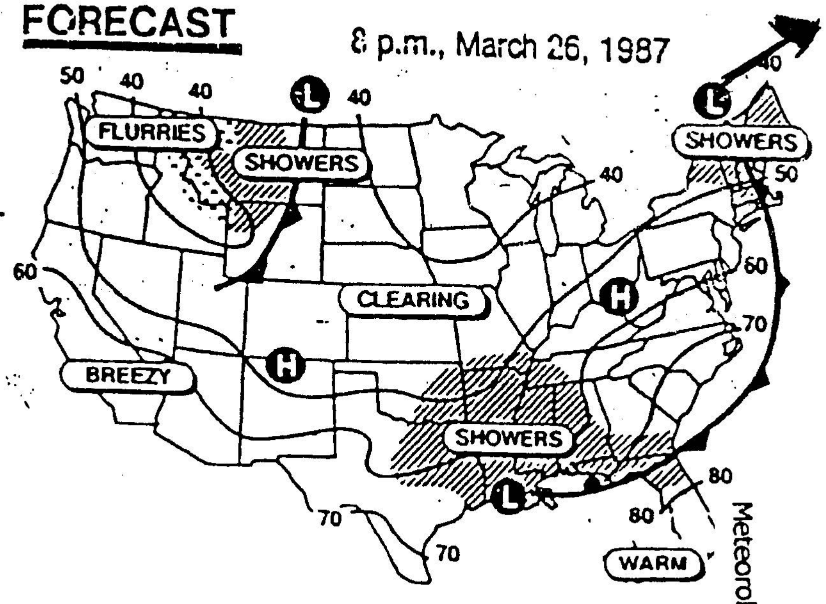
FORECAST 8 a.m., March 26, 1987

③



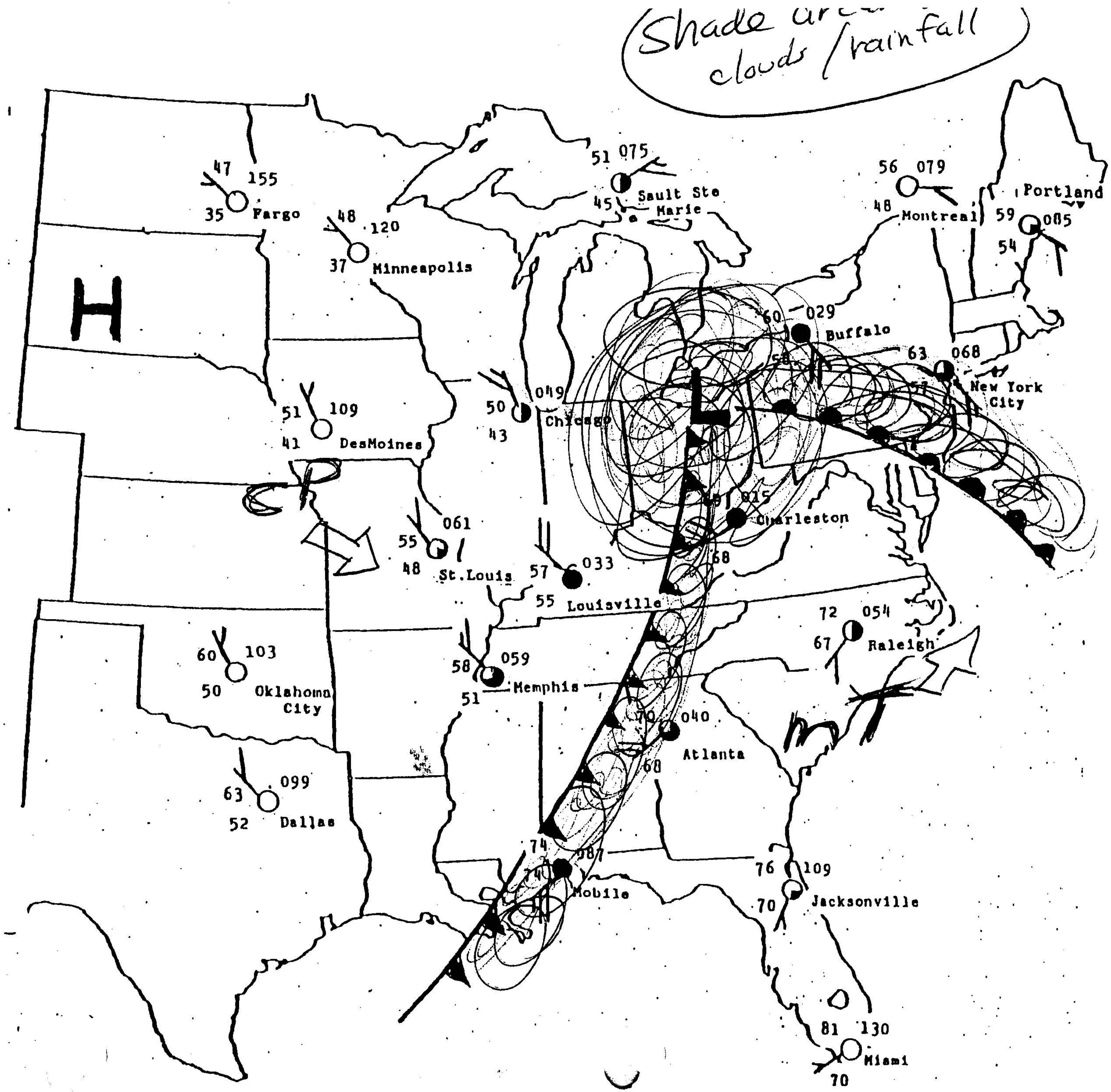
FORECAST 8 p.m., March 26, 1987

④



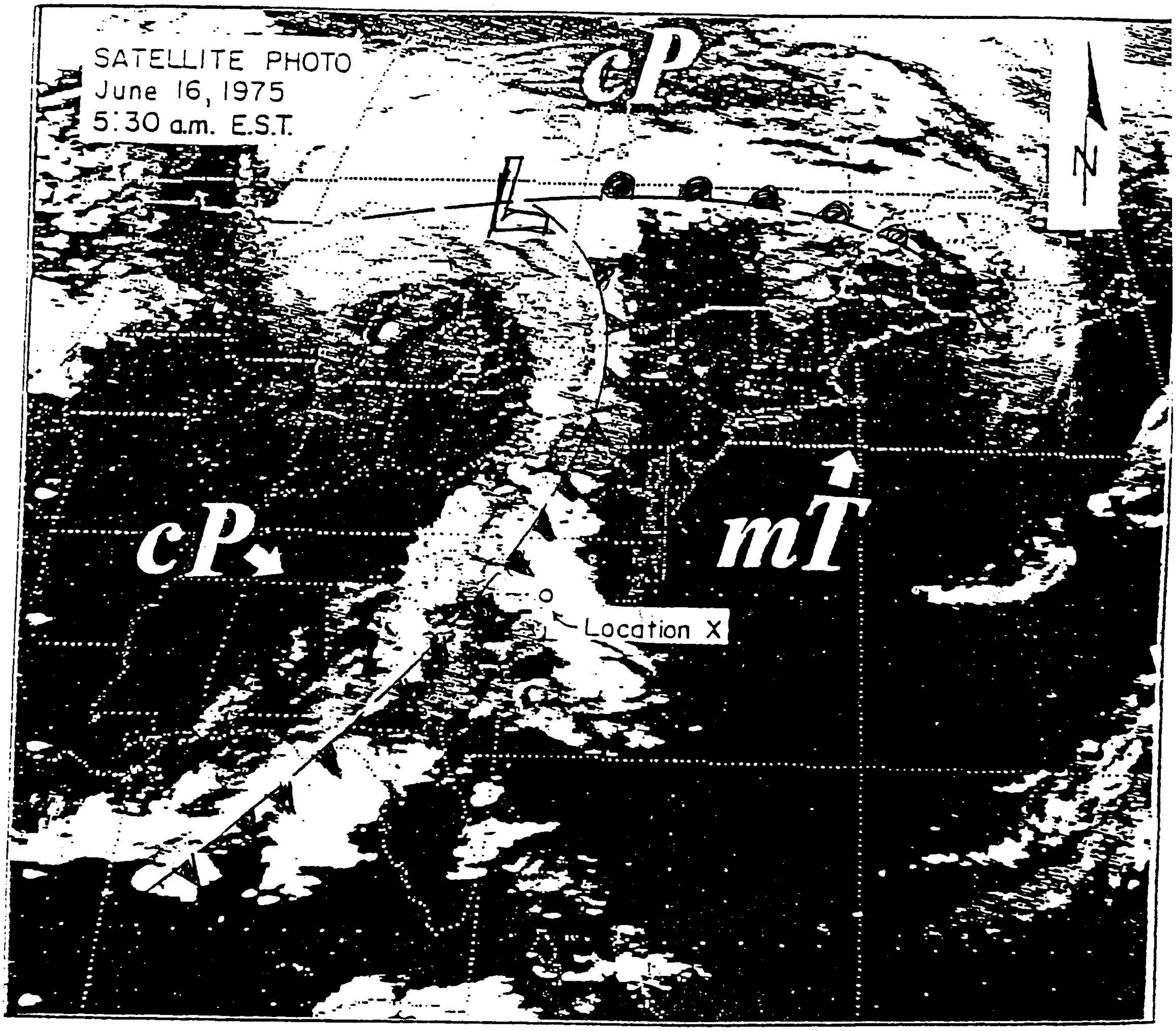
C. Weather Map

1. Synoptic (a map that describes current weather and is used for prediction)

