Name_____ _____ 280 points total

Date Period

Chapter 12 Meteorology

SECTION 12.1 *The Causes of Weather*

_____ 35 points

In your textbook, read about weather and climate.
In the space at the left, write *correct* if the statement is correct, if the statement is incorrect, change the italicized word to make it correct.

_____ **1.** *Meteorology* is the study of atmospheric phenomena.

_____ **2.** Weather is the current state of the *lithosphere*.

_____ **3.** Long-term variations in weather for a particular area make up the *climate* of the area.

_____ **4.** The tropics are hotter than the poles because the sun strikes this area of Earth more *indirectly*.

In your textbook, read about air masses and source regions.
Completes each statement.

5. A large parcel of air that takes on the characteristics of the area over which it forms is a(n) _____.

6. An air mass takes on its source region's _____.

a. temperature and humidity.
b. landforms.
c. clouds and wind.
d. elevation.

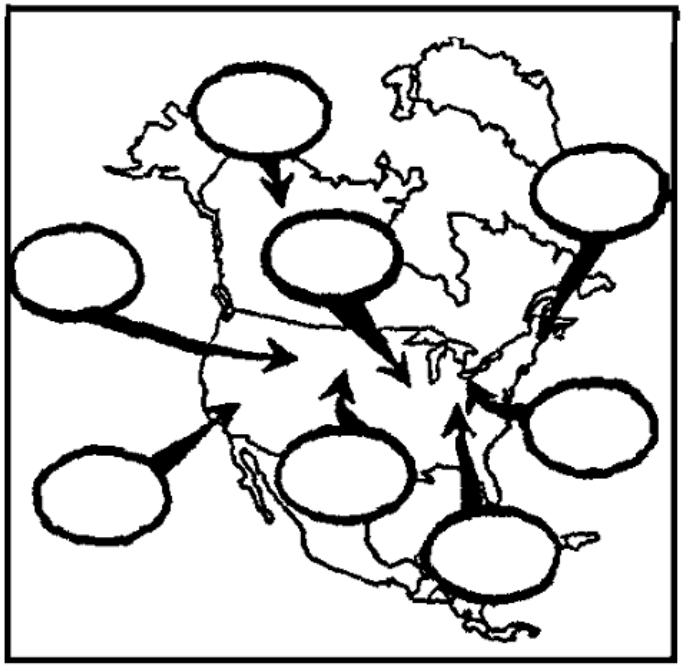
7. Maritime air masses originate over _____.

8. Describe the difference between weather and climate.

9. For each air mass, identify its symbol; describe the difference types of air masses and their source regions.

Types of air masses	Symbol	Describe air	Describe source region
continental tropical			
maritime tropical			
continental polar			
maritime polar			
Arctic			

Label the air masses from Table 1 on page 316 on the map below (page 380)



Name_____ _____ **Date** **Period**

30 points

SECTION 12.2 *Weather Systems*

In your textbook, read about global winds and how Earth's rotation affects their movement. **Use each of the terms below just once to complete the passage.**

intertropical convergence zone **rotation** **North America** **jet streams**
trade winds **southwest** **polar jet streams** **Coriolis effect**
low pressure **prevailing westerlies** **polar easterlies** **northeast**

The **(1)** _____ deflects moving air to the right in the northern hemisphere and to the left in the southern hemisphere. The cause of this is Earth's **(2)** _____.

Each hemisphere has three basic wind systems. The first, at 30° latitude north and south, is known as the **(3)** _____. There, air sinks, warms, and moves toward the equator from northeast to southwest in the northern hemisphere and from southeast to northwest in the southern hemi-sphere. When the air reaches the equator, it rises, and then moves back toward 30° to start the cycle again. These winds from both hemispheres converge at the equator. They are forced upward, creating an area of **(4)** _____. This area near the equator is called the **(5)** _____.

The second wind system, called the **(6)** _____, flows between 30° and 60° latitude north and south of the equator. Its circulation pattern is opposite that of the wind system discussed above. These winds are responsible for the movement of many weather systems across much of **(7)** _____. The third wind system, the **(8)** _____, lies between the poles and 60° latitude. In the northern hemisphere, these winds flow from the **(9)** _____ to the **(10)** _____. They flow in the opposite direction in the southern hemisphere.

