Weather Unit Glossary

Wind: the natural movement of air parallel to the Earth's surface.

Atmosphere: the layers of the air that surrounds the earth.

Weather: the condition of the air around the earth (atmosphere).

Temperature: a measure of how hot or cold something is.

Thermometer: a tool used to measure temperature.

Clouds: a large mass of water droplets or ice crystals in the air.

Humidity: a measure of the amount of water vapour in the air.

Precipitation: water that falls from the sky either in liquid or solid form: rain, snow, sleet, or hail.

Cirrus: clouds that are this and look like curls of hair.

Cumulus: clouds that look puffy with flat bottoms.

Stratus: clouds that are flat and form layers low in the sky.

Fog: stratus clouds that are on the ground.

Meteorology: the scientific study of weather.

Forecast: a prediction of what the weather may be in advance or ahead of time.

Weather vane: a device that shows wind direction.

Wind rose: a graph that illustrates the direction and speed of the wind in an area.

Anemometer: a weather tool used to measure wind speed.

Equinox: when the sun is directly over the equator it is called an equinox; this happens twice a year at the beginning of fall and spring seasons

Solstice: When the sun is directly over the Tropic of Cancer (northern hemisphere) or Tropic of Capricorn (southern hemisphere) it is called the solstice; this begins the summer or winter seasons.

Air pressure: the weight of the air pushing downward on the Earth. This is air pressure.

Barometer: a weather tool that measures air pressure.

Weather balloons: a thin, large balloon that is released into the sky to gather information about the weather and send it to weather stations.

Radar: a device that uses radio waves to locate objects and determine their speeds.

Weather satellites: a device that is launched into space that orbits and takes pictures of the earth; it shows where the clouds are and how they are moving.

Weather map: a map that summarizes information about weather across various locations.

Thunderstorms: a storm with strong winds, rain, lightening, and thunder.

Flood: an overflow of water that occurs when a large amount of rain falls in a short period of time, when there is more snow than usual or snow melts too quickly, or when ice jams a river.

Drought: occurs when an area receives less rain than usual over many months or years.

Hurricanes: a severe storm that forms over an ocean; has violent winds and heavy rain.

Tornado: a violent storm of whirling winds that often includes a funnel-shaped cloud.

Weather watch: an alert that severe weather could develop in an area.

Weather warning: an alert that severe weather is happening or about to happen.

Wind chill: when air temperature feels lower than it actually really is because of cold winds blowing warm air away from the body.

Ozone layer: the thin layer of ozone gas in Earth's atmosphere which protects the Earth From ultra violet rays.

Factors of Weather: Air Pressure

Weather is the condition of the air around the Earth. It develops in the atmosphere that surrounds the Earth. Weather changes from day to day and even from hour to hour. There are several factors that determine the weather. Let's take a look at one of these factors: air pressure.

Remember that air is matter. All matter has mass and takes up space, so air has mass and takes up space. (You proved that fact if you did the experiment on page 6.) Weight is the measure of gravity acting on matter. Gravity acts on air by pulling it and holding it as close to the Earth's surface as possible. The weight of the air being pulled down on an area of the Earth's surface is called air pressure.

Air pressure is affected by two things. First, it is affected by the amount of air above it. Imagine that you are lying on the floor. Someone puts a book on your stomach (a science book, of course). You feel the weight of the book. We will call that "book pressure." If someone adds two more books, you feel more "book pressure." If someone adds ten more books, you feel a lot more "book pressure." The same idea is true for air pressure. If you are at the top of a mountain, there is not much air above you, so the air pressure is low. If you move down into a valley, there is a lot more air above you, so the air pressure is greater.

Air pressure is also affected by temperature. Warm air weighs less than the same amount of cold air because the particles of air are farther away from each other. Cold air weighs more than the same amount of warm air because the particles of air are closer to each other. Because warm air weighs less, warm air has less air pressure. Because cold air weighs more, cold air has greater air pressure.

Air pressure changes, sometimes very quickly. Imagine that you are in a very small room with many classmates. You are all standing elbow-to-elbow, pushed against each other and against the walls. You are in an area of high pressure. Suddenly, someone opens a door to a very large room. You would want to move into the larger room where you would have enough space to be comfortable. You would want to move to an area with less pressure, and the sooner you could get there the better! The same idea is true for air particles. Air wants to move from an area of high pressure to an area of low pressure, and it will do so as quickly as possible.

Air moves from an area of high pressure (top) to an area of lower pressure (bottom).

Name _____ Date _____

For the student:

1. What is air pressure?

_____

_____

_____

2. What are two factors that affect air pressure?

_____

_____

_____

3. Why would air pressure be greater at sea level than it would be on the top of a mountain?

_____

_____

_____

4. Would air pressure be greater at the South Pole or at the equator? Why?

_____

_____

_____

5. How does the force of air pressure move air particles?

_____

_____

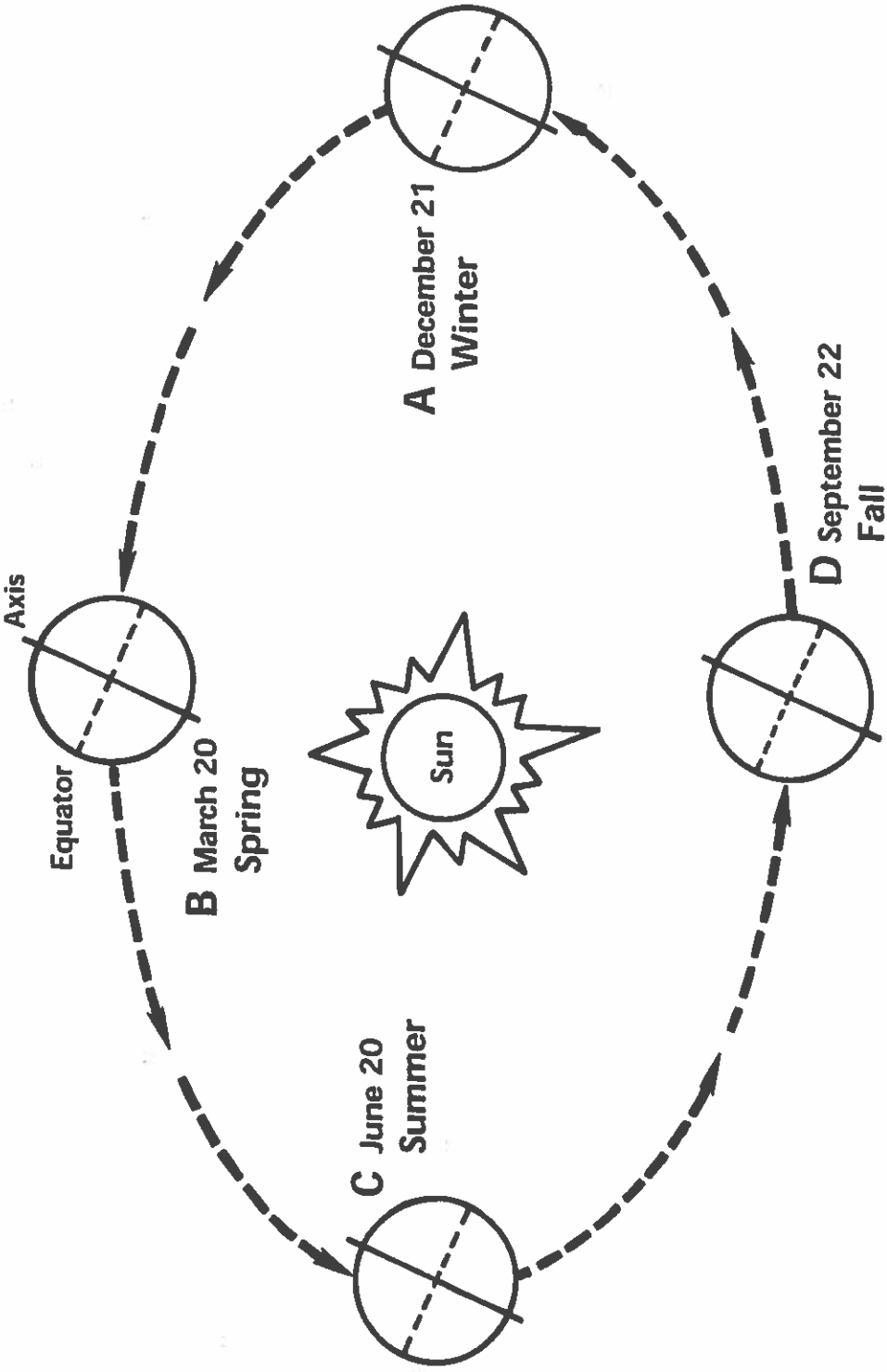
_____

Name _____ Date _____

WEATHER

SUN AND THE EARTH

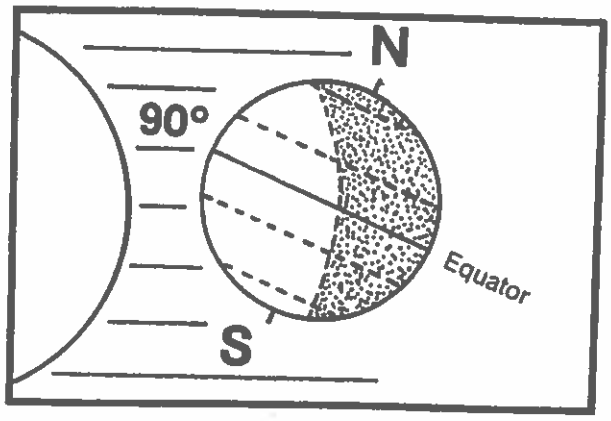
The tilt of the Earth's axis and Earth's revolution around the Sun cause the amount of sunlight striking the Earth to change continually from day to day.