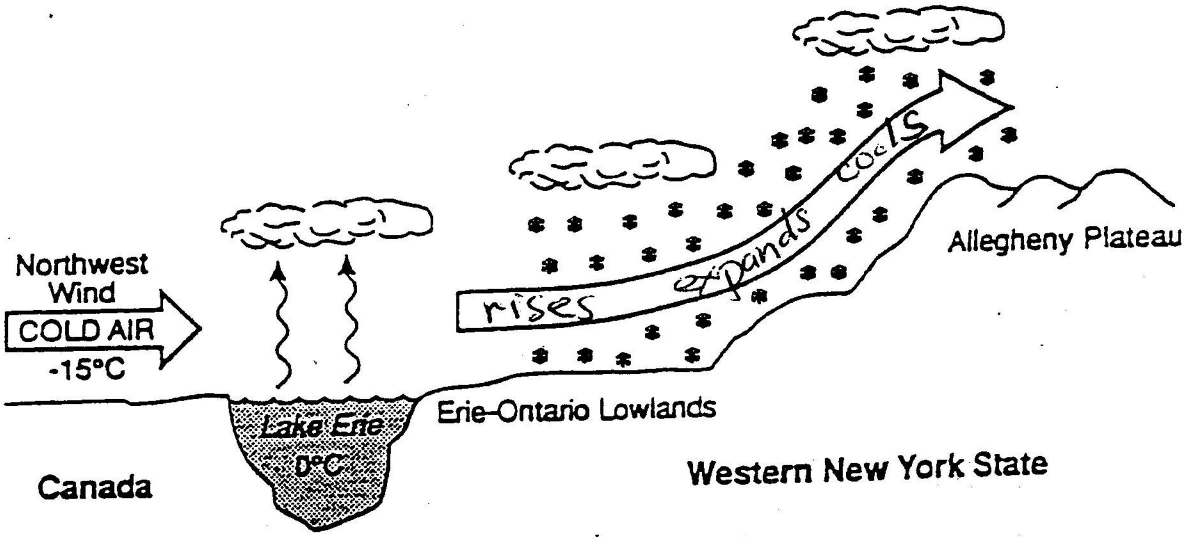


2. Satellite Map

Place this transparency over page 42



D. Lake Effect Snowfall



CLIMATE

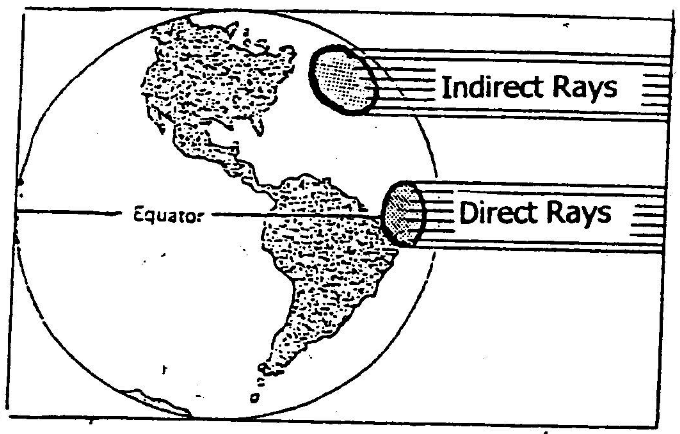
I. Climate - long term weather; composite weather; average weather

