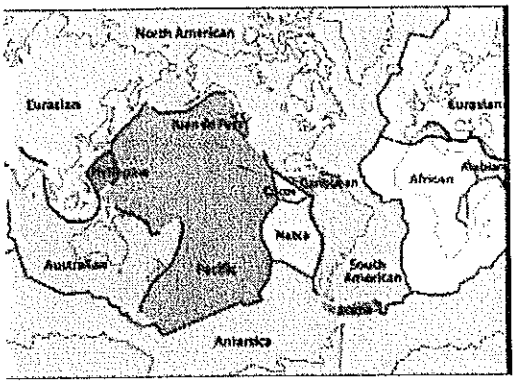
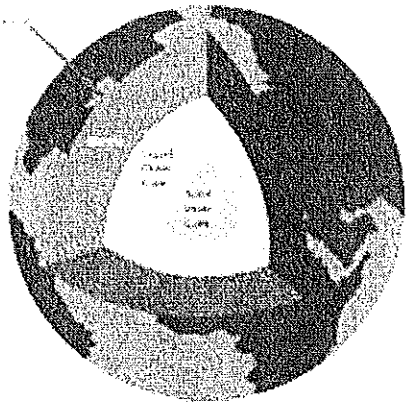
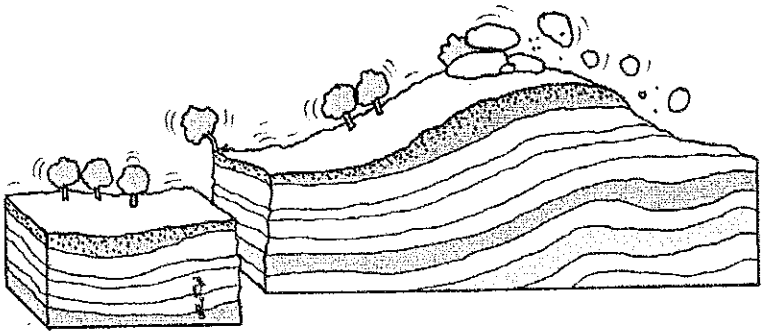






CATASTROPHIC EVENTS NOTEBOOK:

~~Earthquakes, Volcanoes & Rocks~~

FRIENDSHIP JR. HIGH SCHOOL

Student Name: _____

Science Teacher: _____

Science Period: _____

2013-2014
School Year

Lesson 1: Thinking About Catastrophic Events

Name:_____

Class:_____ Date:_____

Student Sheet 1.2a
Where on Earth? Pre-Module Assessment

Directions Think about where on the earth the catastrophic events listed in Table 1 might occur most often and why this type of event might happen there. Then complete the table.

Table 1 What I Know About Catastrophic Events

Type of Catastrophic Event	Where Does This Event Happen?	Why Does It Happen There? What Does It Tell About the Earth?
Tornado		
Hurricane (or other similar storm)		
Earthquake		
Volcano		
Other event		

Group Members: _____

Date: _____ Period: _____

Brain "storming"

1. Where do you think the following occur most often?
   - Tornadoes: _____
   - Hurricanes: _____
   - Thunderstorms: _____
   - Typhoon: _____

2. Describe the shape, pattern, or look of the clouds with each of the storms.
   - Tornadoes: _____
   - Hurricanes: _____
   - Thunderstorms: _____
   - Typhoon: _____

3. Why do you think clouds begin to "swirl"?

   _____

   _____

   _____

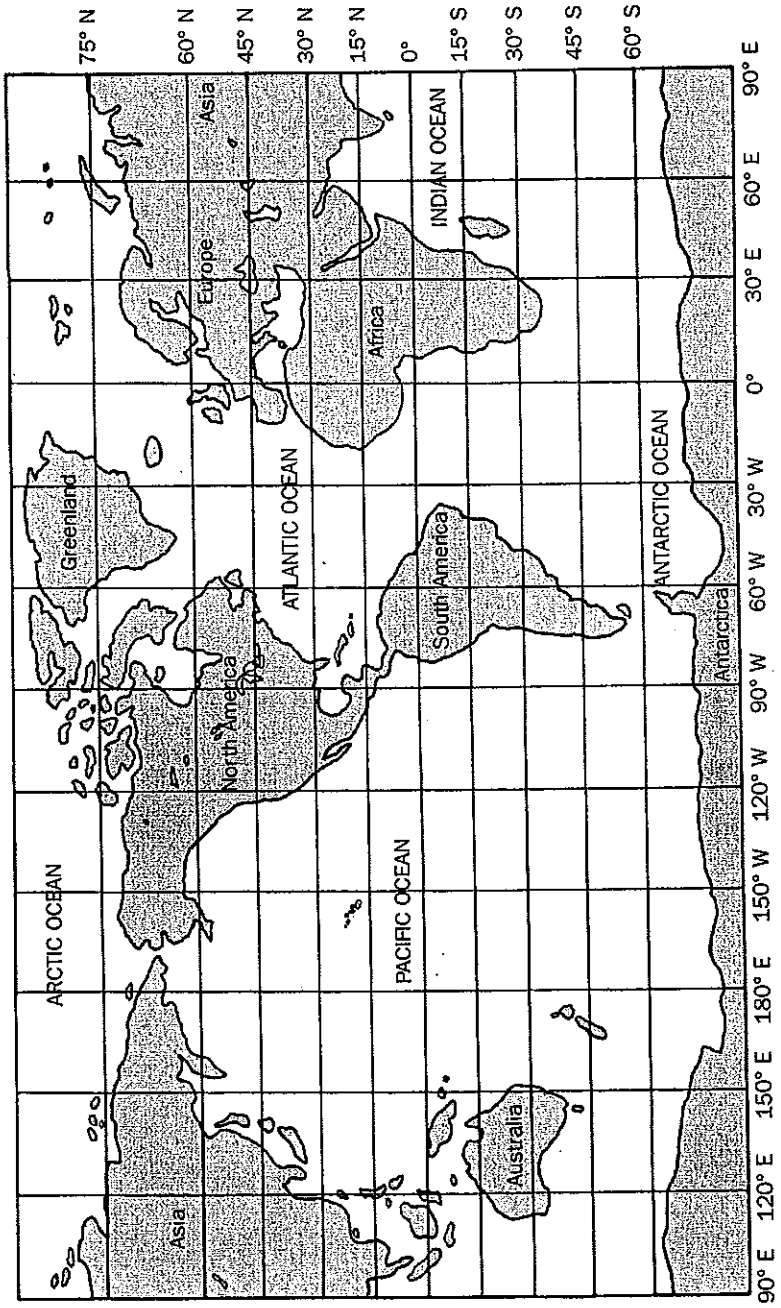
Names: _____ _____

_____ _____

Class: _____ Date: _____

Student Sheet 1.2b
World Map: Pre-Module Assessment

Directions Using colored markers, pencils, or crayons, draw dots on the map below that correspond to the location of dots on your Catastrophic Events World Map. Create a legend or key. Leave the dots on your large group Catastrophic Events World Map. You will refer to the dot locations in later lessons.



Lesson 2:
Introducing Storms

Name: _____
Date: _____ Period: _____

TITLE: Modeling a Vortex

PROBLEM: What is a vortex?

BACKGROUND:

- _____
- _____
- _____

HYPOTHESIS:

_____

_____

_____

EXPERIMENT:

MATERIALS NEEDED:

- 1 vortex model
- 4 paper towels
- 1 copy of the lab

PROCEDURE:

1. Watch as your teacher holds up the class vortex model. Answer questions A and B in the Data/Observations section of the lab.
2. Watch as student volunteers practice getting the water in the top bottle to move quickly into the bottom bottle.
3. NOW YOUR GROUP WILL TRY THIS. REVIEW STEPS 4-7 WITH YOUR TEACHER BEFORE TRYING.
4. Just as your teacher did, turn the model so that the water is in the top bottle. Hold the bottle very still (DO NOT shake or turn the bottle). Record your observations in the data table under the Data/Observations section.
5. Now try to get the water in the top bottle to flow into the bottom bottle by swirling the bottles. Do this several times until you get a steady movement of water. Record your observations in the data table under the Data/Observations section.

6. Observe what happens to the glitter and beads when the water moves in a spiral. Discuss with your group.

7. Clean up all materials and answer all conclusion questions.

DATA/OBSERVATIONS:

A. What happens to the water? Record you observations.

_____

_____

_____

B. How can you explain what you see?

_____

_____

_____

Title: _____

Trial	Motion of the Water	Observations
Step 4: Tilting the Bottle		
Step 5: Swirling the Bottle		

CONCLUSION QUESTIONS:

1. Use your observations from step 5 in your data table to help you answer this question. Where were most of the glitter and beads? Where was the movement of the glitter and beads the fastest? Where was the movement the slowest?

2. What happened when you first held the model so that the water remained still in the tops bottle? Why do you think this happened?

3. How did you get the water to flow quickly into the bottom bottle?

4. How did the motion of the glitter and beads change as they moved closer to the center of the spiral?

5. What is a vortex?

6. Think about your model as a tornado. What might the glitter and beads represent? Wh does the movement tell you about the movement of air within a rotating storm?

7. Think about your model as a hurricane. What do you think causes the clouds of a hurricane to spiral?

Name: _____
Date: _____ **Period:** _____

PREVIEW: EXTREME WEATHER

All four of the books in this unit are about Extreme Weather.

My book is about _____.

Make 5 thoughtful comments about the picture on the cover of your book.
(observations, predictions, connections, questions, etc.)

1. _____

2. _____

3. _____

4. _____

5. _____

Look for the subheading **Key Concepts** on the inside cover.
List the 3 key concepts for the unit below.

1. _____

2. _____

3. _____

Look for the subheading **About** _____(your weather/storm) on the inside cover.
Read the paragraph carefully and list 5 important facts about your type of extreme weather.

1. _____

2. _____

3. _____

4. _____

5. _____

List the four kinds of extreme weather featured in the red section on pgs. 4-5. List the four and the information provided on each.

1. Drought : droughts happen when there is a lack in rain.

2. _____

3. _____

4. _____

Read the paragraph at the top of pg. 6 and make a connection (TS, TT, TW, TM) to the text.

_____

_____

_____

Name: _____

Date: _____ Period: ____

KEY CONCEPT QUESTIONS TO EXTREME WEATHER

FLOODS	TORNADOES	HURRICANES
1. Name one kind of extreme weather. What conditions lead to this weather?		
2. What can meteorologists learn about the weather from studying clouds?		
3. What tools do meteorologists use to forecast the weather?		
4. How does extreme weather affect people and the land?		

Name: _____

Date: _____ Period: ___

Data Table:

Read pages 6-16. Complete the table below for your extreme weather event.

DROUGHTS

Question	Drought Information
What is a drought?	
Where is it likely to form?	
What causes it to form?	
What type of damage does it cause?	
How is this event predicted?	

Vocabulary:

Record the definition for each of the vocabulary terms that relates to your extreme weather event.
Important Vocabulary:

Atmosphere: _____

Droughts: _____

Famine: _____

Humidity: _____

Vapor: _____

Diagram Reading

Look at the diagram on either page 8 or 9 of your book. Draw a picture of your diagram and explain the cycle in your own words.

Title of Cycle: _____

Compare and contrast low air pressure and high air pressure. What type of weather does each of these bring?

Topic #1: What is the name of your disaster? When did this disaster happen? Where did this disaster happen?

Topic #2: How many people were affected by this disaster? Describe how these people were affected.