Name _____

Changing of the Seasons on Earth

The earth's axis always has the same tilt and points toward the North Star. In the year it takes the earth to revolve around the sun, the sun's rays strike the North and South Hemisphere at different angles. The more directly the sun's rays strike the surface of the earth, the more heat energy is delivered. The difference in heating of the earth's surface produces our seasons.



1. In the place you live, on what date is the sun highest in the sky? _____
2. Is this a warm or cool season? _____
3. At the same latitude in the Southern Hemisphere, where is the sun in the sky on that day? _____
4. In the place you live, six months later, would the sun be high or low in the sky at noon? _____
5. Is this a warm or cool season? _____

When the sun is directly over the equator, it is called the EQUINOX. This happens twice a year, at the beginning of Fall and Spring seasons.

6. What is the date of the Fall Equinox? _____
7. What is the date of the Spring Equinox? _____

When the sun is directly over the Tropic of Cancer or the Tropic of Capricorn, it is called a SOLSTICE. This begins the Summer or Winter seasons.

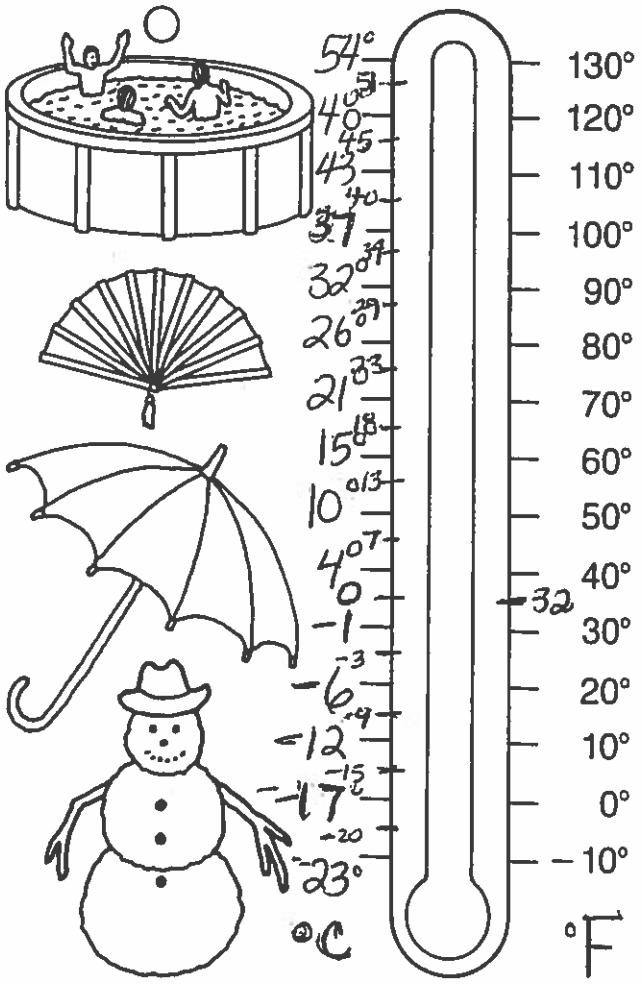
8. What is the date of the Winter Solstice? _____
9. What is the date of the Summer Solstice? _____
10. How many months does each season last? _____
11. The change of the sun's position in the sky causes the seasons. Will this affect your daily weather, as well as the season?

Explain _____

How Hot Is It?

Name _____

Look at the outside thermometer.
Write the temperature on the chart.



Day	Temperature
Monday	
Tuesday	
Wednesday	
Thursday	
Friday	

At the end of the week, fill in the graph.
Color the boxes to show how hot it was each day.

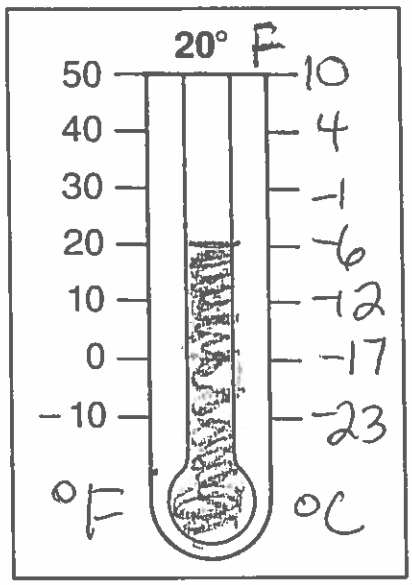
Day											
Mon.											
Tues.											
Wed.											
Thurs.											
Fri.											
	35	40	45	50	55	60	65	70	75	80	85 °F
	1°C	4°	7°	10°	12°	15°	18°	21°	23°	26°	29° °C

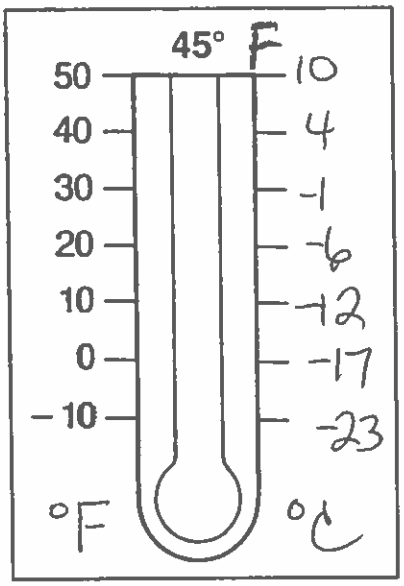
Temperature (°F)

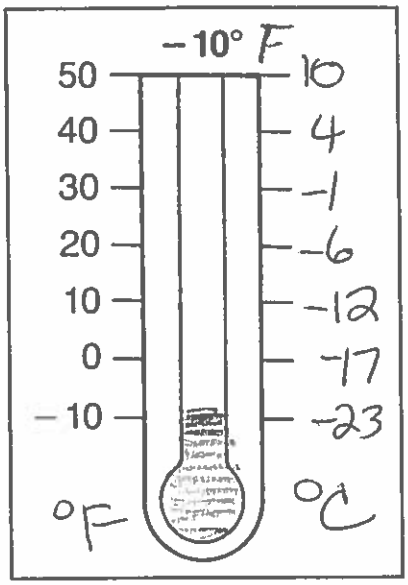
Hot and Cold

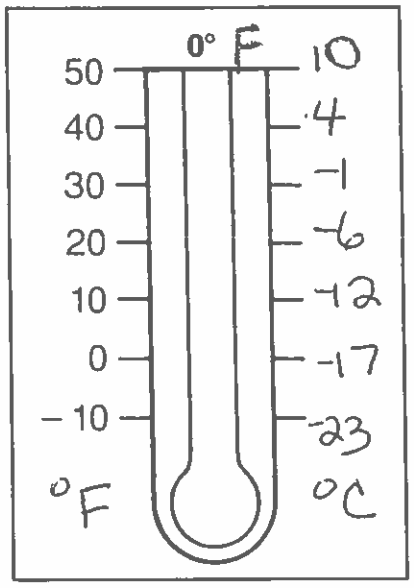
Name _____

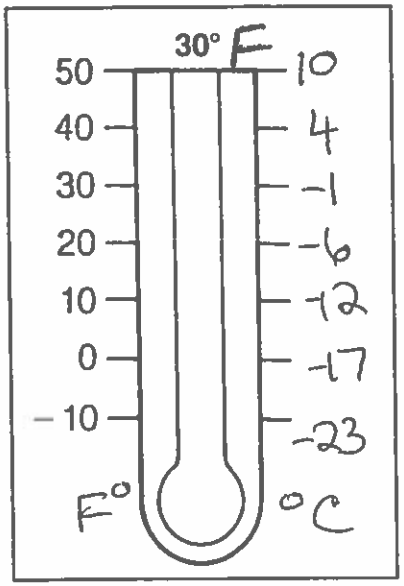
Look at the temperature above each thermometer.
Use a red crayon to mark the temperature on each thermometer.

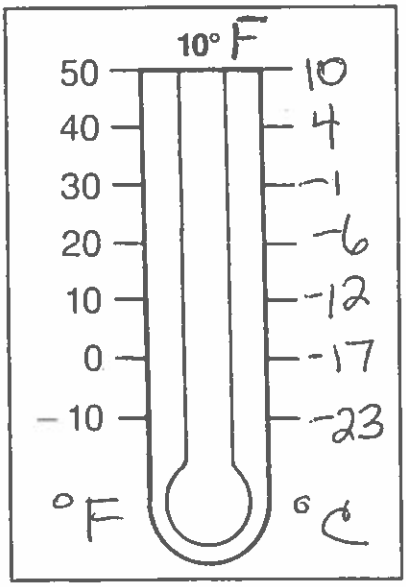












Which is the coldest temperature? _____

Which is the hottest temperature? _____

Is the red line higher or lower when the temperature is hotter?

_____

Is the red line higher or lower when the temperature is colder?

_____

Watching Weather

Name _____

Write the starting date on the calendar.
Pick the cards that show what it is like outside.
Paste the cards in the boxes.

Month _____ **Day** _____ **Year** _____

	Monday	Tuesday	Wednesday	Thursday	Friday
Temperature					
Wind					
Clouds					
Precipitation					

Name _____

Watching Weather

Write the starting date on the calendar.
Pick the cards that show what it is like outside.
Paste the cards in the boxes.

Month _____ **Day** _____ **Year** _____

	Monday	Tuesday	Wednesday	Thursday	Friday
Temperature					
Wind					
Clouds					
Precipitation					

Factors of Weather: Moisture
Basic Types of Clouds

Clouds are collections of tiny droplets of water or particles of ice that float in the air. Clouds form when water vapor molecules condense.