A. TEMPERATURE FACTORS :

1. LATITUDE :

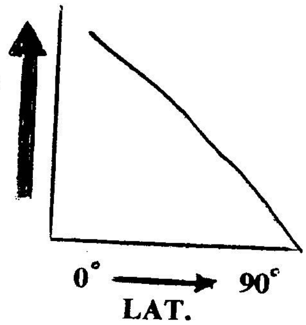
a. Average yearly temperature :

(1)



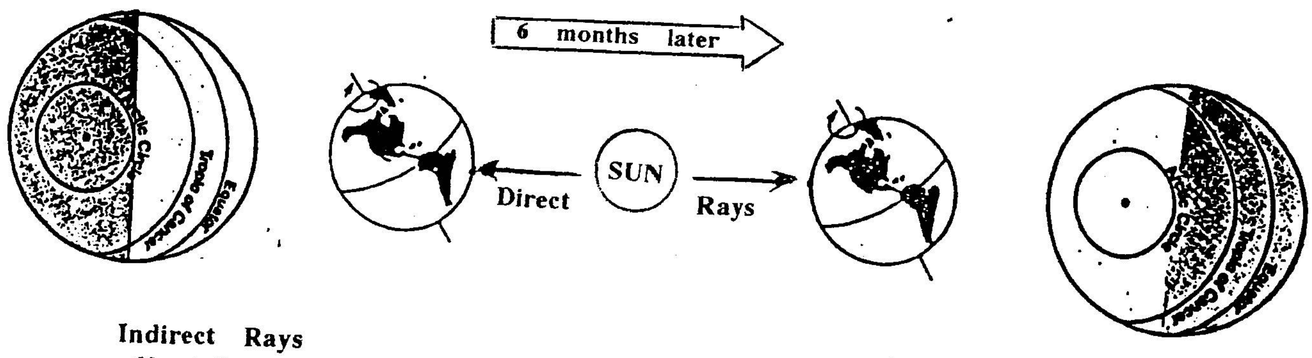
(2) As latitude increases, average yearly tempertature decreases.

(3)



b. Yearly temperature range :