Topic #3: Why is this area prone to this type of disaster? Give specific examples.

Topic #4: What caused the drought to occur? Is there anything that could have been done to prevent the drought from occurring?

Topic #5: Describe the climate of Australia. How did the climate contribute to the drought?

Topic #6: Describe how the Great Australian Drought of 1982-1983 began?

Topic #7: Describe the effects of the drought.

Topic #8: How long did it take Australia to recover? How much did the total damage cost?

Name: _____
Date: _____ Period: ____

Data Table:

Read pages 6-16. Complete the table below for your extreme weather event.

FLOODS

Question	Flood Information
What is a flood?	
Where is it likely to form?	
What causes it to form?	
Which type(s) of clouds are involved? Describe their appearance.	
What type of damage does it cause?	
How is this event predicted?	

Vocabulary:

Record the definition for each of the vocabulary terms that relates to your extreme weather event.
Important Vocabulary:

Atmosphere: _____

Floods: _____

Front: _____

Vapor: _____

Flood Plain: _____

Diagram Reading

Look at the diagram on either page 8 or 9 of your book. Draw a picture of your diagram and explain the cycle in your own words.

Title of Cycle: _____

Compare and contrast low air pressure and high air pressure. What type of weather does each of these bring?

Topic #1: What is the name of your disaster? When did this disaster happen? Where did this disaster happen (name of country)?

Topic #2: How many people were affected by this disaster? Describe how these people were affected.

Topic #3: Why is this area prone to this type of disaster? Give specific examples.

Topic #4: Describe where Bangladesh is located. Which countries border Bangladesh? Describe any other features of the land that affect this country.

Topic #5: Describe the climate of Bangladesh. What land features are the main cause of this flooding?

Topic #6: Describe how the 1998 flood began?

Topic #7: Describe the effects of the flood.

Topic #8: How long did it take Bangladesh to recover? How much did the total damage cost?

Name: _____

Date: _____ Period: ____

Data Table:

Read pages 6-16. Complete the table below for your extreme weather event.

TORNADOES

Question	Tornado Information
What is a tornado?	
Where is it likely to form?	
What causes it to form?	
Which type(s) of clouds are involved? Describe their appearance.	
How fast does it move?	
How fast do the winds rotate?	
What type of damage does it cause?	
How is this event predicted?	
How is this event measured/rated?	

Vocabulary:
Record the definition for each of the vocabulary terms that relates to your extreme weather event.

Important Vocabulary:

Air pressure: _____

Data: _____

Humid: _____

Tornado: _____

Updraft: _____

Diagram Reading
Look at the diagram on either page 8 or 9 of your book. Draw a picture of your diagram and explain the cycle in your own words.

Title of Cycle: _____

Topic #1: What is the name of your disaster? When did this disaster happen? Where did this disaster happen (name of country)?

Topic #2: How many tornadoes did this storm system produce? How fast were the tornado's winds? What was the rating for this tornado?

Topic #3: Why is this area so prone to tornadoes? When are tornadoes in this area most likely to occur?

Topic #4: Describe the weather conditions of May 3, 1999. Why were the conditions "perfect" for the formation of a tornado?

Topic #5: What is a supercell? How does it form? How does this pertain to tornadoes?

Topic #6: Why did the storms worsen? How were people warned?

Topic #7: Present some of the statistics from these Oklahoma tornadoes.

Topic #8: Describe the damage and after effects of the storms.

Name: _____

Date: _____ Period: ____

Data Table:

Read pages 6-16. Complete the table below for your extreme weather event.

HURRICANES

Question	Hurricane Information
What is a hurricane?	
Where is it likely to form?	
What causes it to form?	
Which type(s) of clouds are involved? Describe their appearance.	
How fast does it move?	
How fast do the winds rotate?	
What type of damage does it cause?	
How is this event predicted?	
How is this event measured/rated?	

Vocabulary:
Record the definition for each of the vocabulary terms that relates to your extreme weather event.

Important Vocabulary:

Air pressure: _____

Evaporation: _____

Humidity: _____

Hurricane: _____

Diagram Reading
Look at the diagram on either page 8 or 9 of your book. Draw a picture of your diagram and explain the cycle in your own words.

Title of Cycle: _____

Topic #1: What is the name of your disaster? When did this disaster happen? Where did this disaster happen (name of the states affected)?

Topic #2: When is hurricane season in the United States? Where do the hurricanes that hit the United States begin?

Topic #3: Where do the strongest hurricanes form? What causes these hurricanes to form?

Topic #4: Where did Andrew begin? How did it begin to form?

Topic #5: What is the difference between a tropical depression, tropical storm, and a hurricane? Where was Andrew moving?

Topic #6: Give a day by day progression of Andrew (where was it and how strong was it).

Topic #7: What caused Hurricane Andrew to "die out". Explain this process.

Topic #8: Describe the damage that the hurricane caused. Present some of the statistics from Andrew.

Name _____ Date _____ Class _____

SECTION 3-2 SECTION SUMMARY

Storms

Guide for Reading

- **What are the main kinds of storms? How do they form?**
- **What measures can you take to ensure safety in a storm?**

3

A **storm** is a violent disturbance in the atmosphere. Thunderstorms are heavy rainstorms that are accompanied by thunder and lightning. **Thunderstorms form within large cumulonimbus clouds, or thunderheads.** During a thunderstorm, areas of positive and negative electrical charges build up in the storm clouds. **Lightning** is a sudden spark, or energy discharge, as these charges jump between parts of a cloud, between nearby clouds, or between a cloud and the ground. A lightning bolt heats the air near it, and the rapidly heated air expands suddenly and explosively. Thunder is the sound of the explosion. Because light travels faster than sound, you see lightning before you hear thunder. **During thunderstorms, avoid touching metal objects because they can conduct electricity from lightning into your body.**

A **tornado** is a rapidly whirling, funnel-shaped cloud that reaches down from a storm cloud to touch Earth's surface. **Tornadoes develop in low, heavy cumulonimbus clouds—the same clouds that bring thunderstorms.** Tornadoes occur most often in the Great Plains, but they can and do occur in nearly every part of the United States. A "tornado watch" is an announcement that tornadoes are possible in your area. A "tornado warning" is an announcement that a tornado has been seen in the sky or on weather radar. If you hear a tornado warning, move to a safe area as soon as you can. **The safest place to be during a tornado is in the basement of a well-built building.**

A **hurricane** is a tropical storm that has winds of 119 kilometers per hour or higher. **A hurricane begins over warm water as a low-pressure area, or tropical disturbance.** If the tropical disturbance grows in size and strength, it becomes a tropical storm, which may then become a hurricane. The center of a hurricane is a ring of clouds surrounding a quiet "eye." The low pressure and high winds of the hurricane over the ocean raise the level of the water up to six meters above normal sea level. The result is a **storm surge,** a "dome" of water that sweeps across the coast where the hurricane lands. A "hurricane watch" is an announcement that hurricane conditions are *possible* in your area within the next 36 hours. Be prepared to **evacuate,** or move away temporarily. A "hurricane warning" means that hurricane conditions are *expected* within 24 hours. **If you hear a hurricane warning and are told to evacuate, leave the area immediately.**

Snow falls when humid air cools below 0°C. When a cold, dry air mass moves from central Canada southeast across one of the Great Lakes, it picks up water vapor and heat from the lake. As soon as the air mass reaches the other side of the lake, the air rises and cools again. The water vapor condenses and falls as lake-effect snow. **If you are caught in a snowstorm, try to find shelter from the wind.**

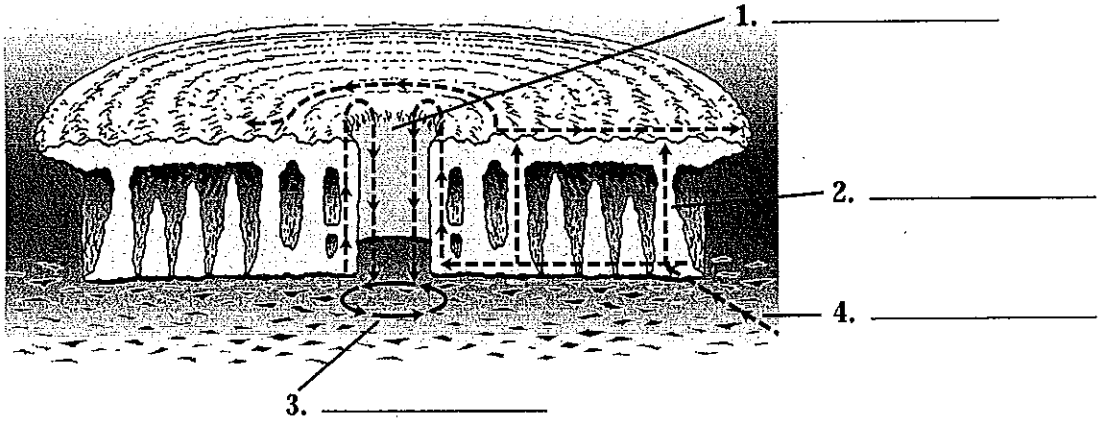
Name _____ Date _____ Class _____

SECTION 3-2 REVIEW AND REINFORCE

Storms

◆ Understanding Main Ideas

Fill in each blank in the diagram with one of the following phrases: path of hurricane; eye of hurricane; warm, moist air; wind direction.



Answer the following questions on a separate sheet of paper.

5. Why should you be on the lookout for tornadoes during a severe thunderstorm?

6. Why should you avoid touching metal objects during a thunderstorm?

7. Where is the safest place to be during a tornado?

8. Why does a hurricane lose strength once it passes over land?

9. What should you do if you are caught in a snowstorm?

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

_____ **10.** storm

_____ **11.** lightning

_____ **12.** tornado

_____ **13.** hurricane

_____ **14.** storm surge

_____ **15.** evacuate

a. a tropical storm that has winds of 119 kilometers per hour or higher

b. a sudden spark, or energy discharge, between parts of a cloud or between the cloud and the ground

c. a violent disturbance in the atmosphere

d. a rapidly whirling, funnel-shaped cloud that reaches down from a storm cloud to touch Earth's surface

e. move away temporarily

f. a "dome" of water that sweeps across the coast where a hurricane lands

STORMS STUDY GUIDE

Review the following terms:

- Storm, vortex, Typhoon, Hurricane, Cyclone, precipitation, tornado, storm surge

- What is a thunderstorm? What weather event(s) can form as a result of a thunderstorm?
- What is a flood? Which areas are more prone to flooding? Why?
- What is a tornado? How does a tornado form?
- How is the intensity of a tornado measured? When are tornadoes more likely?
- What does the structure/shape of a tornado look like?
- What is the difference between a tornado watch and tornado warning?
- What is a hurricane? How does a hurricane form?
- How is the intensity of a hurricane measured? When are hurricanes more likely?
- Describe the structure of a hurricane (eye and eye wall).

The test will also include 9 review questions. These questions will cover content/material that was covered earlier this quarter. Review your volcano vocabulary and earthquake vocabulary.

Lesson 3: Heating Earth's Surfaces

Name: _____
Date: _____ Period: _____

TITLE: Heating Earth's Surfaces

PROBLEM: What drives the weather?