Narrow bands of fast, high-altitude, westerly winds called **(11)** _____ flow at the boundaries between wind zones in the middle latitudes. These bands of wind steer weather systems in the middle latitudes. The most important one, the **(12)** _____, separates the polar easterlies from the prevailing westerlies.

SECTION 12.2 *Weather Systems, continued*

In your textbook, read about fronts and wave cyclones.

Complete the table by filling in the type of weather system described. Use the following terms: *front, cold front, occluded front, stationary front, warm front, wave cyclone*.

Description	Weather System
13. Cold, dense air that displaces warm air, forcing the warm air up	
14. Narrow region separating two air masses of different densities	
15. Advancing warm air that displaces cold air	
16. Low-pressure system that heavily influences weather in the middle latitudes	
17. Cold air mass that moves rapidly and overtakes a warm front	
18. Two air masses that meet and do not advance	

Diagram the four different types of boundaries between air masses that we call weather fronts *(cold, warm, occluded, and stationary).* Label the following: frontal movement, cold air, warm air, precipitation. Use correct front symbols. (page 322 or 909)

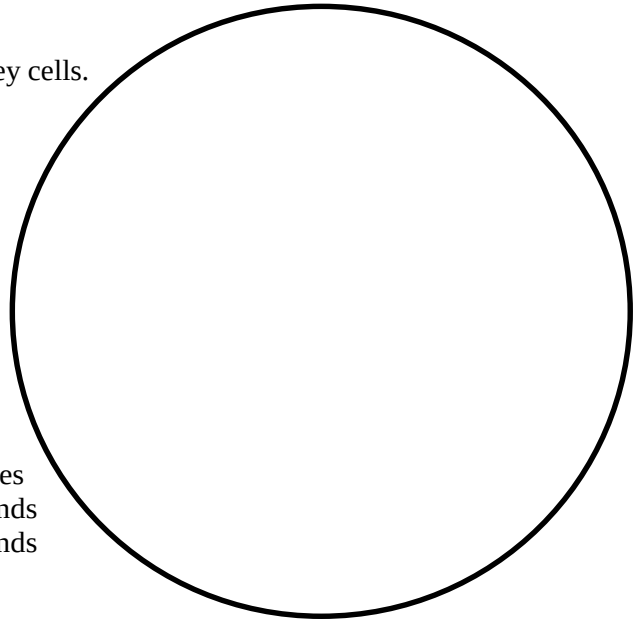
Name_____ _____ **Date** **Period**

30 points

In your textbook, read about global wind systems.

In the circle, draw the Hadley cells.
Label:

- North pole
- South pole
- equator
- 30° north
- 60° north
- 30° south
- 60° south
- Sinking air
- Rising air
- Polar easterlies
- Prevailing westerlies
- Northeast trade winds
- Southeast trade winds



Describe how uneven heating of the equator and Polar Regions combined with the Coriolis Effect create atmospheric circulation a system that moves heat energy around the Earth.

In your textbook, read about pressure systems.

A low pressure system is known as a *cyclone* and a high pressure system is known as an *anticyclone*

Illustrate how a high and a low are formed:

For each item, write *High* for High Pressure System or *Low* for Low Pressure System.

1. _____ Characterized by sinking air
2. _____ Characterized by rising air
3. _____ Air flows toward center
4. _____ Air flows away from center
5. _____ Air moves clockwise in the northern hemisphere
6. _____ Air moves counterclockwise in the northern hemisphere
7. _____ Associated with fair weather
8. _____ Associated with clouds and precipitation

Name_____ **Date** **Period**

30 points

SECTION 12.3 *Gathering Weather Data*

me and Number each illustration. Describe how it works.

In your textbook, read about weather instruments.

For each description, name and <u>illustrate</u> the weather instrument.

1. Measures wind speed and direction
2. Measures temperature
3. Measures air pressure
4. Measures relative humidity
5. A balloon-borne package of sensors that gathers upper-level weather data

In your textbook, read about radar and weather satellites.

Answer the following questions.

7. What is the Doppler effect? How do meteorologists use it to predict weather?

8. How do meteorologists combine data from weather radar and weather satellites to gather information about the atmosphere?

9. What is infrared imagery? How is it used?

Name_____ Date Period

The Nature of Storms

_____
25 points

SECTION 13.1 *Thunderstorms*

In your textbook, read about thunderstorm formation.
Use each of the terms below just once to complete the passage.

condensation	**warmer**	**unstable**	**convection**
cumulonimbus	**moisture**	**stable**	

At any moment, more than 2000 thunderstorms are occurring on Earth. Thunderstorms develop from cumulus clouds that grow into huge **(1)**_____ clouds.