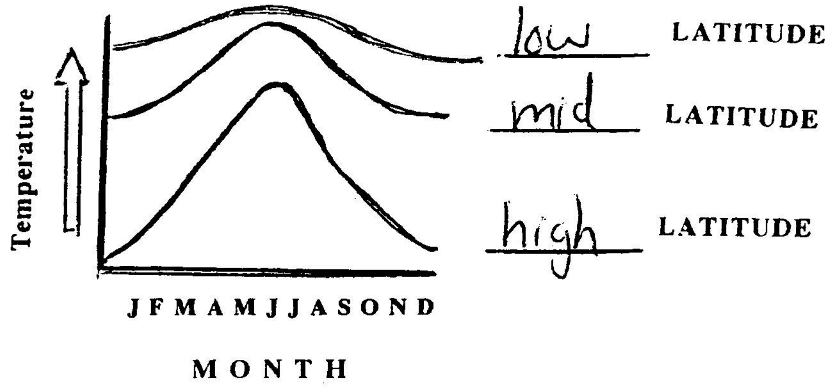
(1) NORTHERN HEMISPHERE



Indirect Rays
Short Daylight Period
cold

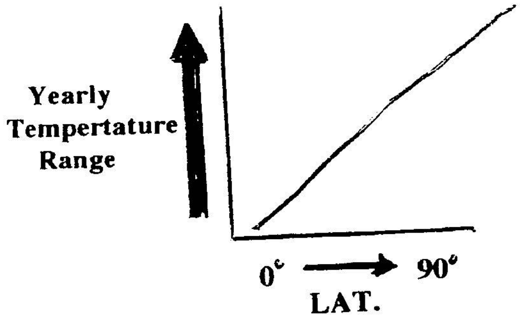
More Direct Rays
Long Daylight Period
warm

(2)



(3) As latitude increases, yearly temperature range increases.