BACKGROUND:

- Earth's surface unevenly heats.
- The transfer of heat energy is a major factor in the formation of weather.
- The movement of heat in the atmosphere causes temperatures to change, winds to blow, storms to develop, and rain to fall.
- _____

_____

HYPOTHESIS:

_____

_____

_____

EXPERIMENT:

MATERIALS NEEDED:

- 2 glass beakers
- 2 digital thermometers
- 2 cardboard strips
- 1 clamp lamp with bulb
- 2 bookends
- 1 stopwatch
- Soil
- Water
- 1 metric ruler

PROCEDURE:

Follow all procedure steps on pages 28-30 in your student guide.

DATA/OBSERVATIONS:
Answer questions 1 and 2 and then complete Table 1.

1. How will you make certain that your investigation of the heating and cooling of soil and water will be a fair test? Record all the things that you will need to keep the same in both setups (your control).

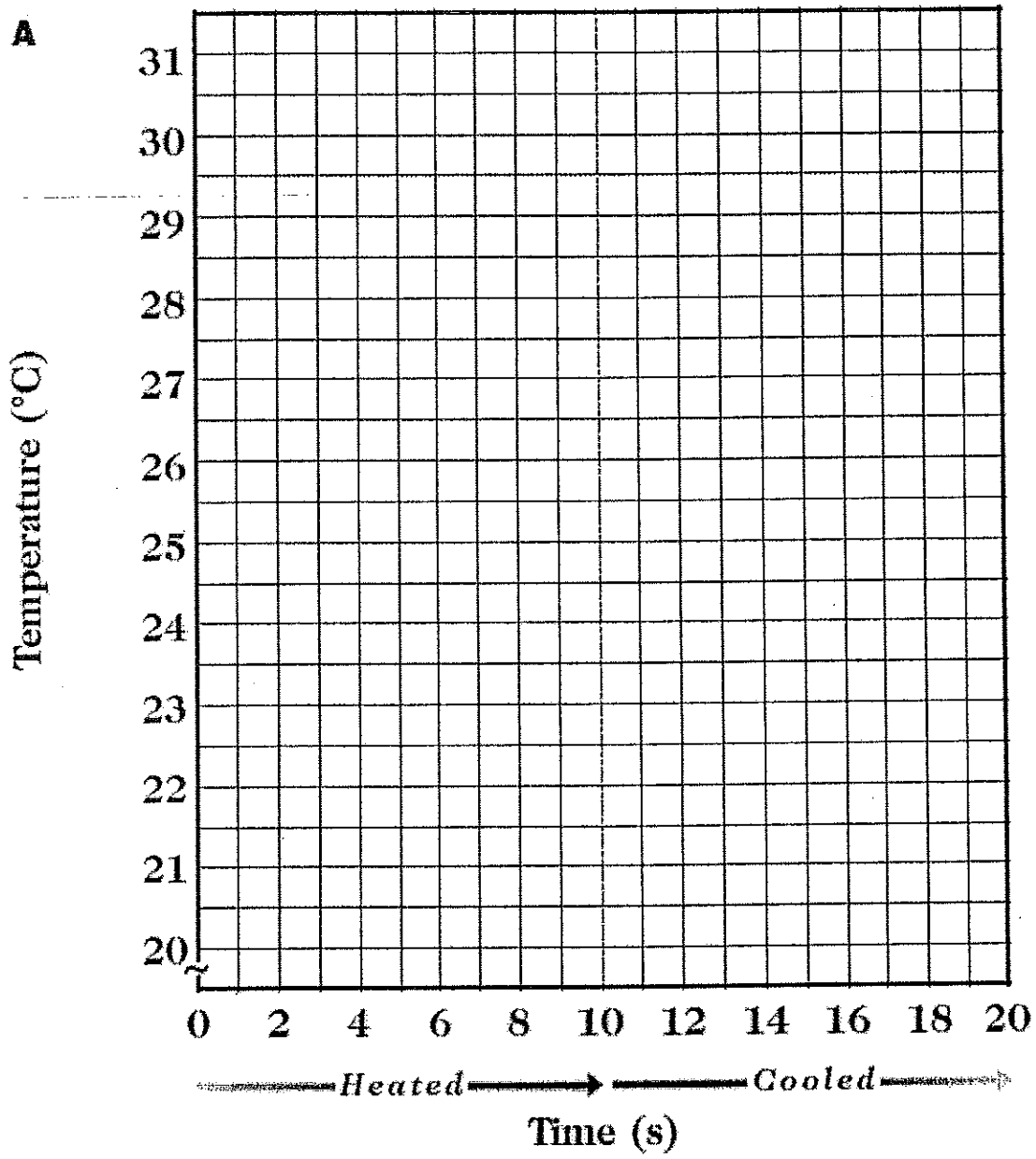
2. What do you think will happen to the temperature of the soil and the water when you turn on the lamp? What will happen to their temperatures when you turn off the lamp? Why do you think this?

Table 1 Heating and Cooling Data

Heating			Cooling		
Time (minutes)	Soil Temperature (°C)	Water Temperature (°C)	Time (minutes)	Soil Temperature (°C)	Water Temperature (°C)
0:00			10:00		
1:00			11:00		
2:00			12:00		
3:00			13:00		
4:00			14:00		
5:00			15:00		
6:00			16:00		
7:00			17:00		
8:00			18:00		
9:00			19:00		
10:00			20:00		
Total temperature change			Total temperature change		

Create a double line graph of your data. Include a key indicating which line represents soil and which represents water.

Graph A



CONCLUSION QUESTIONS:

1. How would you describe the heating and cooling rates of soil and water in this investigation?

2. Which material held its heat longer? Why?

3. What factors may have influenced your results? Why?

4. Refer back to the introduction to this investigation and your background information. Explain why concrete feels hot under your feet in early summer, while water in a pool feels cold?

5. On the basis of your investigation, how do you think oceans absorb and hold heat? How do you think the temperature of the ocean compares with the temperature of the land nearby?

Read *The Source of Earth's Heat*, which is found on pages 31-33 of your student book, then answer questions 6-8.

6. On the basis of this reading, what does the lamp represent? Why?

7. How does solar energy travel? Be specific.

8. Explain what happens to energy from the sun when it reaches the earth's atmosphere and surfaces.

Use the following data table to answer questions 9-14.

Summer Temperatures Near Portland, Maine

Time	Portland Parklands (Temperature, °C)	Atlantic Ocean (Temperature, °C)
6:00 A.M.	14	18
8:00 A.M.	17	19
10:00 A.M.	18	19
Noon	23	19
2:00 P.M.	26.5	19
4:00 P.M.	27	20
6:00 P.M.	27	20
8:00 P.M.	20	20
10:00 P.M.	18	20
Midnight	16	20
2:00 A.M.	15	20
4:00 A.M.	14	19

9. What is the temperature of the Atlantic Ocean at 4:00 P.M.? _____

10. What is the temperature of Portland Parklands at noon? _____

11. At what time of day is the temperature of the land at Portland Parklands and the water in the Atlantic Ocean the same? _____

12. At 2:00 P.M., what is the difference in temperature between the land and the water? _____ Which is warmer? _____ What do you think is the reason for this difference? _____

13. During what season were these data collected? _____ How do you know this? _____

14. What times on the data table do you think represent daytime? _____

Name _____ Date _____ Class _____

SECTION 2-4 SECTION SUMMARY

Water in the Atmosphere

Guide for Reading

- How is humidity measured?
- How do clouds form?
- What are the three main types of clouds?

2

Water is constantly moving between Earth and the atmosphere in the water cycle. Water vapor enters the air by evaporation from the oceans and other bodies of water. **Evaporation** is the process by which water molecules in liquid water escape into the air as water vapor. Some of the water vapor in the atmosphere condenses to form clouds. Then rain and other forms of precipitation fall from the clouds toward Earth's surface.

Humidity is a measure of the amount of water vapor in the air. The percentage of water vapor in the air compared to the maximum amount the air could hold is called the **relative humidity.** Evaporation of moisture from your skin removes heat and helps to keep your body's temperature comfortable. If the relative humidity is high, moisture on your skin evaporates slowly and cools your body less.

Relative humidity can be measured with a psychrometer. A **psychrometer** has two thermometers, a wet-bulb thermometer and a dry-bulb thermometer. Air is blown over both thermometers. Because the wet-bulb thermometer is cooled by evaporation, its reading drops below that of the dry-bulb thermometer. The relative humidity can be found by comparing the temperatures of the wet-bulb and dry-bulb thermometers.

Clouds of all kinds form when water vapor in the air becomes liquid water or ice crystals. The process by which molecules of water vapor in the air become liquid water is called **condensation.** As air cools, the amount of water vapor it can hold decreases. When the air becomes saturated, some of the water vapor in the air condenses to form droplets of liquid water. The temperature at which condensation begins is called the **dew point.** If the dew point is below the freezing point, the water vapor may change directly into ice crystals. For water vapor to condense, tiny particles must be present so the water has a surface on which to condense. Water that condenses from the air onto a cold surface, such as blades of grass, is called dew. Frost is ice that has been deposited directly from the air onto a cold surface. Water vapor condenses to form clouds when warm air rises.

Meteorologists classify clouds into three main types: cumulus, stratus, and cirrus. Clouds that look like fluffy, rounded piles of cotton are called **cumulus** clouds. Cumulus clouds usually indicate fair weather. Towering cumulus clouds with flat tops, called cumulonimbus clouds, often produce thunderstorms. Clouds that form in flat layers are called **stratus** clouds. Stratus clouds that produce rain or snow are called nimbostratus clouds. Wispy, feathery clouds are called **cirrus** clouds. Cirrus clouds are very high, and they are made mostly of ice crystals. Clouds that form at or near the ground are called fog. Fog often forms when the ground cools at night after a warm, humid day.

Name _____ Date _____ Class _____

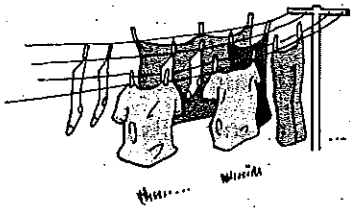
SECTION 2-4 REVIEW AND REINFORCE

Water in the Atmosphere

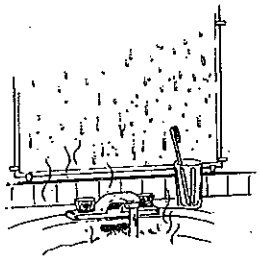
◆ Understanding Main Ideas

Label each of the pictures below with the name of the process it shows—either evaporation or condensation.

1. _____



2. _____



3. _____

4. _____

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition in the right column on the line beside the term in the left column.

_____ **5.** evaporation

_____ **6.** humidity

_____ **7.** relative humidity

_____ **8.** psychrometer

_____ **9.** condensation

_____ **10.** dew point

_____ **11.** cumulus

_____ **12.** stratus

_____ **13.** cirrus

a. the process by which molecules of water vapor in the air become liquid water

b. the temperature at which condensation begins

c. instrument with two thermometers, a wet-bulb thermometer and a dry-bulb thermometer

d. clouds that look like fluffy, rounded piles of cotton

e. the percentage of water vapor in the air compared to the maximum amount the air could hold

f. clouds that form in flat layers

g. a measure of the amount of water vapor in the air

h. wispy, feathery clouds

i. the process by which water molecules in liquid water escape into the air as water vapor

Name _____ Date _____ Class _____

SECTION 2-5 SECTION SUMMARY

Precipitation

Guide for Reading

- What are the main types of precipitation?
- How is precipitation measured?

2

Precipitation is any form of water that falls from clouds and reaches Earth's surface. For precipitation to occur, cloud droplets or ice crystals must grow heavy enough to fall through the air. One way that cloud droplets grow is by colliding and combining with other cloud droplets. When the droplets become heavy enough, they fall out of the cloud as raindrops.