Meteorologists classify clouds into three basic groups according to their shapes and the heights at which they form: stratus, cumulus, and cirrus.

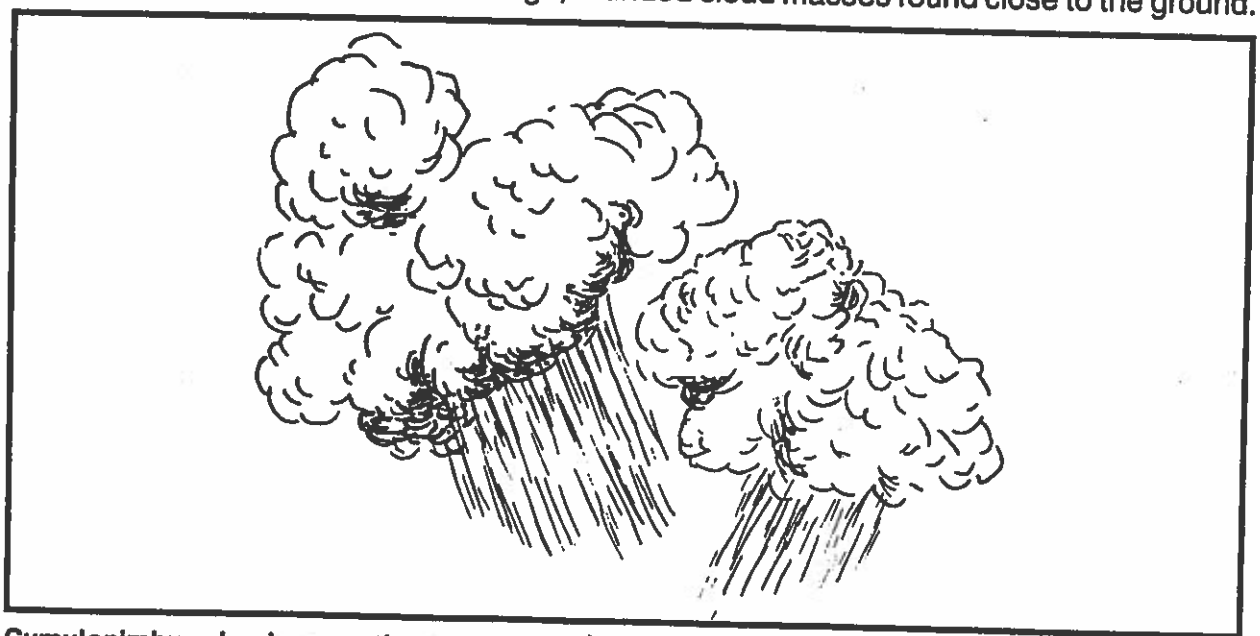
Stratus clouds form at altitudes below two kilometers. They are flat layers of gray clouds that are made of water droplets. Stratus clouds may be only a few hundred meters thick, but they may cover great distances. Stratus clouds do not form individual cloud units. They seem to blanket the Earth, allowing almost no sunshine to get through. These clouds may be responsible for long periods of drizzling rain or snow.

A stratus cloud that forms close to the ground is called fog. Fog is common near large bodies of water, which, of course, contain large amounts of moisture. If the air temperature falls below the dew point and the air is still, the water vapor condenses and becomes fog. Fog may also form when warm, moist air layers move over cold surfaces.

Cumulus clouds are large, puffy, white clouds that may have gray centers. They have bases that form below two kilometers, but they may go upwards for thousands of meters into the atmosphere. Cumulus clouds often have interesting shapes that change continuously. Cumulus clouds may be associated with fair weather or with snow showers and thunderstorms.

The highest clouds are known as cirrus clouds. They are feathery, white clouds made of ice crystals. They form above six kilometers in the atmosphere and may be seen during any season. They are usually associated with fair weather.

Any cloud that produces precipitation is called a nimbo or nimbus. Some clouds are combinations of the three basic cloud types. Cirrocumulus clouds are puffy clouds found at high altitudes. Cumulonimbus clouds are puffy "thunderheads" that produce thunderstorms. Stratocumulus clouds are large, rounded cloud masses found close to the ground.



Cumulonimbus clouds, sometimes called "thunderheads," produce thunderstorms that precipitate large amounts of rain, and often, hail.

Name _____ Date _____

For the student:

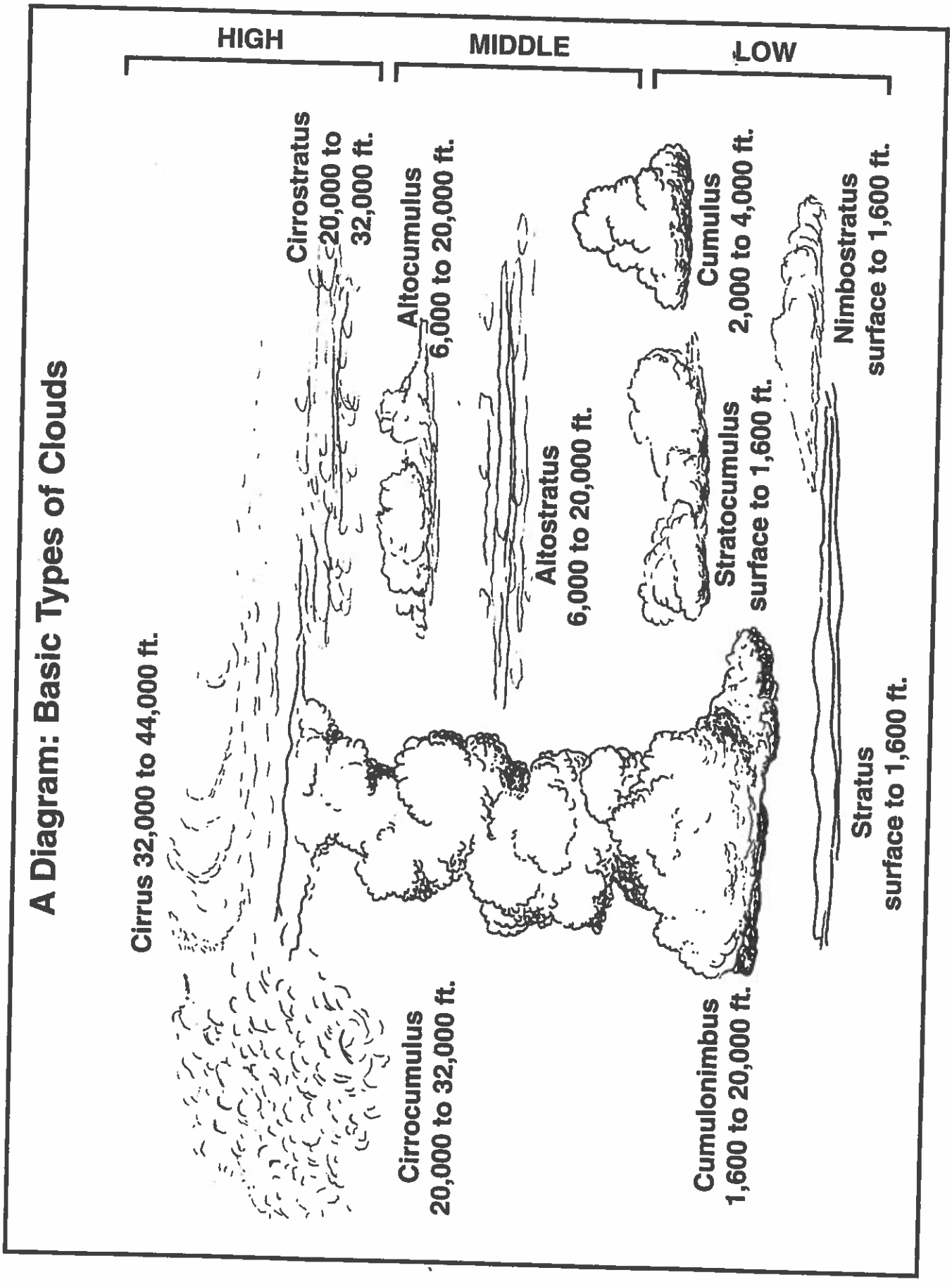
1. What is a cloud?

2. How do meteorologists classify clouds?

3. What kinds of clouds form low in the atmosphere?

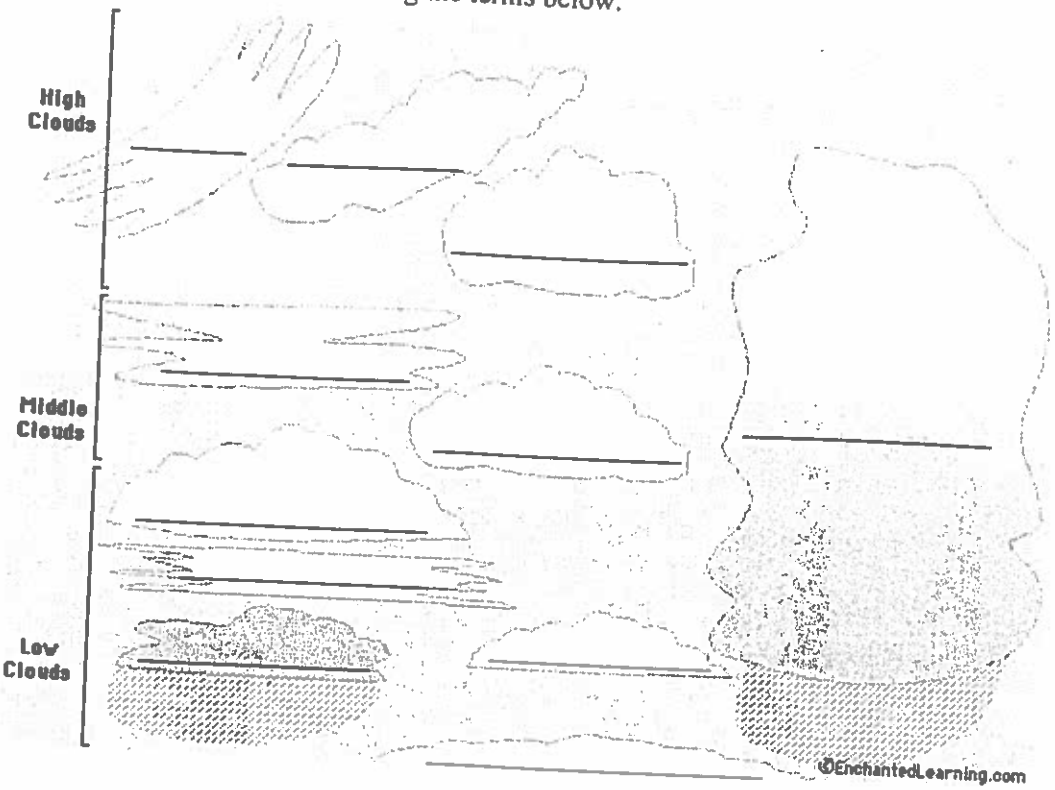
4. What are nimbo or nimbus clouds?