(4)

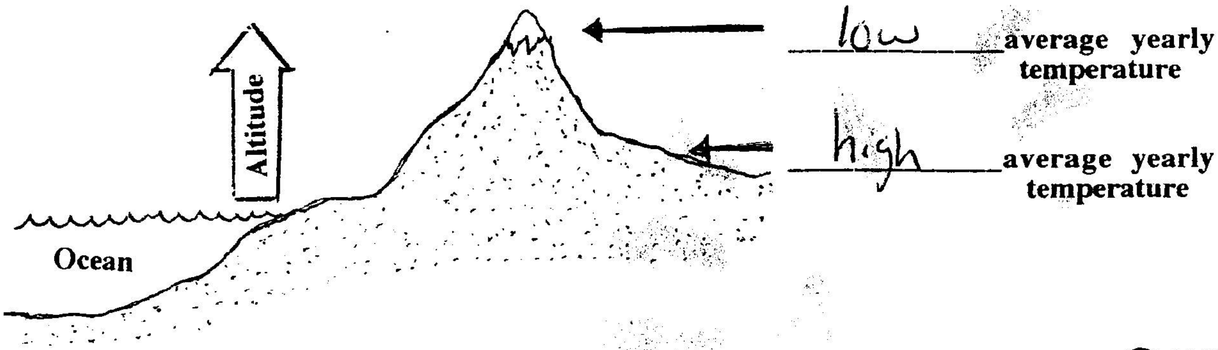


c. Average Yearly Temperature vs. Yearly Temperature Range

	Average Yearly Temperature	Yearly Temperature Range
Valdivia, Chile	53° F	16°F (from 46°to 62°F)
Peking , China	53° F	55°F (from 24° to 79°F)

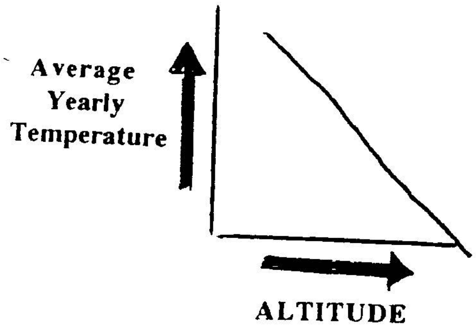
2. **ALTITUDE** :

a.



b. As altitude increases, average yearly temperature decreases.