Common types of precipitation include rain, sleet, freezing rain, hail, and snow. The most common kind of precipitation is rain. Drops of water are called rain if they are at least 0.5 millimeter in diameter. Precipitation made up of smaller drops of water is called mist or drizzle. Sleet forms when raindrops fall through a layer of freezing air and turn into solid ice particles. Ice particles smaller than 5 millimeters in diameter are called sleet. Freezing rain forms when raindrops freeze on a cold surface. As the rain continues to freeze on surfaces, a thick layer of ice may build up that can break tree branches and power lines. Round pellets of ice larger than 5 millimeters in diameter are called hailstones. Hail forms only inside cumulonimbus clouds during thunderstorms. Strong updrafts in the cloud carry the hailstone up and down through the cold region many times, each time adding a new layer of ice to the hailstone. Eventually, the hailstone becomes heavy enough to fall to the ground. Snow forms when water vapor in a cloud is converted directly into ice crystals called snowflakes. Each snowflake has six sides.

Meteorologists measure rainfall with a rain gauge. A **rain gauge** is an open-ended can or tube that collects rainfall. The amount of rainfall is measured by dipping a ruler into the water or by reading a marked scale. Snowfall is measured by using a ruler or by melting collected snow and measuring the depth of water it produces. On average, 10 centimeters of snow contain about the same amount of water as 1 centimeter of rain.

Long periods of low precipitation are called **droughts.** Droughts may cause crops to fail and widespread hunger, or famine. In recent years, scientists have been trying to produce rain during droughts. The most common method is cloud seeding. Tiny crystals of dry ice and silver iodide are sprinkled into clouds from airplanes. Water vapor can condense on the particles of silver iodide, forming rain or snow. The dry ice cools the droplets so they can condense without particles.

Name _____ Date _____ Class _____

SECTION 2-5 REVIEW AND REINFORCE

Precipitation

◆ Understanding Main Ideas

Fill in the blanks in the table below.

Type of Precipitation	Description
1. _____	water droplets at least 0.5 millimeters in diameter
sleet	2. _____
3. _____	rain that freezes on a cold surface
hail	4. _____
5. _____	ice crystals

Answer the following questions in the spaces provided.

6. What is needed for precipitation to occur? _____

_____

_____

7. How is snowfall measured? _____

_____

◆ Building Vocabulary

Fill in the blanks with the correct word or words.

8. _____ is any form of water that falls from clouds and reaches Earth's surface.

9. A(n) _____ is an open-ended can or tube that collects rainfall.

10. Long periods of low precipitation are called _____.

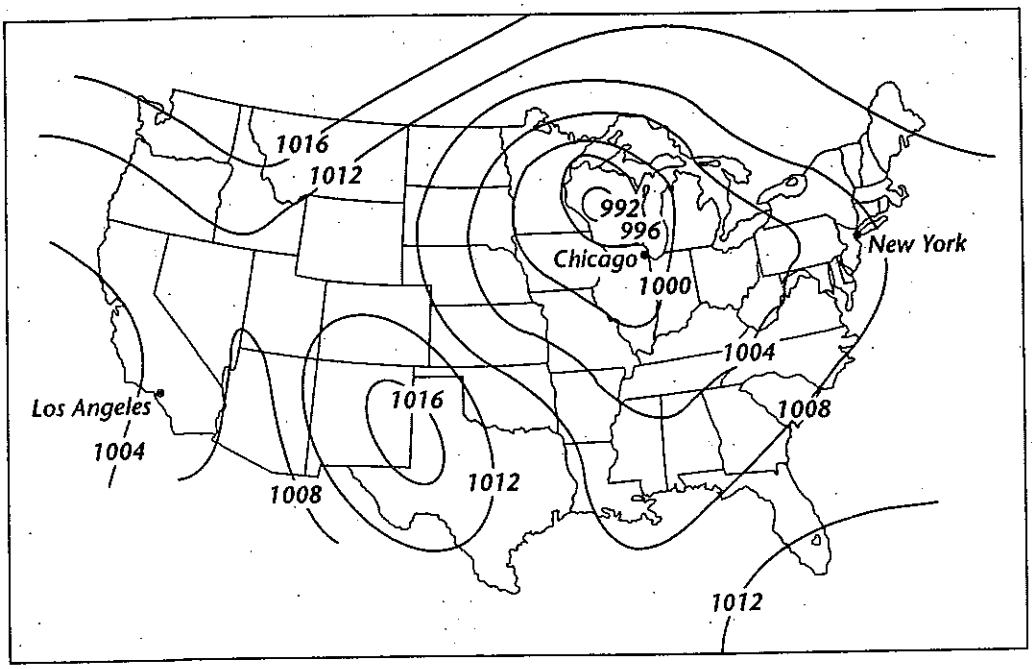
Name _____ Date _____ Class _____

SECTION 1-3 ENRICH

Isobars and Air Pressure

1

Air pressure is an important factor affecting weather. Changes in air pressure help weather forecasters predict how the weather will change. Air pressure readings from barometers are shown on weather maps, like the one below, with lines called isobars. Isobars are drawn to connect areas that have the same air pressure.



Refer to the map to complete the following statements.

1. Each isobar differs from the next isobar by _____ millibars.
2. The lowest air pressure reading on the map is _____ millibars.
3. Where this low pressure occurs, the weather is likely to be _____.
4. The highest air pressure reading on the map is _____ millibars.
5. This high-pressure area is likely to be experiencing _____ weather.
6. An area of _____ air pressure is centered northwest of Chicago.
7. The air pressure in Chicago is about _____ millibars.
8. The air pressure in Los Angeles is about _____ millibars.
9. The air pressure in New York City is about _____ millibars.
10. Most of Florida has a barometric pressure between about 1008 millibars and _____ millibars.

Name _____ Date _____ Class _____

SECTION 1-4 SECTION SUMMARY

Layers of the Atmosphere

1

Guide for Reading

- **What are the characteristics of the main layers of the atmosphere?**

As you rise up through the atmosphere, air pressure and temperature change dramatically. **The four main layers of the atmosphere are classified according to changes in temperature. These layers are the troposphere, the stratosphere, the mesosphere, and the thermosphere.**

The **troposphere** is the inner, or lowest, layer of Earth's atmosphere. It extends from Earth's surface to between 9 and 16 kilometers above the surface. As altitude increases in the troposphere, the temperature decreases. At the top of the troposphere, the temperature is about -60°C. The troposphere is the shallowest layer of the atmosphere, but it contains most of the atmosphere's mass and all of Earth's weather.

The **stratosphere** extends from the top of the troposphere to about 50 kilometers above Earth's surface. The lower stratosphere is cold at about -60°C. However, the stratosphere gets warmer toward the top. This is because the upper stratosphere contains a layer of ozone, the three-atom form of oxygen. Ozone absorbs energy from the sun and converts it to heat.

The **mesosphere** is the layer of Earth's atmosphere above the stratosphere. It begins 50 kilometers above Earth's surface and extends to 80 kilometers. The top of the mesosphere is the coldest part of the atmosphere, with temperatures near -90°C. The mesosphere protects Earth's surface from most meteoroids. They burn up as they fall toward Earth through this layer of the atmosphere.

The **thermosphere** is the outermost layer of Earth's atmosphere. It extends from 80 kilometers outward into space with no definite outer limit. Gas atoms and molecules there are so far apart that the air blends gradually with outer space. The air in the thermosphere is very hot, up to 1,800°C. This is because energy coming from the sun strikes the thermosphere first. Its nitrogen and oxygen molecules convert the sun's energy into heat. The air in the thermosphere has a very low density, having just a fraction of a percent of the density of air at sea level.

The thermosphere is divided into two layers. The lower layer of the thermosphere is the **ionosphere.** Gas molecules here are electrically charged because of the sun's energy. Radio waves bounce back from the ionosphere to Earth's surface. The brilliant light displays of the **aurora borealis,** or Northern Lights, also occur in the ionosphere. The outer layer of the thermosphere is the **exosphere.** Satellites orbit Earth in this layer. They communicate long-distance telephone and television signals and watch weather from far out in the atmosphere.

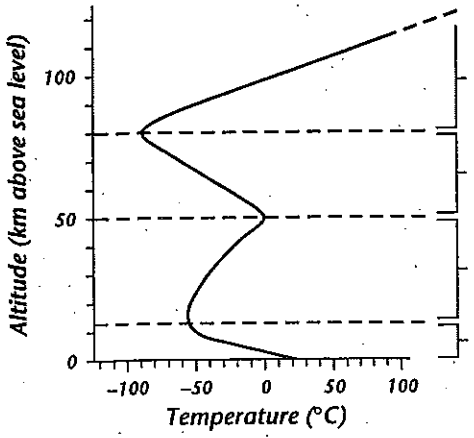
Name _____ Date _____ Class _____

SECTION 1-4 REVIEW AND REINFORCE

Layers of the Atmosphere

◆ Understanding Main Ideas

The graph below shows altitudes and temperatures for the four main layers of the atmosphere. Label the four layers and then complete the statements that follow.



1. _____
2. _____
3. _____
4. _____

5. The coldest temperatures in the atmosphere occur at an altitude of about _____.

6. The hottest temperatures in the atmosphere occur in the _____.

7. Temperatures increase in the _____ and _____ layers of the atmosphere.

8. As you move up through the mesosphere, the temperature _____.

◆ Building Vocabulary

If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

_____ 9. The layer of the atmosphere where weather occurs is the thermosphere.

_____ 10. The mesosphere is the layer of the atmosphere that contains ozone.

_____ 11. The exosphere is the outer layer of the thermosphere.

_____ 12. Most meteoroids burn up in the stratosphere.

_____ 13. The troposphere is divided into two layers.

_____ 14. The ionosphere lies between the mesosphere and exosphere.

Name: _____
Date: _____ Period: ____ Score: _____

Temperatures of Earth's Atmosphere

Purpose:

To see how the layers of the earth's atmosphere differ in temperature.

Directions:

1. Place the temperature on the horizontal (X) axis and the distance (in miles) on the vertical (Y) axis.
2. Plot all of the data from the table.
3. Connect all the points.
4. Draw a horizontal line through the distances of 7 miles, 20 miles, and 50 miles.
5. Label 0-7 miles as the Troposphere, 7-20 miles as the Stratosphere, 20-50 miles as the Mesosphere, and beyond 50 miles as the Ionosphere.
6. Answer all conclusion questions.