5. What is fog?



Label the Clouds

Label the clouds using the terms below.



alto-cumulus - Middle-level, medium-sized puffy clouds.
alto-stratus - Middle-level, layered clouds.
cirro-cumulus - High-altitude, small, wispy, patchy, puffy clouds.
cirro-stratus - High-altitude, thin, wispy clouds in layers.
cirrus - High-altitude, thin, wispy clouds.
cumulo-nimbus- Large, dense, towering clouds that cause thunderstorms.
cumulus - Low, puffy clouds.
fog - Ground-hugging clouds.
nimbo-stratus - Low, dark, rain cloud.
stratus - Low, layered, horizontal, wispy clouds with a flat base.
strato-cumulus - Low clouds, broad and flat on the bottom, puffy on top (higher than cumulus and lower than altocumulus).

Other types of clouds:
Mammatus clouds are dark clouds shaped like sagging pouches. These clouds often appear after a tornado.

Orographic clouds are clouds that are formed as moist air rises over mountains or other major geographic features. The air floats up the side of the mountain and cools quickly, condensing and turning into a cloud.

A **pileus cloud** is a smooth cloud that is found over or on the top of a major geographic feature, like a mountain.

A **contrail** (short for **CON**densation **TRAIL**) is a cloud-like vapor trail that forms behind some aircraft when flying in cold, clear, humid air. The contrail forms from the water vapor contained in the jet's engine exhaust.

Name: _____

Weather Forecasts

Location: _____

	Monday	Tuesday	Wednesday	Thursday	Friday
Forecasted weather					
Actual weather					

Name: _____

Make a Rain Gauge

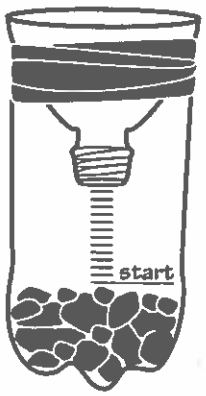
Make a rain gauge and use it to measure rainfall.

Materials

- 2 L clear plastic bottle
- scissors
- small rocks
- ruler
- water
- marker
- duct tape or masking tape

Procedure

1. Make sure that the bottle is clean. Wash and rinse it well. Remove any labels.
2. Cut off the top of the bottle, just below where the sides become straight. Make an even cut. You will use the top as a funnel for your rain gauge.
3. Fill the bottom part of the bottle with rocks (about 2 cm high). The rocks will keep the bottle from falling over.
4. Pour in some water so that you can see a water line just above the rocks. Trace the water line on the outside of the bottle with a marker. This will be your starting point. Write "Start" beside or above the line you drew.
5. Line up your ruler with the Start line. Make a mark on the bottle every 0.5 cm. Write the measurement beside each line.
6. Turn the top of the bottle (from step 2) upside down. Insert it into the bottle. Use tape to secure it to the bottom of the bottle.

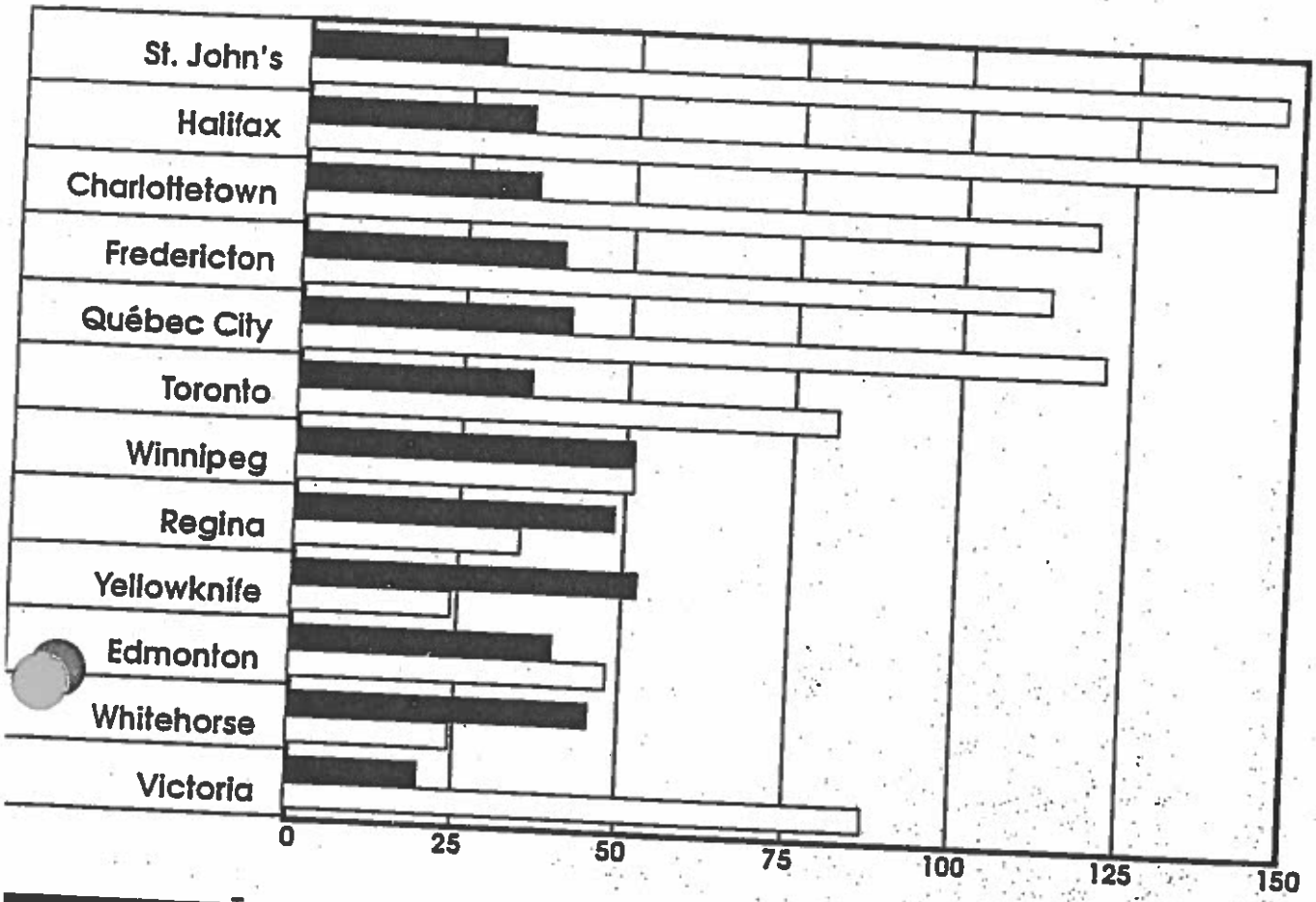


7. Find a good place outdoors to put your rain gauge. Make sure that nothing is blocking it from above.

#14b Worksheet

PRECIPITATION AND TEMPERATURE

The bar graph below shows the precipitation and temperature ranges for most of the capital cities of Canada.



#14c Worksheet PRECIPITATION AND TEMPERATURE

Examine the graph carefully then answer the following questions.

1. Which capital city only received 50 centimetres of rain? Winnipeg
2. Which capital city has the highest temperature? _____
3. Which capital city had the lowest range in temperature? _____
4. Which capital city receives the most rainfall? _____
5. Which city has the same range in temperature and annual rainfall? _____
6. Which two cities receive more than 125 centimetres of rainfall each year?