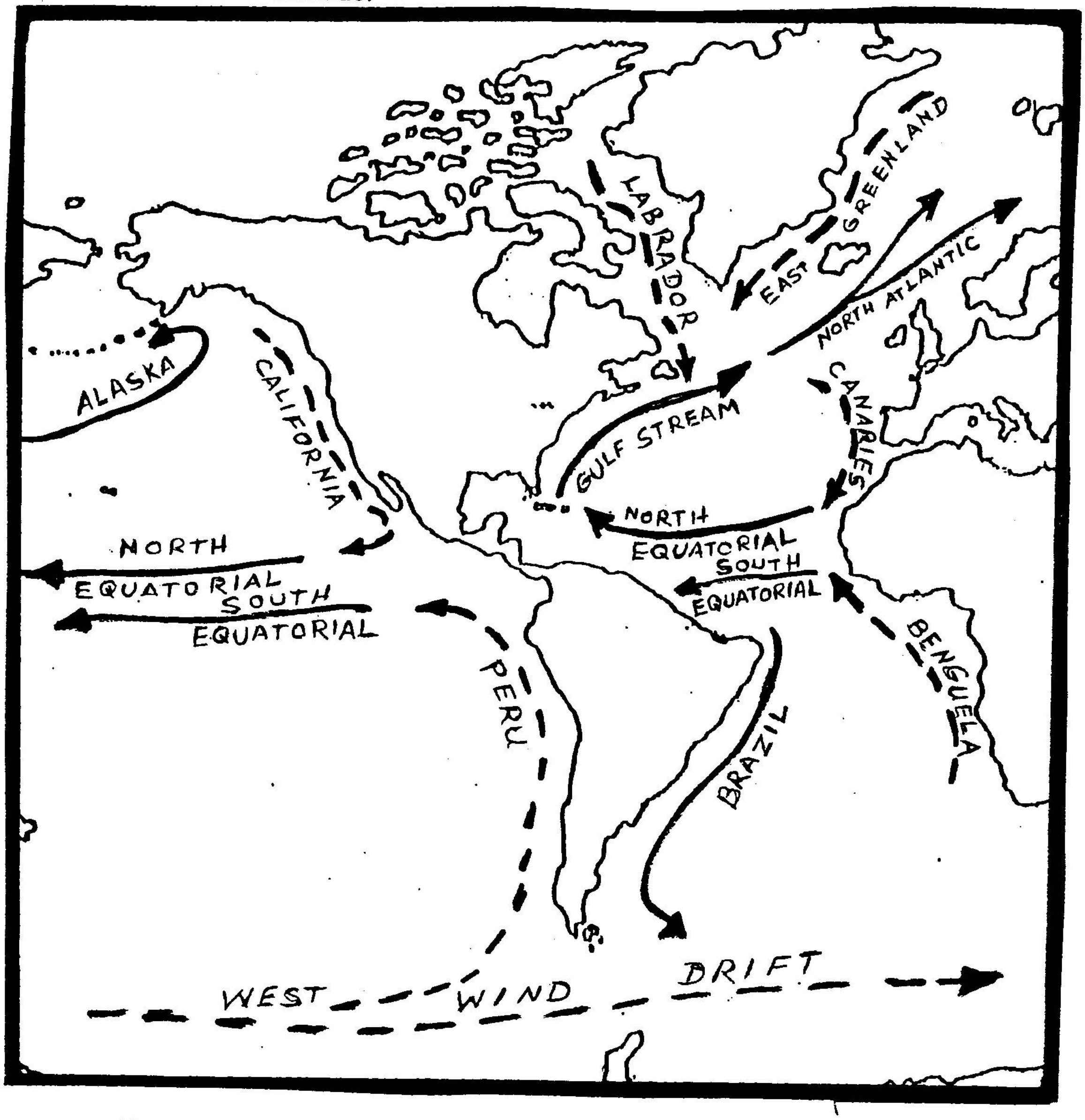
c.



3. **OCEAN CURRENTS :**

a. Ocean currents may make the climate of a coastal region _warmer_ or _colder_ than normal for its latitude.

R.T. pg 4



N
W E
S

KEY : warm currrent

cold current

b. Warmer or Colder ?

Due to ocean currents , the

(1) east coast of North America is warmer than normal.

(2) west coast of North America is cooler than normal.

(3) east coast of South America is warmer than normal.

(4) west coast of South America is cooler than normal .

(5) west coast of Africa and Europe is cooler than normal .

(6) northwestern Europe (Iceland, Great Britain and Scandinavia) is warmer than normal

4. MARINE vs. CONTINENTAL

a. Sea or land locations affect temperature ranges. Since land gains and loses heat much more quickly than water, land areas tend to have warmer summers and cooler winters. Coastal areas near the ocean have cooler summers and milder / warmer winters.

Coastal areas have marine climates with a small yearly temperature range. Continental interiors (land areas) have continental climates with a larger yearly temperature range.

b.

(1) Location X : continental climate ; greater yearly temperature range.