Conclusion Questions:

1. Which layer of the atmosphere has the smallest changes in temperatures?
   _____

2. Which layer of the atmosphere is closest to the ground? Explain the range of temperatures from the lower end of this layer to the upper end of this layer.
   _____
   _____
   _____
   _____

3. Why does it get warmer at the top of the stratosphere?
   _____
   _____
   _____

4. Which layer of the atmosphere is the ionosphere located within?
   _____

5. Which layer of the atmosphere has some of the planet's highest temperatures? Why?
   _____
   _____
   _____
   _____

Data Table:

Distance (mi)	Temperature (°F)	Distance (mi)	Temperature (°F)
1	+60	38	+84
2	+47	39	+75
3	+34	40	+66
4	+21	41	+57
5	+8	42	+48
6	-6	43	+39
7	-20	44	+30
8	-34	45	+21
9	-47	46	+12
10	-60	47	+3
11	-59	48	-6
12	-58	49	-13
13	-56	50	-20
14	-55	51	-13
15	-54	52	-7
16	-52	53	+1
17	-50	54	+10
18	-48	55	+19
19	-46	56	+28
20	-45	57	+37
21	-28	58	+46
22	-11	59	+55
23	+6	60	+64
24	+23	61	+73
25	+40	62	+82
26	+57	63	+91
27	+74	64	+100
28	+91	65	+109
29	+106	66	+118
30	+120	67	+127
31	+130	68	+136
32	+140	69	+145
33	+130	70	+154
34	+120	71	+163
35	+111	72	+172
36	+102	73	+180
37	+93	74	+186

Lesson 4:
Heat Transfer & Movement in the Air

Name _____ Date _____ Class _____

SECTION 3-1 SECTION SUMMARY

Air Masses and Fronts

Guide for Reading

- **What are the major types of air masses that affect the weather in North America?**
- **What are the main types of fronts?**
- **What are cyclones and anticyclones?**

3

A huge body of air that has similar temperature, humidity, and air pressure throughout it is called an **air mass.** Scientists classify air masses according to temperature and humidity. **Tropical,** or warm, air masses form in the tropics and have low air pressure. **Polar,** or cold, air masses form north of 50° north latitude and south of 50° south latitude and have high air pressure. **Maritime** air masses form over oceans and are humid. **Continental** air masses form over land, in the middle of continents, and are dry.

Four major types of air masses influence the weather in North America: maritime tropical, continental tropical, maritime polar, and continental polar. Maritime tropical air masses from the Gulf of Mexico bring warm, humid air to the eastern United States. Maritime tropical air masses from the Pacific Ocean bring warm, humid air to the West Coast. Continental tropical air masses from the Southwest bring hot, dry air to the southern Great Plains. Maritime polar air masses from the Pacific Ocean bring cool, humid air to the West Coast. Maritime polar air masses from the Atlantic Ocean are often pushed out to sea by westerly winds. Continental polar air masses from central and northern Canada bring cold air to the central and eastern United States.

The prevailing westerlies generally push air masses from west to east in the United States. As air masses move across the land and the oceans, they bump into each other. However, if they have different temperatures and densities, they do not mix. The area where the air masses meet and do not mix becomes a **front.** When air masses meet at a front, the collision often causes storms and changeable weather.

There are four major types of fronts: cold fronts, warm fronts, stationary fronts, and occluded fronts. A cold front forms when cold air moves underneath warm air, forcing the warm air to rise. Cold fronts move quickly and bring cold, dry air. A warm front forms when warm air moves over cold air. Warm fronts move slowly and bring warm, humid air. A stationary front forms when cold and warm air masses meet but neither one has enough force to move the other. It may bring many days of clouds and precipitation. An occluded front forms when a warm air mass is caught between two cooler air masses. The warm air mass is cut off, or **occluded,** from the ground. The occluded warm front may cause clouds and precipitation.

A swirling center of low air pressure is called a **cyclone.** Cyclones are also called "lows." **Cyclones and decreasing air pressure are associated with storms and precipitation. Anticyclones** are high-pressure centers of dry air. They are also called "highs." Anticyclones lead to dry, clear weather. Because of the Coriolis effect, in the Northern Hemisphere winds spin in a counterclockwise direction in a cyclone and in a clockwise direction in an anticyclone.

Name _____ Date _____ Class _____

SECTION 3-1 REVIEW AND REINFORCE

Air Masses and Fronts

◆ Understanding Main Ideas

Fill in the blanks in the table below.

Air Masses

Type	Where It Forms	Temperature	Humidity
1. _____	Over ocean	Warm	Moist
Maritime polar	**2.** _____	Cold	Moist
Continental tropical	Over land	**3.** _____	**4.** _____
Continental polar	**5.** _____	**6.** _____	Dry

◆ Building Vocabulary

Fill in the blanks to complete each statement.

7. A huge body of air that has similar temperature, humidity, and air pressure throughout it is called a(n) _____.

8. _____ air masses form in the tropics and have low pressure.

9. Air masses that form over oceans are called _____ air masses.

10. _____ air masses form north of 50° north latitude and south of 50° south latitude.

11. The area where air masses meet and do not mix becomes a(n) _____.

12. _____ air masses form over land, in the middle of continents.

13. A warm air mass that is cut off from the ground is said to be _____.

14. A swirling center of low air pressure is called a(n) _____.

15. _____ are high-pressure centers of dry air.

Name:_____

Class:_____ Date:_____

Student Sheet 4.1
Investigating the Temperature of Air

Question I will try to answer:
How does the temperature of the earth's surface affect the temperature of the air above it?

Directions Answer the questions. Then complete Table 1 as you conduct your investigation.

1. How will you set up your equipment in order to make this a fair test? What will you keep the same?

What one variable will you test?

2. Now make a prediction. How do you think the temperature of a surface will affect the temperature of the air above it?

Table 1 Temperature Changes

Time (minutes)	Cold Water Convection Tube		Hot Water Convection Tube	
	Container of Cold Water: Temperature (°C)		Container of Hot Water: Temperature (°C)	
	Temperature (°C) Thermometer A (top)	Temperature (°C) Thermometer B (bottom)	Temperature (°C) Thermometer A (top)	Temperature (°C) Thermometer B (bottom)
0:00				
1:00				
2:00				
3:00				

Name: _____

Inquiry 4.1: Temperature of Air Reflection Questions

1. How did the temperature of each container of water affect the temperature of the air above it?

2. The movement of heat is called heat transfer. Describe the heat transfer between the container of hot water and the air. Describe the heat transfer between the container of cold water and the air.

3. Under what conditions was it difficult to see through the cylinder? Why do you think this happened?

4. Why do you think covering the container helped to keep the cylinder clear?

Inquiry 4.2: The Movement of Warm and Cool Air

What is the purpose of this investigation?

What is your hypothesis?

What have you observed with the cold water?

What have you observed with the hot water?

Answer the following reflection questions.

1. On the basis of your temperature readings in Inquiry 4.1, how does the temperature of a surface affect the temperature of the air above it?

2. How did the air, which was visible because of the smoke, move in the Convection Tube when the water under it was cold? Explain why you think this happened.

3. What happened to the air inside the Convection Tube when the water was hot? Explain why you think this happened.

4. Why do you think moisture formed on the inside of the Convection Tube with hot water? How do you think this relates to cloud formation on earth?

5. Apply what you observed during these labs to the earth. If the earth's surface is cold, what will happen to the air above it? If the surface is hot, what will happen to the air above it?

Lesson 5: Convection Currents in the Air

Name _____ Date _____ Class _____

SECTION 2-3 SECTION SUMMARY

Winds

Guide for Reading

- What causes winds?
- What are local winds and global winds?
- Where are the major global wind belts located?

2

A **wind** is the horizontal movement of air from an area of high pressure to an area of lower pressure. **All winds are caused by differences in air pressure.** Most differences in air pressure are caused by unequal heating of the atmosphere. Cool, dense air has higher air pressure so it flows underneath warm, less dense air, forcing the warm air to rise.

Winds are described by their direction and speed. Wind direction is determined with a wind vane. The name of a wind is the direction the wind is coming from. Wind speed is measured with an **anemometer.**

Wind blowing over your skin removes body heat. The increased cooling that a wind can cause is called the **wind-chill factor.**

Local winds are winds that blow over short distances. **Local winds are caused by unequal heating of Earth's surface within a small area.** Local winds form only when no winds are blowing from farther away.

The sun heats land faster than water, so during the day air over land becomes warmer than air over water. The cool air blows inland from the water and moves underneath the warm air. The flow of air from an ocean or lake to the land is called a **sea breeze** or a lake breeze. At night, land cools more quickly than water, so air over land becomes cooler than air over water. The cool air blows toward the water from the land and moves underneath the warm air. The flow of air from land to a body of water is called a **land breeze.** Sea and land breezes over a large region that change direction with the seasons are called **monsoons.**

Winds that blow steadily from specific directions over long distances are called **global winds.** Warm air rises at the equator and cold air sinks at the poles, causing winds at Earth's surface to blow from the poles toward the equator. **The movement of air between the equator and the poles produces global winds.** Because Earth is rotating, global winds do not follow a straight path. The way Earth's rotation makes winds curve is called the **Coriolis effect.** In the Northern Hemisphere, global winds curve to the right. In the Southern Hemisphere, global winds curve to the left.

The Coriolis effect and other factors produce a pattern of calm areas and wind belts around Earth. The calm areas are called the doldrums and horse latitudes. **The major global wind belts are the trade winds, the prevailing westerlies, and the polar easterlies. Latitude** is a measure of distance north and south of the equator. The trade winds blow between the equator and 30° north and south latitude, the prevailing westerlies between 30° and 60° north and south latitude, and the polar easterlies between 60° north and south latitude and the poles.

About 10 kilometers above Earth's surface are bands of high-speed winds called **jet streams.** They blow from west to east.

Name _____ Date _____ Class _____

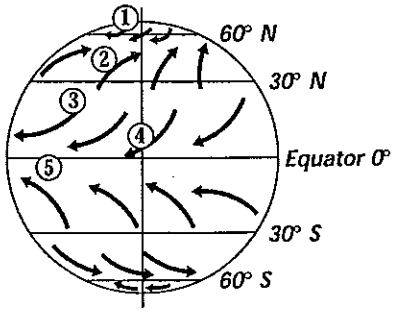
SECTION 2-3 REVIEW AND REINFORCE

Winds

◆ Understanding Main Ideas ⊛ Extra Credit

Identify the global wind belts and calm areas in the figure below.

1. _____
2. _____
3. _____
4. _____
5. _____



◆ Building Vocabulary

If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

_____ **6.** A wind is a horizontal movement of air from an area of high pressure to an area of lower pressure.

_____ **7.** Wind speed is measured with a(n) wind vane.

_____ **8.** The increased cooling that a wind can cause is called the Coriolis effect.

_____ **9.** Local winds are winds that blow over short distances.

_____ **10.** The flow of air from an ocean or lake to the land is called a land breeze.

_____ **11.** The flow of air from land to a body of water is called a sea breeze.

_____ **12.** Sea and land breezes over a large region that change direction with the seasons are called global winds.

_____ **13.** Winds that blow steadily from specific directions over long distances are called doldrums.

_____ **14.** The way Earth's rotation makes winds curve is called the prevailing westerlies.

_____ **15.** Bands of high-speed winds about 10 kilometers above Earth's surface are called polar easterlies.

60

Name: _____
Date: _____ Period: _____

TITLE: Convection Currents in the Air

PROBLEM: What happens when air masses with the same temperature and humidity conditions meet? What happens when air masses with different temperature and humidity conditions meet?