   _____
7. How many cities receive more than 75 centimetres of rainfall each year? _____

   List their names. _____

   _____

   _____
8. Which cities receive less than 125 centimetres of rain each year?

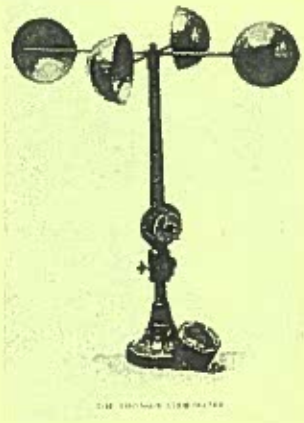
   _____

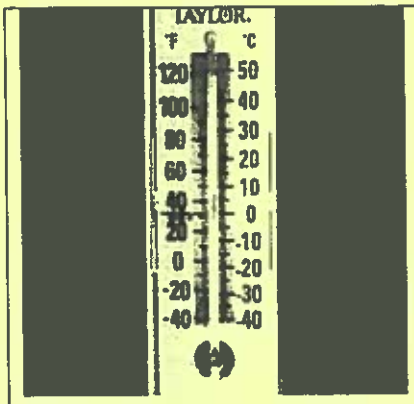
Community Climate

Find out the following things about your local community:

1. What is the average temperature in your community during the summer? _____
2. What is the average temperature in your community during the winter? _____
3. What is the average temperature in your community during the spring? _____
4. What is the average temperature in your community during autumn? _____
5. How many centimetres does your community receive in rainfall in a year? _____
6. How many centimetres does your community receive in snowfall in a year? _____
7. What is the highest temperature that your community has ever experienced during a summer? _____
8. What is the coldest temperature that your community has ever experienced during winter? _____

Weather Tools Name: _____

Images of Weather Tools	Name of equipment:	Uses:
		
		
		

		
		
		
Draw a hygrometer: 		

Weather Forecasting: Weather Maps

The National Weather Service issues weather forecast maps. They develop national weather maps, continental weather maps, and global weather maps.

There are different kinds of weather maps. Surface weather maps provide information about the present weather conditions for an area. These weather maps locate and identify fronts, areas of high and low pressure, and temperatures. Isotherms are lines drawn on a weather map connecting places with the same temperature. Isobars are lines on a weather map that connect areas with the same air pressure. The isobars on a weather map correlate to wind strength. When isobars are close together, the winds are strong. When the isobars are spaced farther apart, the winds are much gentler.

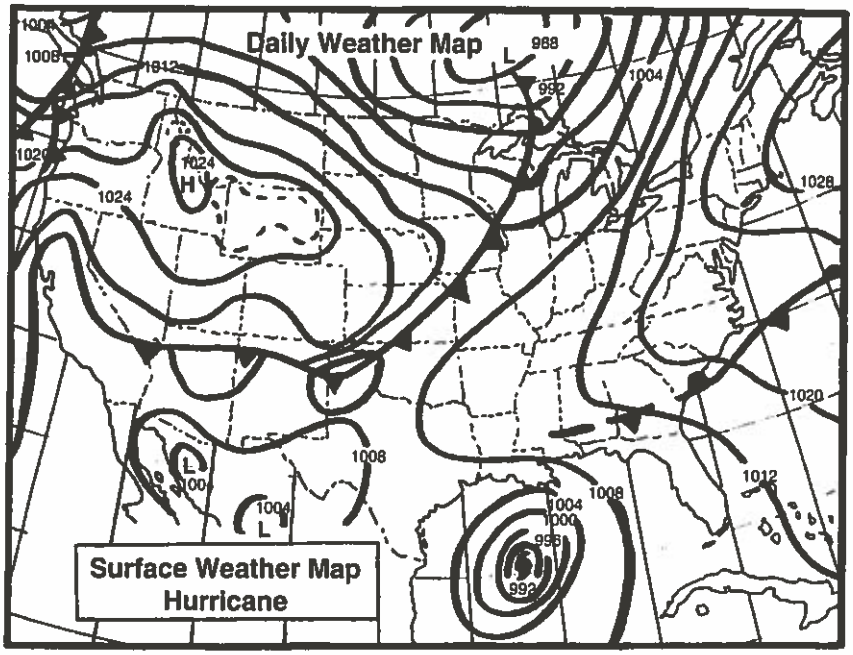
Surface weather maps also include data from weather station reports. These stations use internationally accepted symbols to represent such factors as wind speed and direction, temperature, types of clouds and amount of cloud cover, types and amounts of precipitation, and barometric tendancy.

Forecast weather maps are used to demonstrate the predicted changes in the weather. Computers generate many of these maps after carefully analyzing weather data using complex formulas.

There are short term and long term weather forecast maps. Short term forecasts indicate the weather for the following 18–36 hours. This information is updated often to include the most accurate information possible.

Long range forecasts may be for the following five days. These maps are updated daily. They may also cover the weather for the following 6–10 days. This information is updated three times a week. Meteorologists also develop 30-day forecasts, which are updated twice a month.

Weather maps are important tools for developing and explaining weather forecasts. Weather conditions, however, change very rapidly, so weather forecasts may not always be accurate. They are, at best, close guesses of what the weather should be for a certain period of time. The shorter that period of time, the more accurate the forecast should be.



Name _____ Date _____

For the student:

1. Who issues weather forecast maps?

The National Weather Service

2. What are two basic types of weather maps?

(1) Surface Weather Maps
(2) Forecast Weather Map

3. Which type of map would give information about the current weather conditions for an area? Surface Weather maps and Short term forecast maps indicate weather for the following 18-36 hours.

4. What kinds of weather forecast maps are developed?

Short term and long term or long range weather maps.

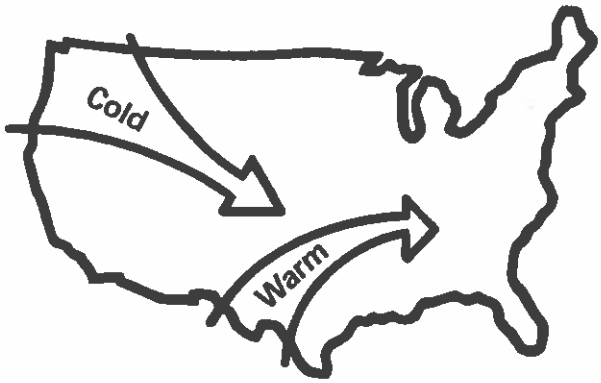
5. Why aren't weather forecasts 100 percent accurate?

Weather conditions change very rapidly.

Name Answer Key Date

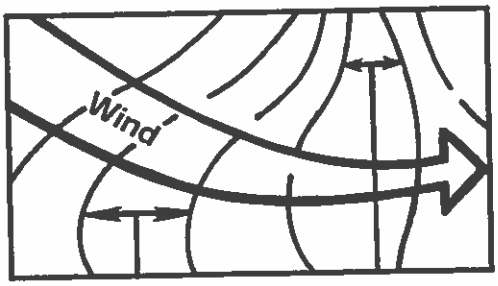
Weather Map Symbols

Weather moves from west to east, about 500 miles a day. It moves faster in the winter.



High, cold air travels faster than low, warm air. Both follow the general paths shown here.

Isobars: Lines drawn through points of equal barometric pressure.



Isobars far apart mean mild winds

Isobars close mean strong winds

Rain Scattered Showers

Snow Flurries

clear cloudy (H) high pressure area

partly cloudy (R) rain (L) low pressure area

Fronts

A cold air mass is moving in the direction of the arrows. It often brings storms and cooler weather.

A warm air mass moving in the direction of half circles is usually preceded by rain or snow.

A line between two air masses when there is little or no movement means unsettled weather—often prolonged rain.

Low pressure cells move in a counterclockwise direction. They usually forecast cloudiness and precipitation.

High pressure cells move in a clockwise direction. They usually forecast clear skies.

The line of contact between air masses of different temperatures is a front.