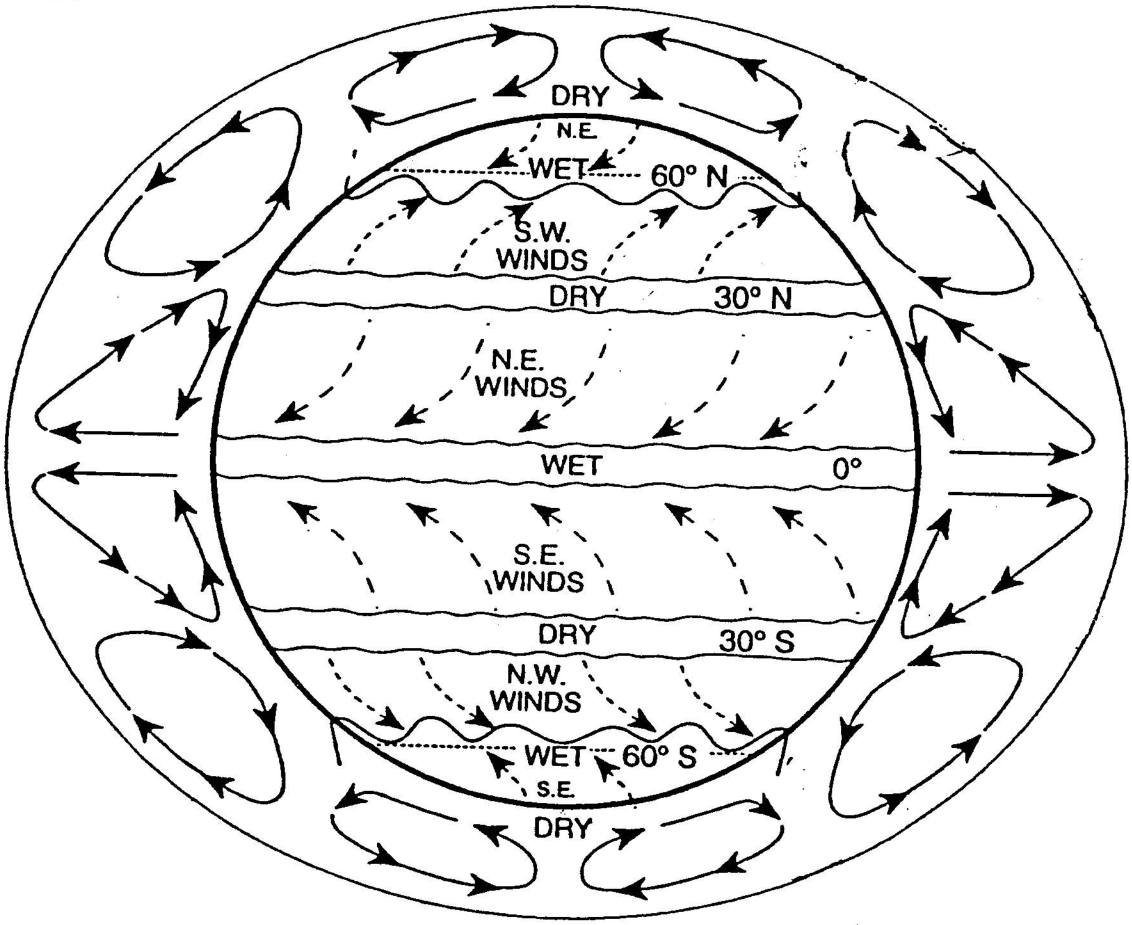
(2) Location Y : marine climate ; smaller yearly temperature range.

B. RAINFALL FACTORS

1. LATITUDE

a. Uneven heating of the Earth produces global wind belts and pressure belts. These "pressure belts" determine the wetness or dryness of a particular location. Low pressure regions occur where air is rising. As air rises, it expands and cools, which causes condensation and precipitation to occur. Thus low pressure regions are areas of rainfall (wetness) , and high pressure regions are areas that lack rainfall (dryness).

b.