BACKGROUND:

- _____
- _____
- _____

HYPOTHESIS:

_____

_____

_____

_____

EXPERIMENT:

MATERIALS NEEDED:

PROCEDURE:

What we will keep the same when comparing the three setups:

_____

What we will change:

_____

Part 1:

Part 2:

Part 3:

DATA/OBSERVATIONS:

Setup of Convection Tubes	Predictions (What We Think Will Happen to the Air)	Observations (What Happened to the Air)

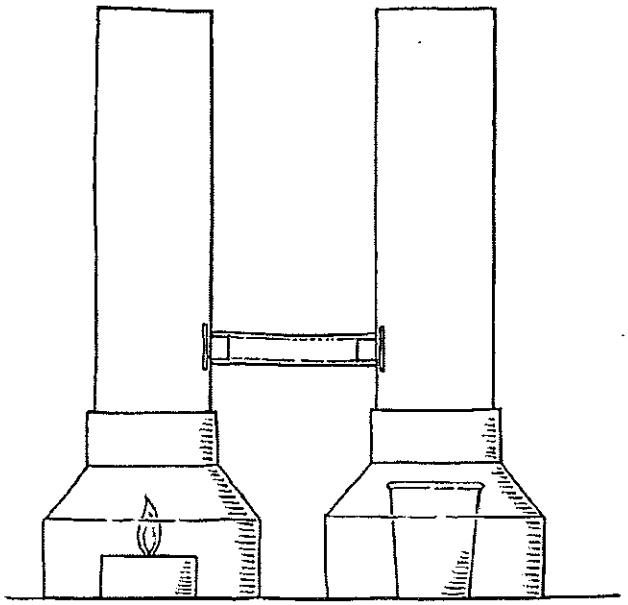
CONCLUSION:

1. What did you observe when both tubes contained air with the same temperature and humidity conditions? Why do you think this happened?

2. What did you observe when the tubes contained air with different temperature and humidity conditions? Why do you think this happened?

3. On the basis of your results from the Temperature of the Air lab and this investigation, under what conditions do you think winds and rotating storms might form? Explain.

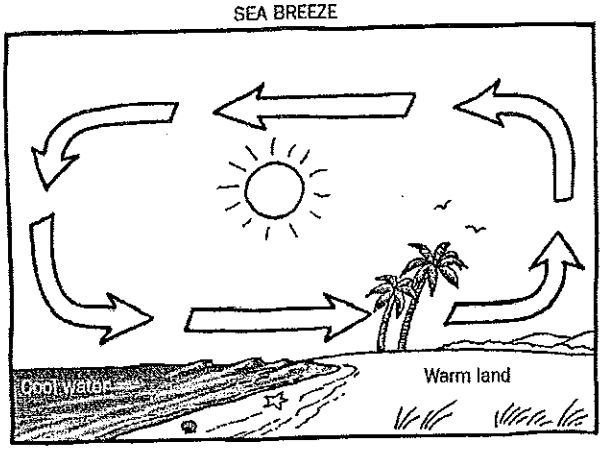
4. Think back to the lab you just completed. Draw a punk stick, smoke, and arrows on the Convectio Tubes to show the movement of air. Then, in the space provided below the picture, explain why the air moves like this.



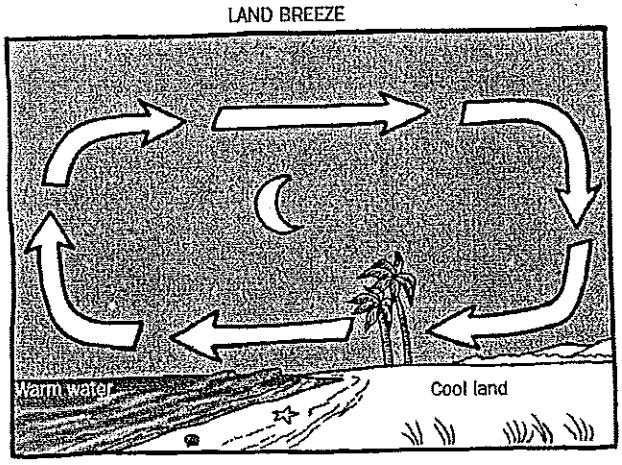
Explanation:

5. In the space below the illustrations, describe how uneven heating of land and water is responsible for sea breezes. Describe how uneven heating and cooling of land and water is responsible for land breezes.

SEA BREEZE

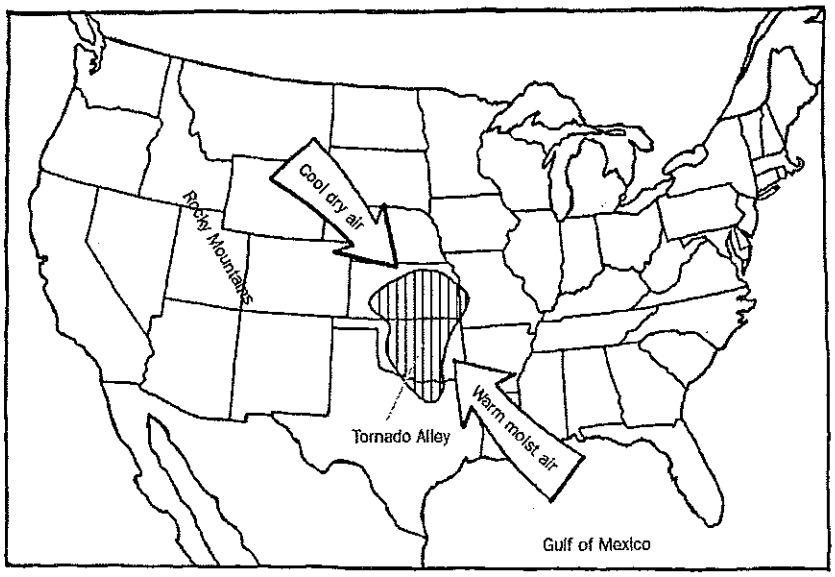


LAND BREEZE



Explanation:

6. Explain why you think tornadoes form more often in Tornado Alley than in any other place on earth. Be specific and use your science vocabulary.



Explanation:

_____

_____

_____

_____

_____

_____

Ldo

Lesson 6: Temperature, Pressure, & Cloud Formation

Name _____ Date _____ Class _____

SECTION 1-3 SECTION SUMMARY

Air Pressure

1

Guide for Reading

- What are some of the properties of air?
- What instruments are used to measure air pressure?
- How does increasing altitude affect air pressure and density?

Air consists of atoms and molecules that have mass. Therefore, air has mass. **Because air has mass, it also has other properties, including density and pressure.** The amount of mass per unit volume of a substance is called the **density** of the substance. The force per unit area is called **pressure. Air pressure** is the result of the weight of a column of air pushing down on an area. The molecules in air push in all directions. This is why air pressure doesn't crush objects.

Falling air pressure usually indicates that a storm is approaching. Rising air pressure usually means that the weather is clearing. A **barometer** is an instrument that measures changes in air pressure. **There are two kinds of barometers: mercury barometers and aneroid barometers.** A **mercury barometer** consists of a glass tube open at the bottom end and partially filled with mercury. The open end of the tube rests in a dish of mercury, and the space above the mercury in the tube contains no air. The air pressure pushing down on the surface of the mercury in the dish is equal to the weight of the column of mercury in the tube. At sea level, the mercury column is about 76 centimeters high, on average. An **aneroid barometer** has an airtight metal chamber that is sensitive to changes in air pressure. The thin walls of the chamber flex in and out as air pressure changes, and the movements are recorded on a dial.

In weather reports, air pressure usually is given in inches of mercury. National Weather Service maps indicate air pressure in millibars. One inch of mercury equals 33.87 millibars.

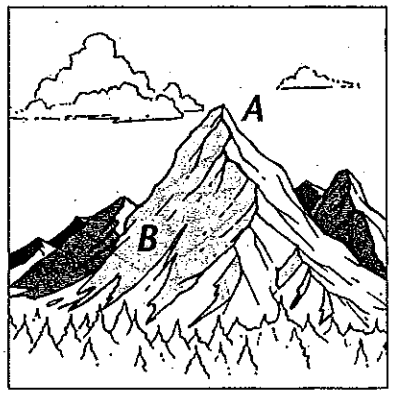
Altitude, or elevation, is the distance above sea level. **Air pressure decreases as altitude increases. As air pressure decreases, so does density.** Sea-level air has the weight of the whole atmosphere pressing on it, so air pressure is highest at sea level. Air pressure is much lower at the tops of mountains. There the low density of air can make it hard to breathe because there is less oxygen in each cubic meter of air.

Name _____ Date _____ Class _____

Air Pressure

◆ Understanding Main Ideas

Study the figure below, and then complete the following statements.



1. Altitude is greater at point _____.

2. Air pressure is greater at point _____.

3. Density of the air is greater at point _____.

4. A cubic meter of air has less mass at point _____.

5. The percentage of oxygen in the air at point A is _____ percent.

Answer the following questions on a separate sheet of paper.

6. State three properties of air.

7. Why doesn't air pressure crush objects such as your desk?

8. What two units of air pressure are used in weather reports?

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

_____ **9.** air pressure

_____ **10.** altitude

_____ **11.** aneroid barometer

_____ **12.** barometer

_____ **13.** density

_____ **14.** mercury barometer

_____ **15.** pressure

a. the amount of mass in a unit volume of a substance

b. force per unit area

c. the result of the weight of a column of air pushing down on an area

d. any instrument that measures changes in air pressure

e. instrument that measures changes in air pressure using liquid mercury

f. the distance above sea level

g. instrument that measures changes in air pressure without using a liquid

Name _____ Date _____ Class _____

SECTION 3-4 SECTION SUMMARY

Predicting the Weather

Guide for Reading

- **How does technology help forecasters predict the weather?**
- **What types of information are shown on weather maps?**

3

Meteorologists are scientists who study the causes of weather and try to predict it. To prepare weather forecasts, meteorologists interpret information from local weather observers, instruments carried by balloons, satellites, and weather stations around the world.

Techniques for predicting weather have changed rapidly in recent years. **Changes in technology have occurred in two areas: gathering weather data and using computers to make forecasts.** Cameras on weather satellites in the exosphere can photograph Earth's surface, clouds, storms, and ice and snow cover. These images are then transmitted to meteorologists on Earth, who interpret the information. Computers process large amounts of information quickly to help forecasters make predictions. To make a forecast, the computer starts with weather conditions reported from weather stations over a large area. Then the computer works through thousands of calculations and makes forecasts for 12 hours, 24 hours, 36 hours, and so on. Each forecast builds on the previous forecast. When new weather data come in, the computer revises its forecasts.

Periodically, a warm-water event known as **El Niño** occurs in the tropical Pacific Ocean. During an El Niño event, winds shift and push warm surface water toward the west coast of South America. El Niño events occur once every two to seven years. They can cause dramatic climate changes around the Pacific Ocean and in other places. Scientists have looked for clues and warnings to help predict the return of El Niño. One signal is rising surface temperatures in the tropical part of the Pacific Ocean.

A weather map is a "snapshot" of conditions at a particular time over a large area. There are many different types of weather maps. Data from weather stations all over the country are assembled into weather maps at the National Weather Service. Maps in newspapers are simplified versions of maps produced by the National Weather Service. **Standard symbols on weather maps show fronts, areas of high and low pressure, types of precipitation, and temperatures.** On some weather maps, curved lines connect places with the same air pressure or temperature. **Isobars** are lines joining places on a map that have the same air pressure. **Isotherms** are lines joining places that have the same temperature.

A forecast for the weather six days from now is based on forecasts for all the days between now and then. A small change in the weather today can mean a larger change in the weather a week later! This is the so-called "butterfly effect."