Cold

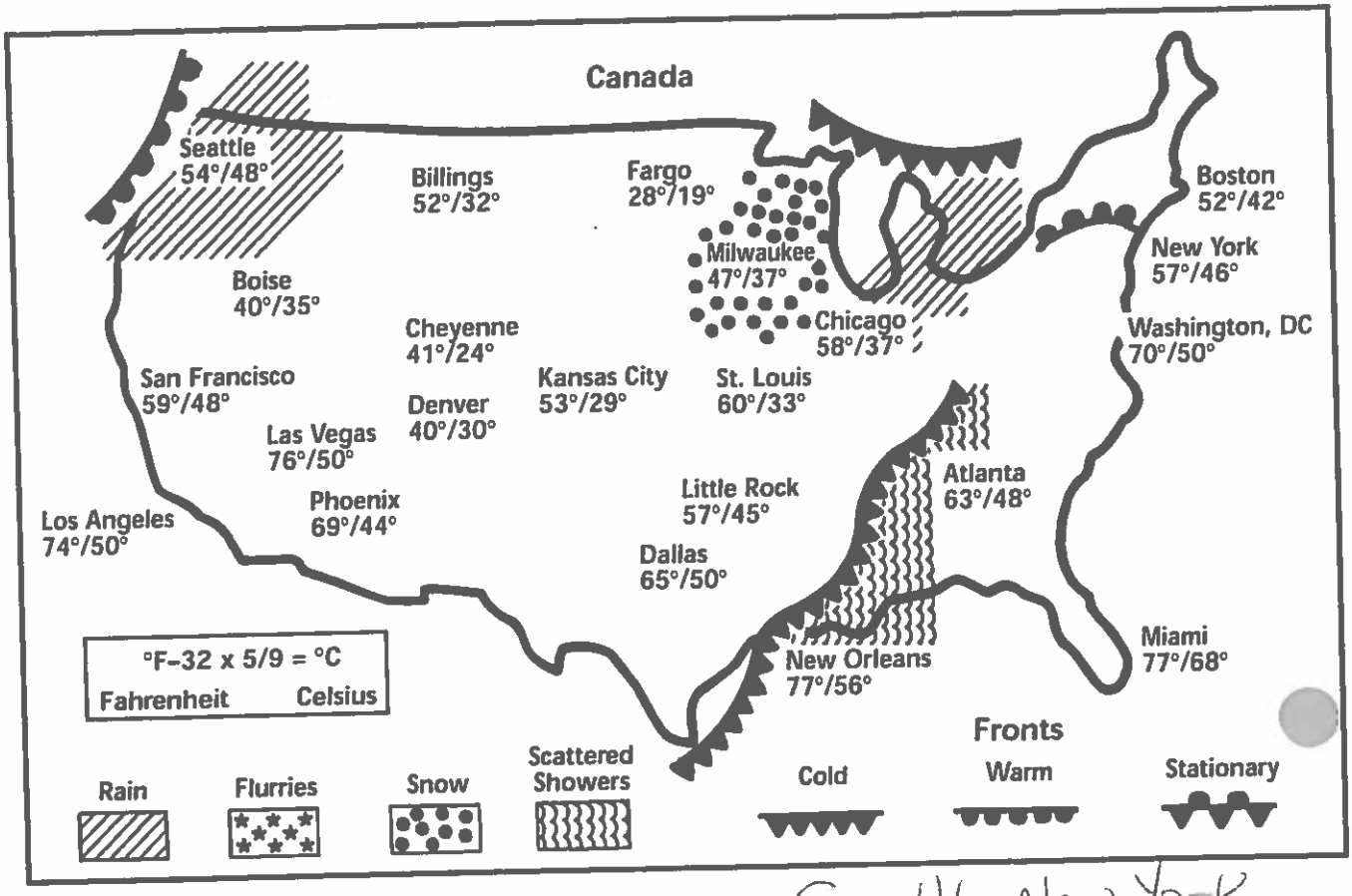
Warm

Stationary

Name _____ Date _____

WEATHER

Using a Weather Map



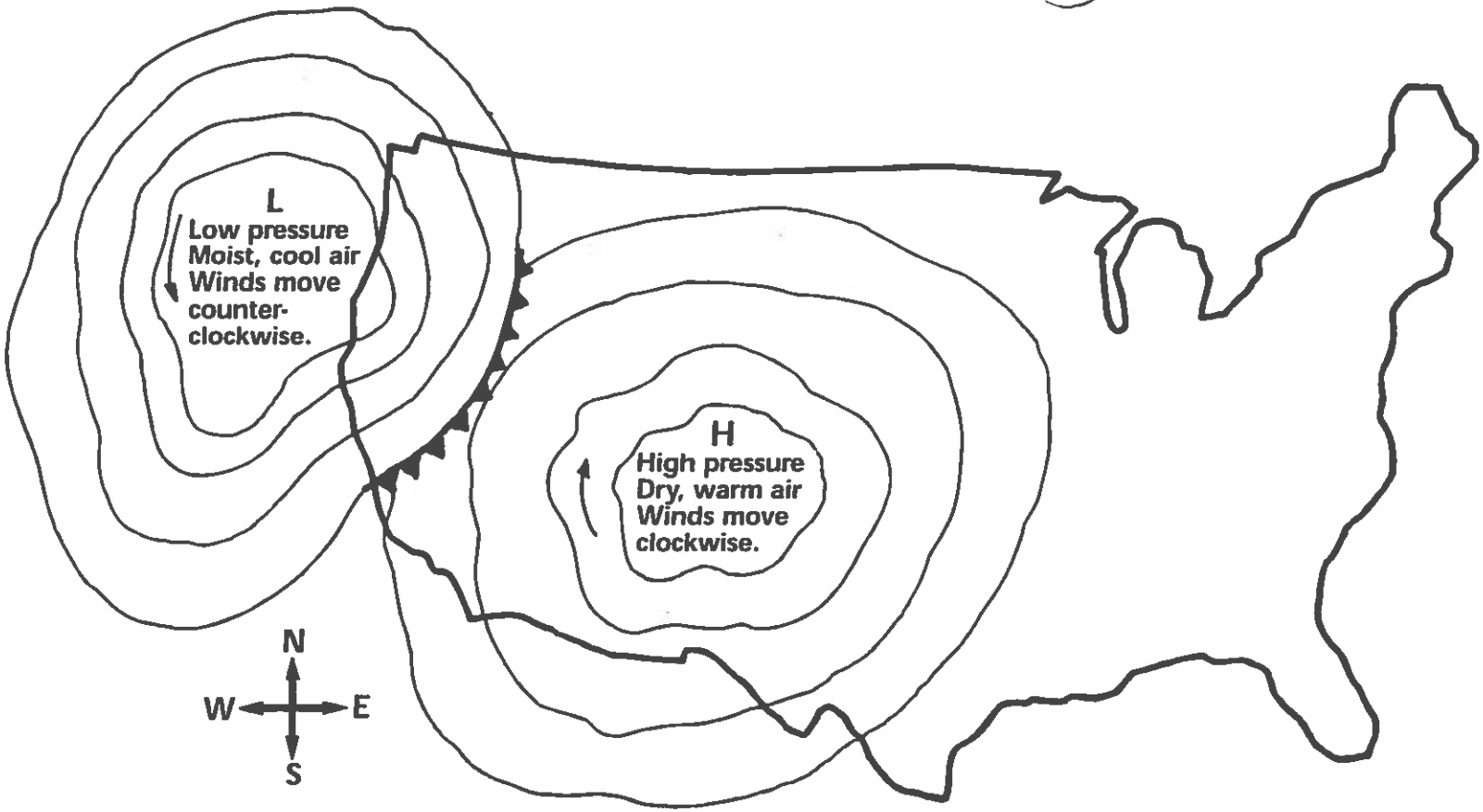
1. Near what cities are the two warm fronts located? Seattle New York
2. What type of weather is associated with these warm fronts? rain
3. Draw the symbol used on the weather map to indicate a warm front. _____
4. Draw the symbol used on the weather map to indicate rain. _____
5. What kind of precipitation did the New Orleans area have? Scattered showers
6. If you lived in Chicago, what type of weather might you expect in the next day or two? Snow or rain
7. What type of weather is moving with the cold front east of St. Louis and Little Rock? Scattered showers
8. Which city had the coldest temperature? What was it? Fargo, 19°
9. Which two cities had the same high temperature? What was it? Miami and New Orleans 77°
10. What type of weather is Los Angeles having? Clear and mild

Name Answer key Date

WEATHER

Tracking a Weather System

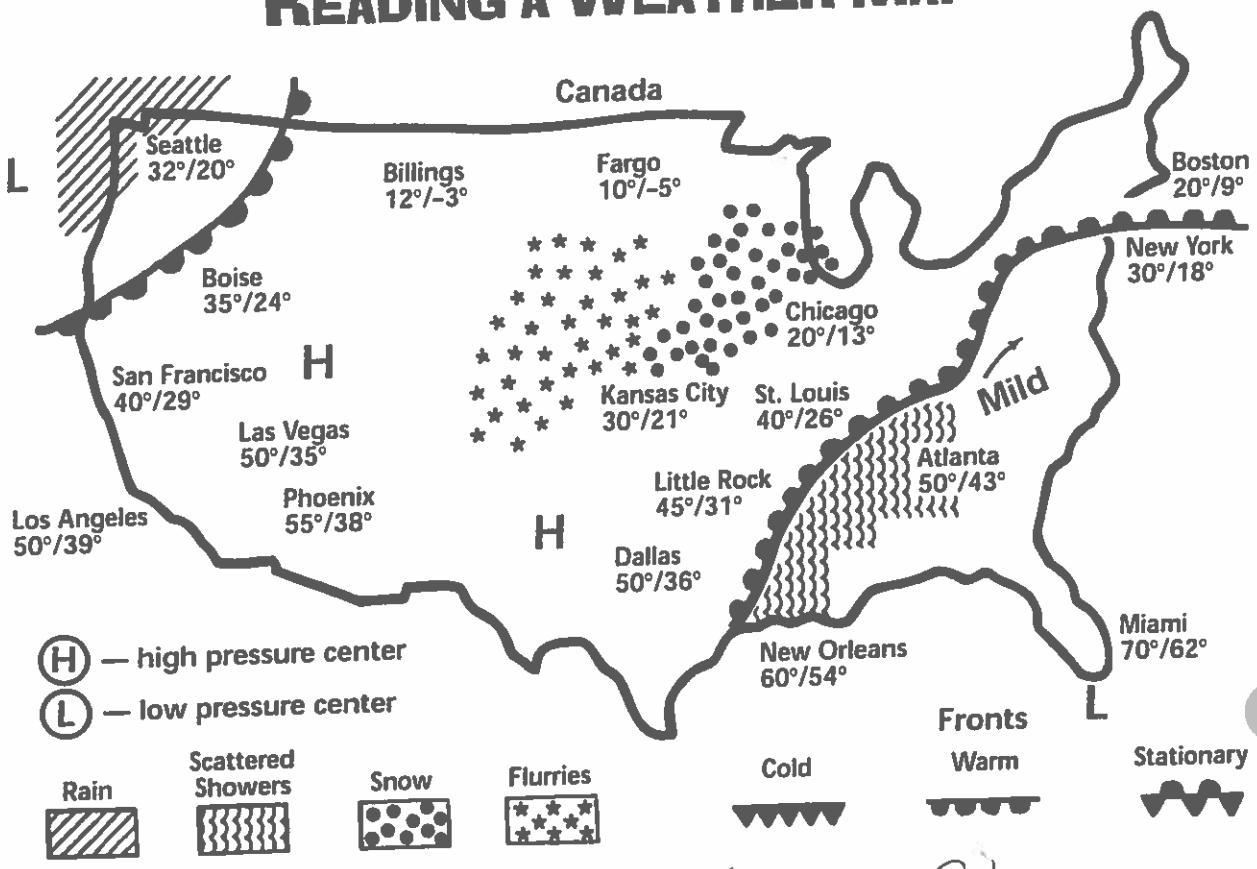
1. These weather systems will move from West to east.
2. In a low pressure cell, winds move counterclockwise.
3. When these two weather systems meet, a Cold front will form.
4. In a high pressure cell, winds move clockwise.
5. Which of the two weather systems is the stronger? low
6. How do you know? The isobar lines are closer together
7. Name three kinds of fronts. cold, warm, stationary



Name _____ Date _____

WEATHER

READING A WEATHER MAP



1. In what cities is it snowing? Chicago Kansas City
2. What cities are near high pressure centers? Las Vegas, Dallas, San Fransisco
3. What type of weather is forecast for the southeastern area of the United States? clear and mild
4. What kind of weather would you forecast for the midwest? Snow and Cold weather
5. What type of weather is moving with the warm fronts? rain, scattered showers
6. Which city recorded the highest temperature? Miami
7. Where is the lowest temperature found? Fargo
8. Where might the snow north of Kansas City have been two days ago? Canada
9. Draw 2 symbols used on the weather map that indicate precipitation.