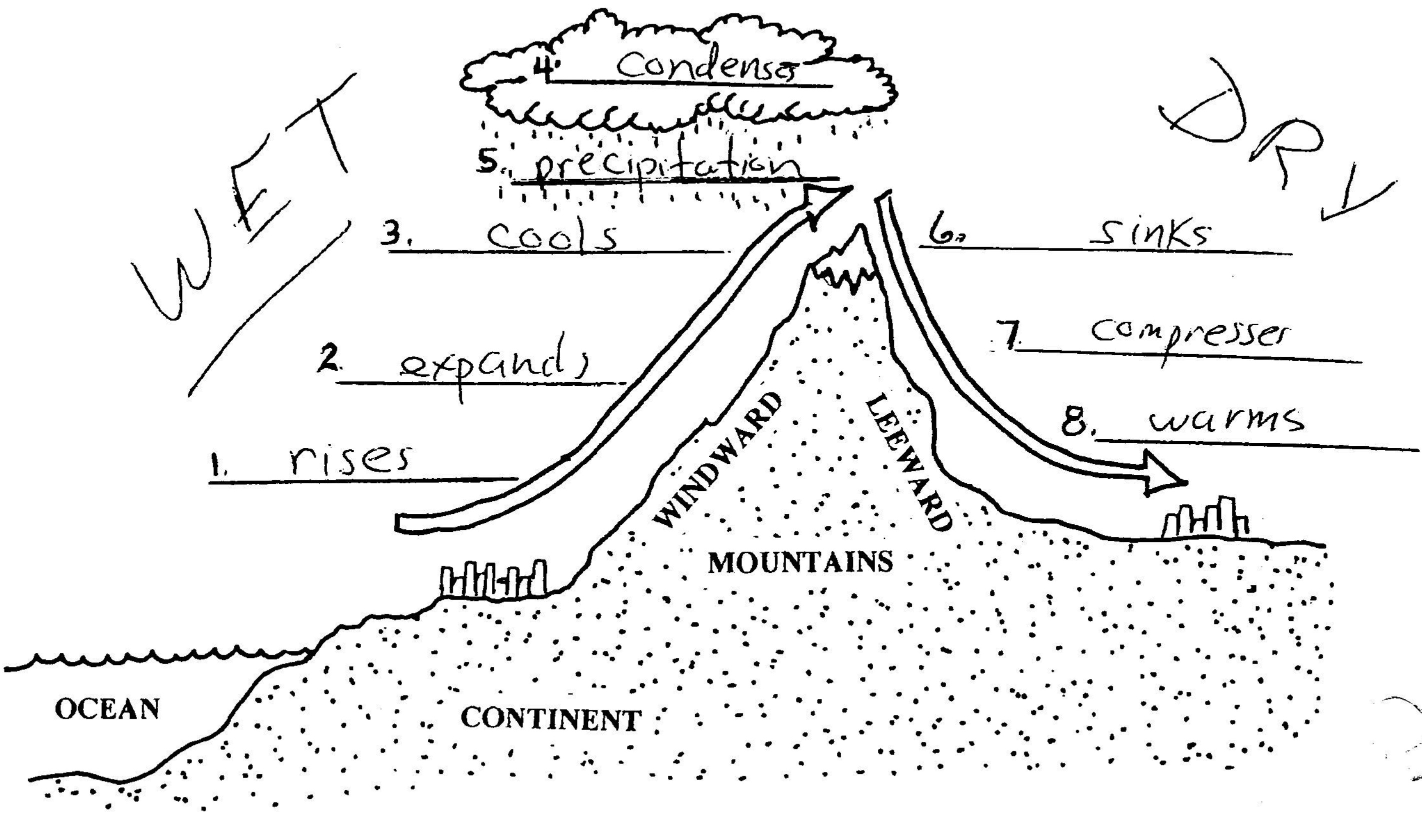


(1) What latitudes are areas of rainfall / wetness ? 0° (equator), 60° N & S

(2) What latitudes are areas that lack rainfall / dryness ? 30° N & S (horse latitudes), 90° N & S

2. MOUNTAINS - The Orographic Effect

a



b. Windward vs. leeward

(1) Rainfall occurs on the windward side of the mountain where air is rising.

(2) It is dry on the leeward side of the mountain where air is sinking.

3. DISTANCE FROM THE SEA and PREVAILING WINDS

Nearness to the ocean is no guarantee of rainfall. Where prevailing winds blow from the ocean, the areas closest to the ocean generally receive more rain. Prevailing winds that blow from the interior of a continent bring less rain to a region.