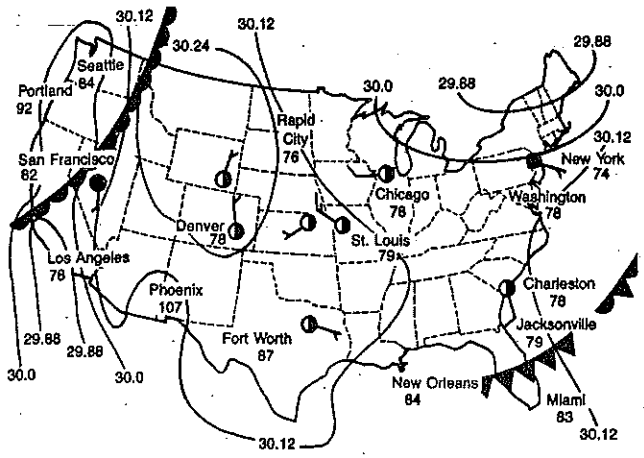
Name _____ Date _____ Class _____

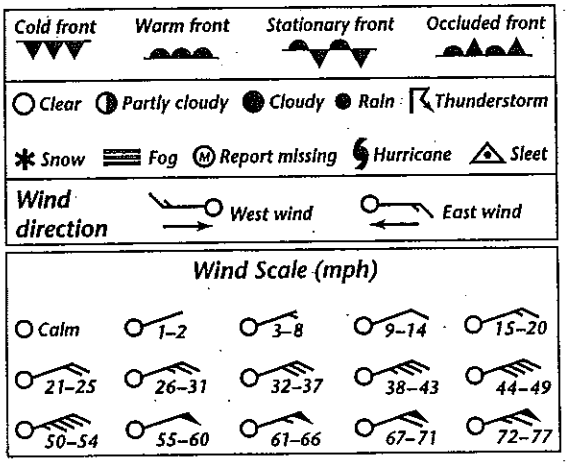
SECTION 3-4 REVIEW AND REINFORCE

Predicting the Weather

◆ Understanding Main Ideas

Fill in the blanks in the table by interpreting the symbols on the map.





Weather Factor	Denver	Chicago	New York
Temperature (°F)	78	1. _____	2. _____
Cloud cover	3. _____	partly cloudy	4. _____
Wind direction	5. _____	6. _____	Southeast
Wind speed (mph)	7. _____	8. _____	9. _____
Air pressure (inches)	30.3	10. _____	11. _____

◆ Building Vocabulary

If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

_____ **12.** Scientists who study the causes of weather and try to predict it are called meteorologists.

_____ **13.** A warm-water event that occurs in the tropical Pacific Ocean periodically is known as the butterfly effect.

_____ **14.** Isotherms are lines joining places on a weather map that have the same air pressure.

_____ **15.** Lines joining places on a weather map that have the same temperature are called isobars.

Name: _____

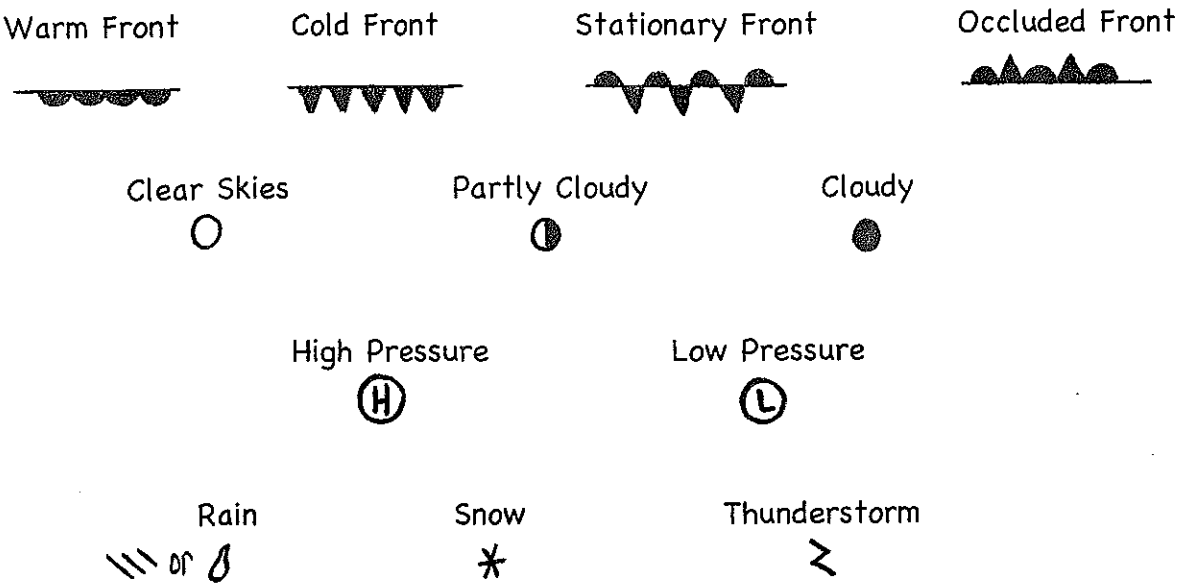
Date: _____ Period: _____ Score: _____

Reading a Weather Map

Background Information:

- Weather maps are a "snapshot" of conditions at a particular time.
- Information for the weather maps comes from the information that is gathered from a number of weather stations.
- The curved lines on a weather map are called isobars. Isobars are the lines that join places on a map with equal air pressure.
- Newspaper weather maps are simplified versions of a weather map.
- The symbols on both types of maps are similar.

Weather Map Symbols



Purpose:

In this activity, you will interpret data/information from a weather map to describe the weather in various parts of the United States.

Problem:

How do different weather maps communicate data?

Procedure:

1. Examine the weather map symbols from the background information.
2. Observe all the symbols on the weather map (diagram #1).
3. Find the symbols for snow and rain.
4. Locate the warm and cold fronts.
5. Locate the symbols for high and low pressure.
6. Observe the cloud cover in various cities.
7. Answer all the questions that follow the weather map (diagram #1).
8. Repeat all of the above steps with the newspaper weather map (diagram #2).

Weather Map (diagram #1) Questions:

1. Which city has the highest temperature? What is that city's temperature?

   _____

   In which state is this city located?

   _____

2. Which city has the lowest temperature? What is that city's temperature?

   _____

   In which state is this city located?

   _____

3. Which states in the country are experiencing rains?

   _____

4. In which state is it snowing? _____

5. Which part of the country is experiencing a low-pressure zone? _____

6. There are four cities listed on the West Coast. List the four cities and describe the cloud cover for each.

   1. _____
   2. _____
   3. _____
   4. _____

7. How many fronts are shown on this map? _____

8. What season does this map represent? How do you know?

_____

_____

_____

_____

9. The triangles and semi-circles on the front lines indicate which direction the front is moving. What type of front is moving toward Chicago? What type of weather do you think it will bring the city?

_____

_____

_____

_____

_____

Newspaper Map (diagram #2) Questions:

10. Which city has the highest temperature? What is that city's high and low temperatures for the day?

_____

In which state is that city located?

_____

11. Which city has the lowest temperature? What is that city's high and low temperatures for the day?

_____

In which state is that city located?

_____

12. Which area of the country indicates an area of high pressure? _____

13. In which state does the map indicate that it is rather windy? _____

14. How many different fronts are indicated by this newspaper weather map? _____

15. What season does this map represent? How do you know?

Final Wrap-Up Questions:

16. How do various weather maps differ from each other? How are they similar?

17. What is the name of the lines on a weather map that connect areas that have the same pressure? Are these lines found on all types of weather maps?

18. Name three types of information you could get from both the weather and newspaper weather map.
    1. _____
    2. _____
    3. _____

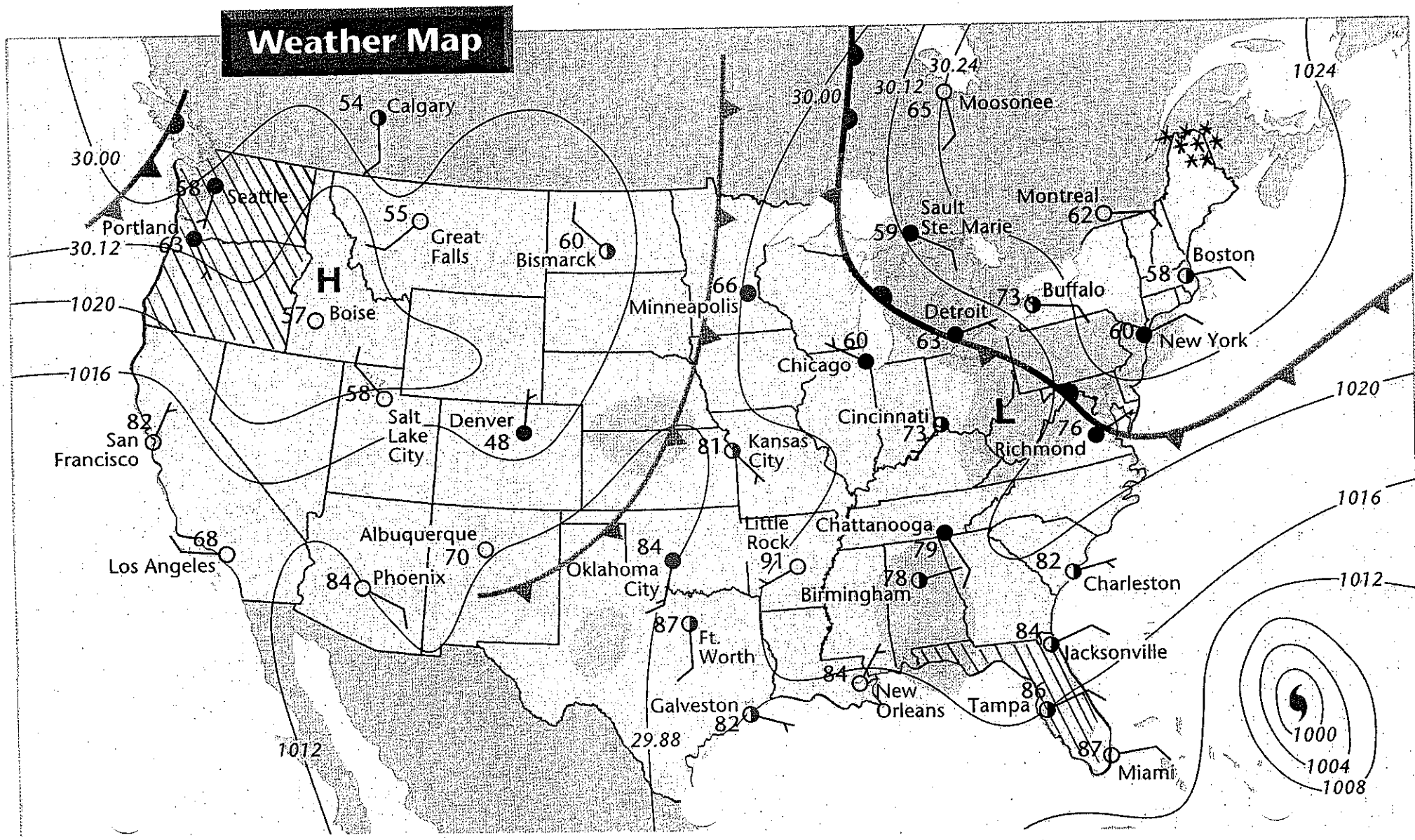
Bonus Questions:

19. If the air pressure is rising, what kind of weather is coming?

20. Take a look at the weather map. What type of "event" is happening off the coast of Florida?

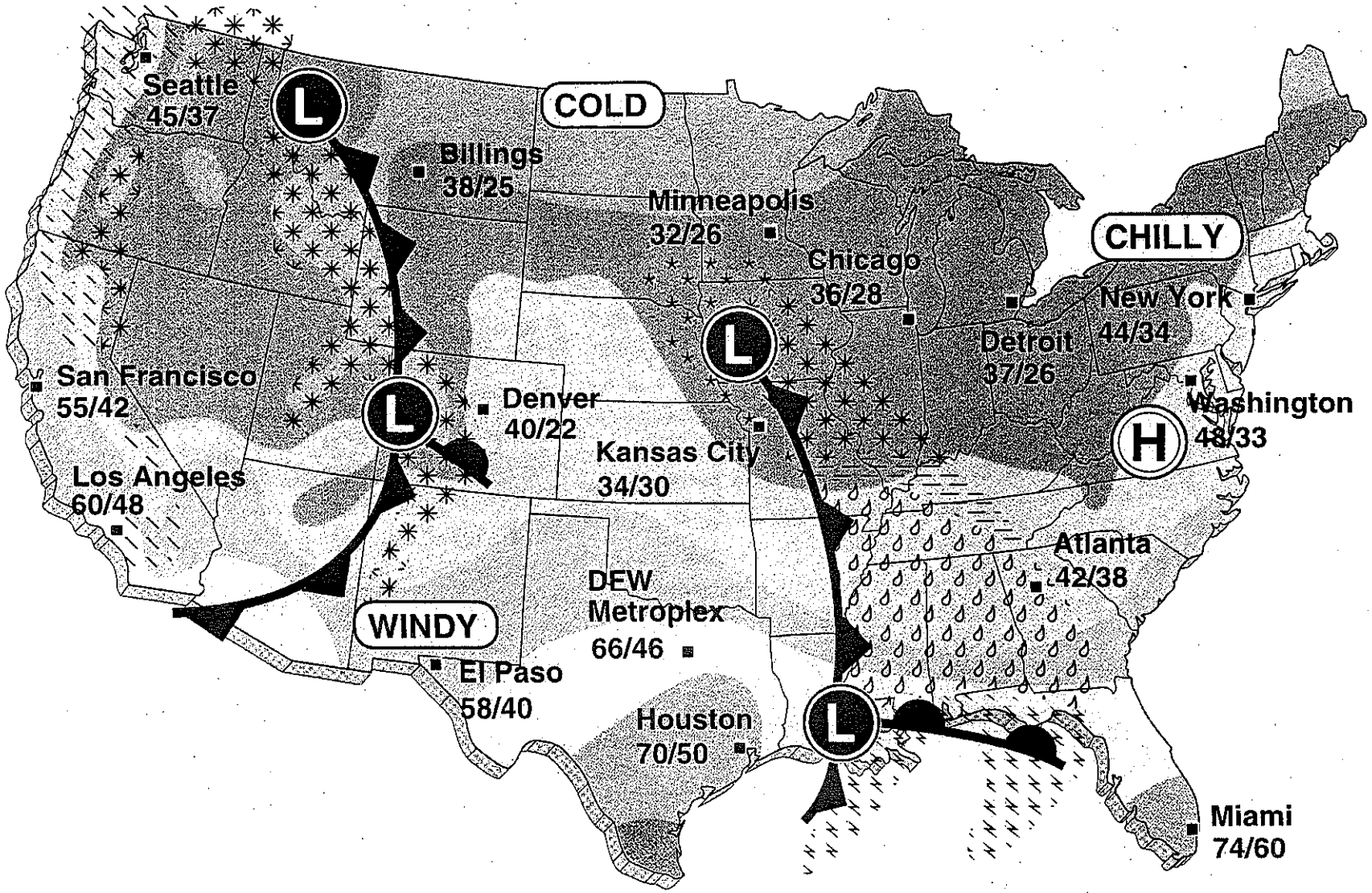
15 Weather Map

Diagram #1



16 Newspaper Weather Map

Diagram #2



Name: _____
Date: _____ Period: _____

LAYERS OF THE ATMOSPHERE,
HEAT, TEMPERATURE, & AIR MASS STUDY GUIDE

Answer each of the following questions. These questions will help you in preparation for your upcoming test.

1. How does air pressure change as you increase in altitude? How does air pressure change as you decrease in altitude?

2. List the main gasses that make up the atmosphere. Which are the most abundant?

3. List the 4 main layers of the atmosphere in order from the ground up.

4. List some of the main characteristics of each layer of the atmosphere. Refer back to your notes.

5. What causes the uneven heating of earth's surface?

6. How does the uneven heating of earth's surface relate to weather?

7. How is the temperature of the air affected by the temperature at the surface?

8. Describe the characteristics of warm air and cold air.

9. What is the difference between heat and temperature? Be specific.

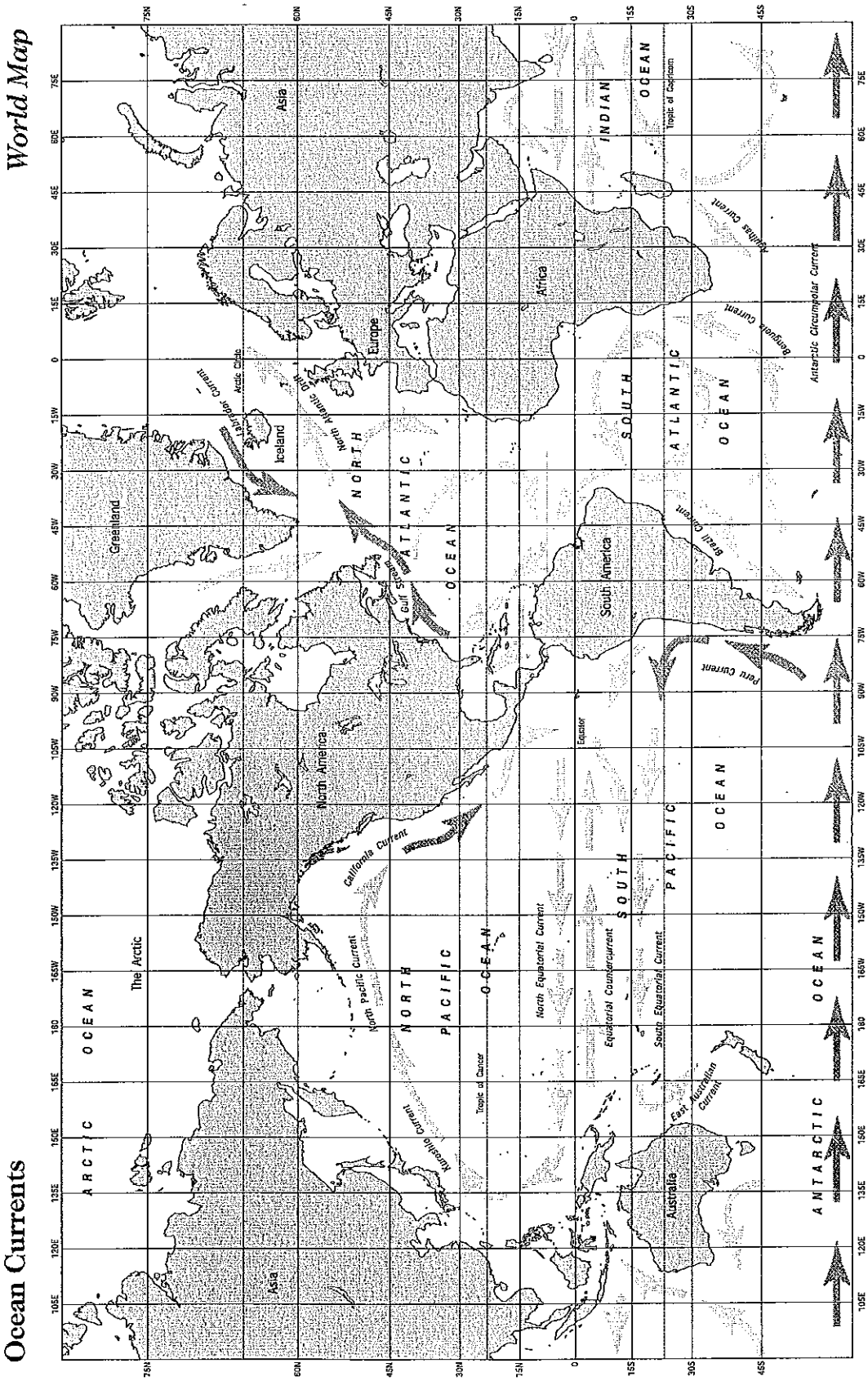
10. Compare and contrast warm/hot particles from cool/cold particles.

11. What is an air mass? How does an air mass form?

12. List three types of air masses that affect the United States and the characteristics of each. Where do each of these masses originate or form?

Lesson 7: Ocean Currents & Global Climate

Inquiry Master 7.2
Mapping Ocean Currents



Name:_____

Class:_____ Date:_____

Student Sheet 7.1a
Investigating the Effect of Temperature on Ocean Currents

Directions Complete all but the last box on this sheet for homework.

Question we are trying to answer:

How does the temperature of water affect the way water moves?

What we think will happen:

Materials we will use:

Procedures we will use:

What we will keep the same when comparing two setups:

What we will look for and how we will know it is present:

What we will measure:

What happened:

Why we think it happened:

Name:_____

Class:_____ Date:_____

Student Sheet 7.1b
Storms Review

Directions Review the reading selections in your Student Guide, your notes, and your student sheets to prepare for this assessment. Ask your teacher whether you will be allowed to use those materials during the assessment.

The assessment for Storms will be divided into Parts A and B.

Part A. In this part of your assessment, you will observe an investigation. Your teacher will set up and work with science equipment to demonstrate science concepts you have investigated in this part of the module. You will be asked to describe what you see and tell why it is happening. You will be graded on your ability to record your observations and to apply what you are seeing to real-world storms.

Answer these questions to study for Part A:

1. What is a vortex, and what causes it to form?

2. How does air above a heated surface move?

3. How does air above a cold surface move?

4. What happens when hot air meets cold air?

5. How do hurricanes form?

(continued)

Student Sheet 7.1b (continued)

Part B. In Part B of the assessment, you will be asked 20 questions. Most of the questions will be multiple-choice. Three will be short-answer questions.

To study for Part B, answer these questions:

1. How are hurricanes and tornadoes alike? (Look at the Venn diagram in which you compared thunderstorms, tornadoes, and hurricanes.)

How are they different?

2. What role does the sun play in the weather on the earth?

3. What is a convection current?

4. Think about the investigation in Lesson 3 when you heated soil and water. Then answer the following questions:

A. How did you set up your investigation to make it a fair test?

B. Which heated faster: soil or water?

C. Which held its heat longer: soil or water?

(continued)

Student Sheet 7.1b (continued)

5. Look at your graph from Lesson 3.
   A. What does the soil curve look like? Why?

   B. What does the water curve look like? Why?

   C. What was the temperature of your soil after 5 minutes of heating?

6. Study the illustration of Tornado Alley on page 65. Answer the following:
   A. What states make up Tornado Alley?

   B. What causes tornadoes to form in Tornado Alley?

7. Take another look at the illustration of a sea breeze and a land breeze on page 59. What is a sea breeze, and when does it form?

8. Look at the illustration of the water cycle on page 72. Describe the water cycle and how clouds form.

(continued)

Student Sheet 7.1b (continued)

9. Look at the weather maps on page 70.

A. Where is the pressure high? What is the weather like there?

B. Where is the pressure low? What is the weather like there?

C. Find a front. Where is it? What is the weather like there?

D. In what direction is the weather moving across the United States? How can this help meteorologists?

10. Think about the investigation in Lesson 7 in which you modeled ocean currents.

A. How do some deep ocean currents form?

B. How do winds affect ocean water?

C. How do ocean currents affect air temperatures around the world?