10. Draw the symbol used on the weather maps to indicate a cold front.

Name: _____

Umbrellas

Umbrellas have been around for thousands of years. They were first designed to provide shade from the Sun. Eventually they were also used to shield people from the rain.

1. Look at the umbrellas below.
   a) In what kinds of weather would each umbrella be used?
   b) What kinds of materials might each umbrella be made of?

A.

B.

C.

D.

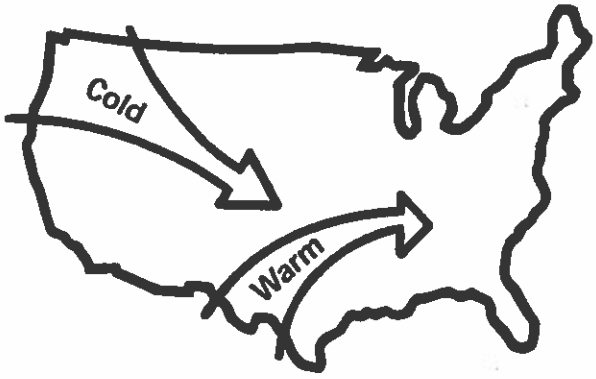
2. Which umbrella(s) do you use where you live?

3. Where in Canada do you think you would see a lot of each umbrella? Why?

Name Answer Key Date

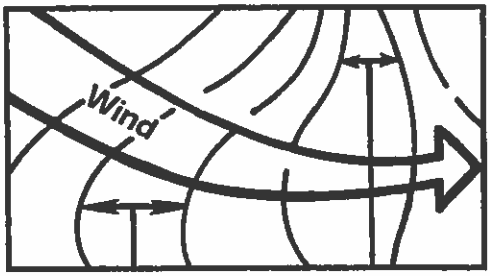
Weather Map Symbols

Weather moves from west to east, about 500 miles a day. It moves faster in the winter.



High, cold air travels faster than low, warm air. Both follow the general paths shown here.

Isobars: Lines drawn through points of equal barometric pressure.



Isobars far apart mean mild winds

Isobars close mean strong winds

Rain Scattered Showers

Snow Flurries

clear cloudy high pressure area

partly cloudy rain low pressure area

Fronts

A cold air mass is moving in the direction of the arrows. It often brings storms and cooler weather.

A warm air mass moving in the direction of half circles is usually preceded by rain or snow.

A line between two air masses when there is little or no movement means unsettled weather—often prolonged rain.

Low pressure cells move in a counterclockwise direction. They usually forecast cloudiness and precipitation.

High pressure cells move in a clockwise direction. They usually forecast clear skies.

The line of contact between air masses of different temperatures is a front.

Cold

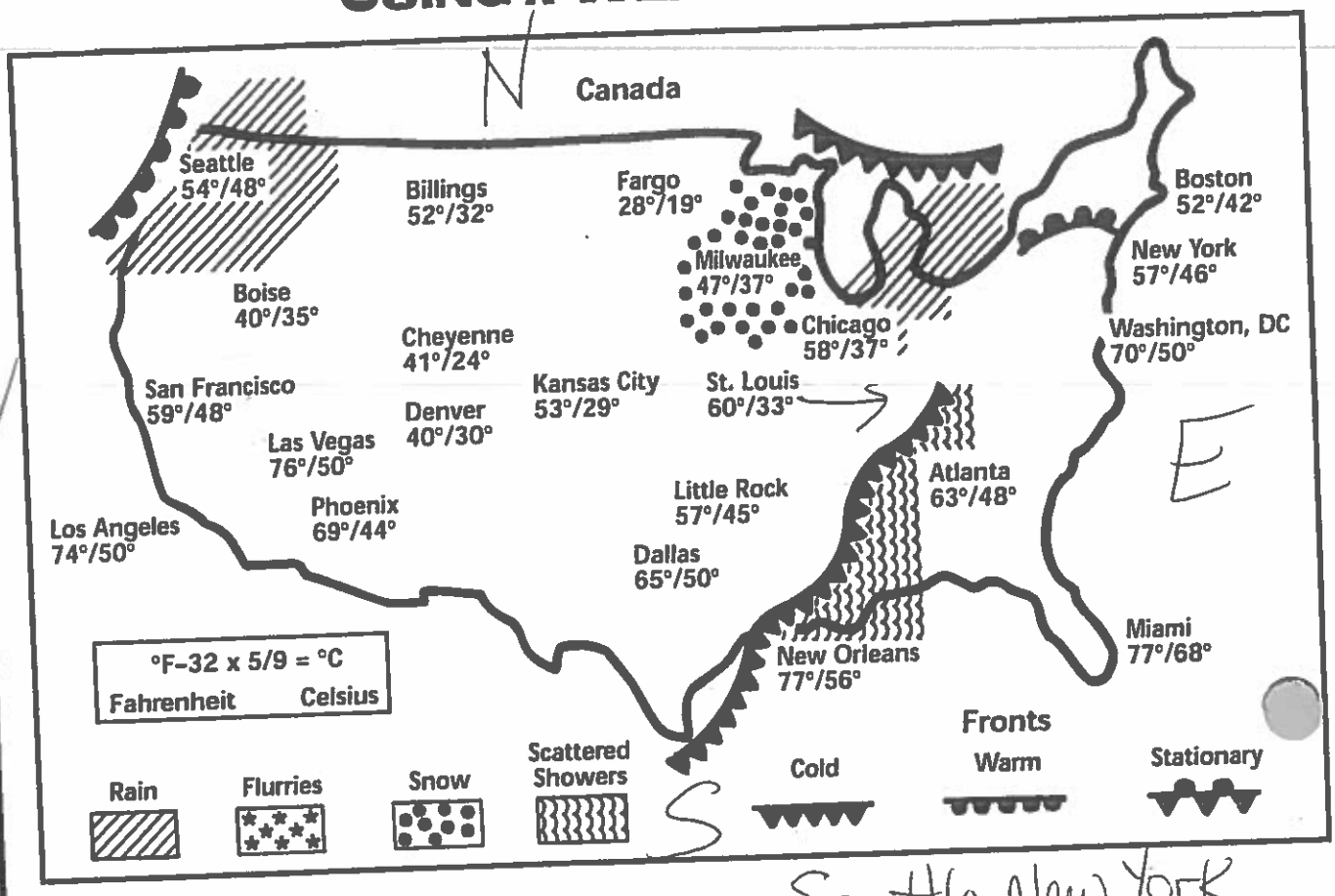
Warm

Stationary

Name _____ Date _____

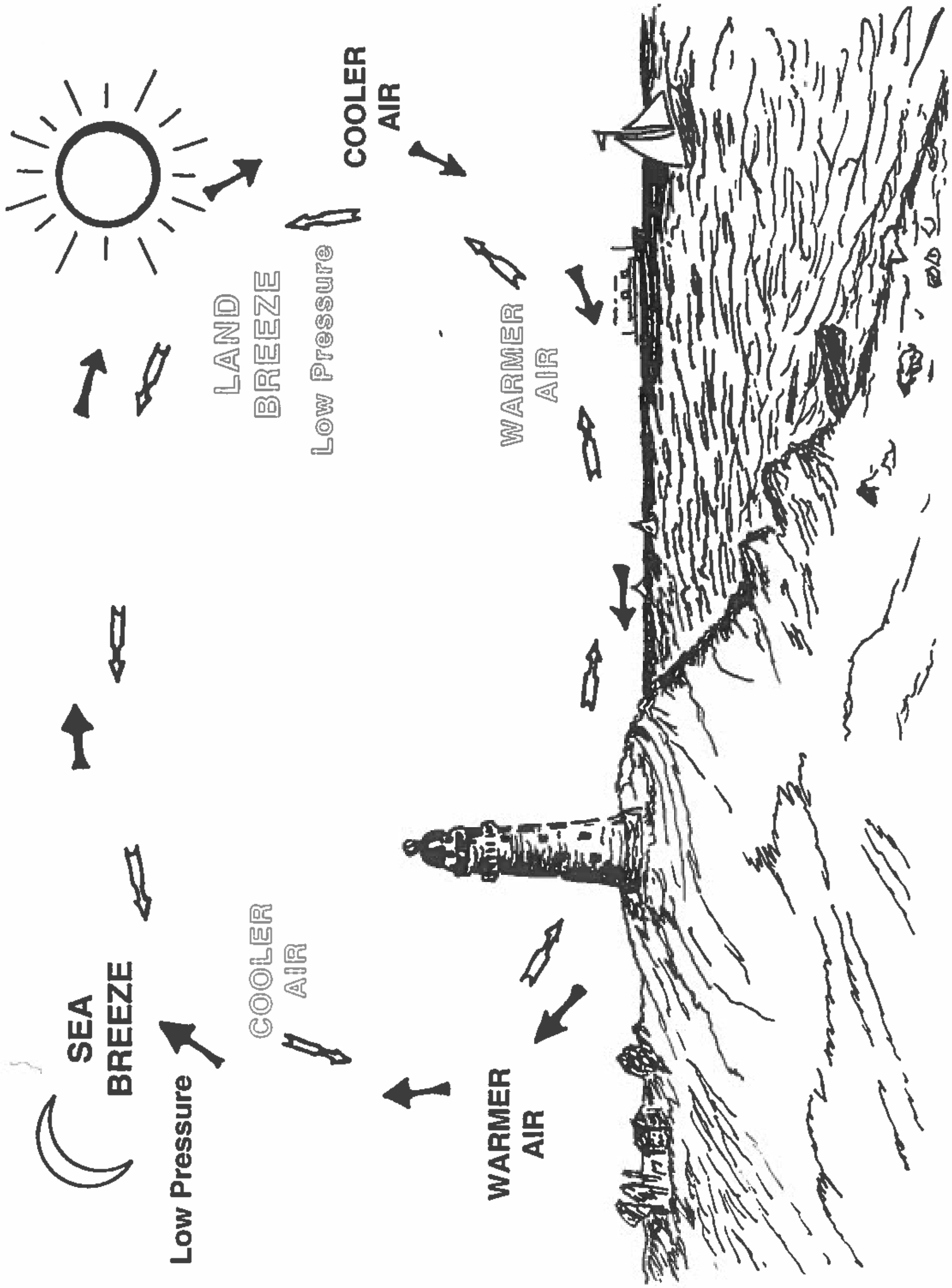
WEATHER

USING A WEATHER MAP



1. Near what cities are the two warm fronts located? Seattle New York
2. What type of weather is associated with these warm fronts? rain and/or snow
3. Draw the symbol used on the weather map to indicate a warm front. _____
4. Draw the symbol used on the weather map to indicate rain. 
5. What kind of precipitation did the New Orleans area have? Scattered showers
6. If you lived in Chicago, what type of weather might you expect in the next day or two? Snow or rain
7. What type of weather is moving with the cold front east of St. Louis and Little Rock? Scattered showers
8. Which city had the coldest temperature? What was it? Fargo, 19°
9. Which two cities had the same high temperature? What was it? Miami and New Orleans 77°
10. What type of weather is Los Angeles having? Clear and mild

A Diagram: Sea and Land Breezes



Land has a lower heat capacity than water, so it heats and cools more rapidly.

Measuring Wind: A Wind Vane

Two features of wind affect weather: its direction and its speed. Special instruments are used to measure these features.

Wind direction is measured with an instrument called a weather vane, or wind vane. A wind vane consists of a flat blade attached to a pole that can pivot, or turn, with the wind. The flat blade lines up with the direction from which the wind is blowing. There is often an arrow that indicates the wind's direction. The wind vane may also be attached to an electric meter.

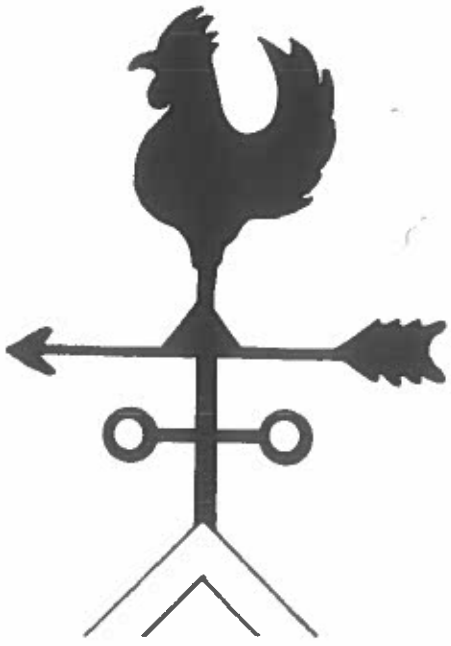
Wind direction is often indicated using the 360 degrees of a circle; 0 degrees, 90 degrees, 180 degrees, and 270 degrees would be north, east, south, and west.

Wind direction may vary with altitude. While a ground-level wind may blow from the south, as indicated by a flag, winds higher in the atmosphere may be pushing clouds to the east.

Wind direction above the Earth's surface may be measured by sending up helium-filled balloons and observing the directions they are blown. Satellites may also be used to indicate cloud and wind movements.

Bonus Activity:

Wind vanes may be made to resemble different animals. Design a wind vane that represents your local area or state.



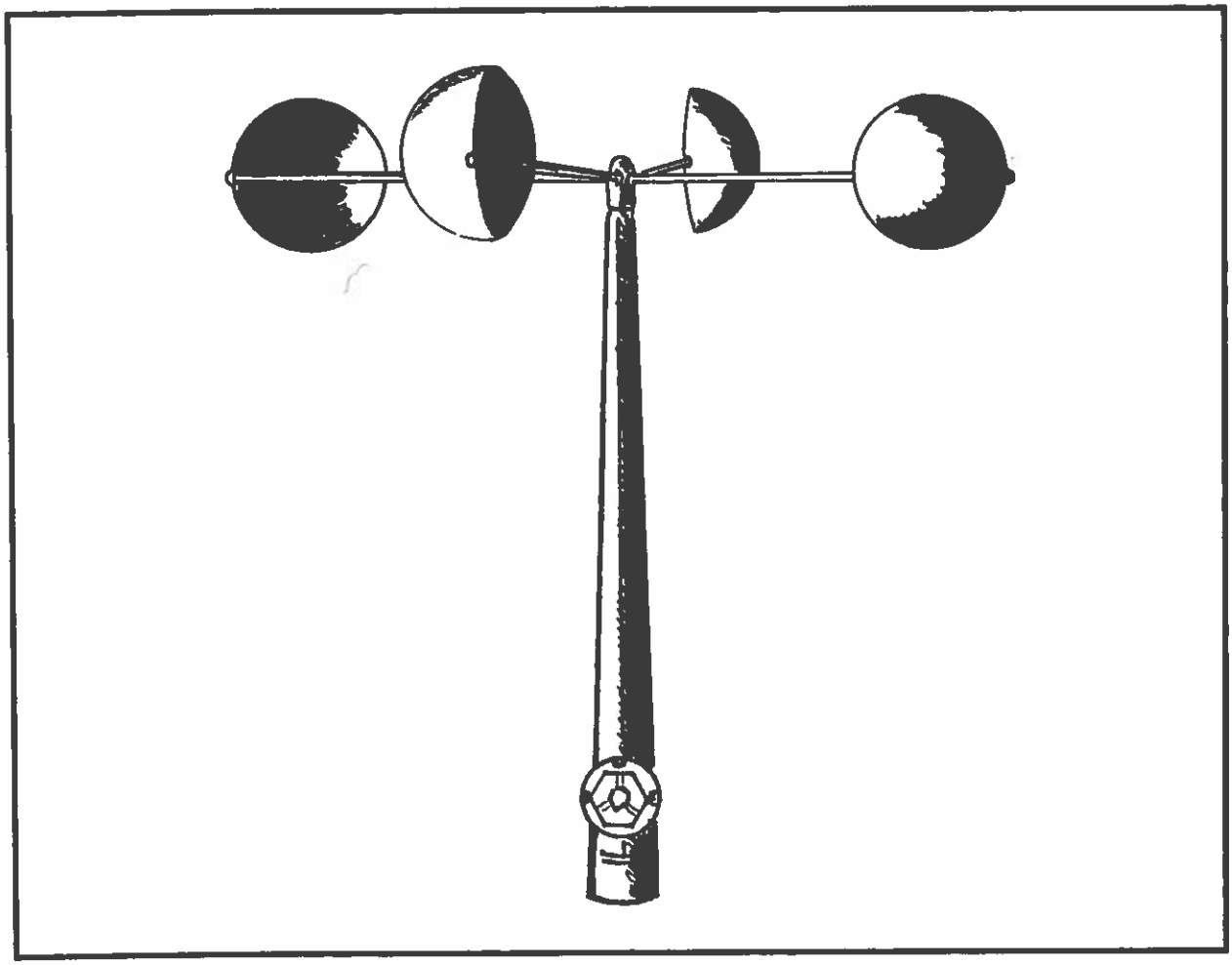
Measuring Wind: An Anemometer

Both the speed and the direction of wind affect weather. Special instruments have been developed to measure these wind features. Wind vanes are often used to indicate wind direction. An anemometer measures the wind's speed.

Most anemometers are devices with three or four small cups attached to fairly short rods, 2–8 inches (5–20 centimeters) in length. The rods, or arms, are attached to a rotating pole or spindle. The wind blows into the cups, making them rotate. The faster the wind blows, the faster the cups rotate. The speed of the wind is calculated from the number of complete rotations of the cups in a given amount of time. The wind speed information is usually indicated on a dial or gauge attached to the anemometer.

In the United States, wind speed is usually recorded in miles per hour. It may also be reported in knots (nautical miles per hour). In many other countries, wind speeds are expressed in kilometers per hour.

Weather balloons may be used to measure wind speed, too. Their movements may be tracked with radar or followed by sight. Wind speed can be calculated from these observations. Satellites may be used in areas where balloons are not very practical, such as over the oceans.



An anemometer measures wind speed by recording how fast the wind rotates its arms.

Name _____ Date _____

For the student:

1. What does a wind vane measure?

_____

2. From where is a 135 degree wind blowing?

_____

3. What degree would indicate a southwest wind?

_____

4. What do helium-filled balloons measure?

_____

5. How can satellites help measure wind direction?

_____

_____

6. What instrument is used to measure wind speed?

_____

7. What happens to an anemometer's cups when winds blow faster?

_____

8. In what unit of measurement would your local meteorologist report wind speeds?

_____

9. What are two ways of observing weather balloon movements?

_____

10. Why isn't it practical to use weather balloons over oceans?

_____