Thunderstorms form when three conditions exist that cause cumulus clouds to grow by the energy transfer method of **(2)**_____. First, there must be sufficient **(3)** _____ in the lower atmosphere to condense and release latent heat. Second, some mechanism must make the air rise, causing the cloud to grow. Third, the portion of the atmosphere that the cloud grows through must be **(4)** _____. The rising cloud must stay **(5)** _____ than the air around it in order for the growth to continue.

The cloud's growth stops when the rate of **(6)** _____ in the cloud, which diminishes with height, is insufficient to create enough heat to keep the cloud warmer than the air around it. Growth will also stop if the rising air meets a layer of **(7)** _____ air that it cannot overcome.

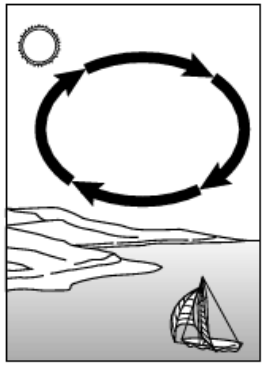
In your textbook, read about different types of thunderstorms.
For each item, write the kind of thunderstorm formed.

_____ **8.** Forms when an air mass rises as a result of orographic lifting

_____ **9.** Forms because of temperature differences between the air over land and the air over water

_____ **10.** Forms as cold air pushes warm air up at a boundary between cold and warm air masses

11. Describe the phenomenon is pictured in the diagram.



12. Illustrate how fronts that may cause a thunderstorm. Label.

Number the stages in the development of a thunderstorm in the order in which they occur.

_____ **14.** Equal amounts of updrafts and downdrafts form convection cells.

_____ **15.**Warm, moist air rises quickly, and the moisture condenses into a visible cloud. Then updrafts form.

_____ **16.** Falling precipitation cools the air around it, forming downdrafts.

_____ **17.** Precipitation begins to fall.

_____ **18.** The updrafts cease and precipitation stops.

_____ **19.** The updrafts slow as downdrafts decrease the supply of warm, moist surface air.

Name_____ 30 points **Date** **Period**

SECTION 13.2 *Severe Weather*

In your textbook, read about thunderstorms and the dangerous conditions they cause. **Completes each statement.**

1. What are extremely powerful thunderstorms that develop intense, rotating updrafts?

2. Electricity caused by the rapid rush of air in a cumulonimbus cloud is known as

3. Describe how a downburst is formed.

4. What is the difference between a macroburst and a microburst?

5. What form of precipitation falls as balls or lumps of ice?

6. What causes the intense updrafts and downdrafts that characterize severe thunderstorms?

7. When can flooding occur?

8. Describe two characteristics that combine to form hail.

9. What is the difference between a tornado watch and tornado warning?

SECTION 13.3 *Tropical Storms*

In your textbook, read about the life cycle of a hurricane.
Number the stages in the development of a hurricane in the order in which they occur. Illustrate.

_____ **1.** tropical disturbance

_____ **2.** hurricane

_____ **3.** tropical storm

_____ **4.** tropical depression

In your textbook, read about tropical cyclones and the damage they cause.
Determine if the statement is correct. If it is not, rewrite the italicized part to make it correct.

5. _____ To people living near the Atlantic Ocean, tropical cyclones are known as *hurricanes.*
6. _____ Tropical cyclones are large, rotating, *high-pressure* storms.
7. _____ Tropical cyclones originate over the warm waters of most *tropical* oceans.
8. _____ Hurricanes are classified according to the *Fujita scale*.
9. _____ The minimum wind speed for a *Category 1* hurricane is 74 mph (120 kph).
10. _____ The eye of a hurricane is surrounded by a band of strong winds called the *eye current*.
11. _____ Hurricane winds can drive a mound of water toward the coast, where it washes over land. This is called a *storm surge.*

Name_____ **Date** **Period**

20 points

SECTION 13.4 *Recurring Weather*

In your textbook, read about weather patterns and problems they cause.
Complete the table by writing the result of each weather pattern. Choose from the following: *cold wave, drought, flood, heat wave*.

Weather Pattern	Result
1. Thunderstorm remains over an area for many hours	
2. Extended period of well-below-normal rainfall	
3. Extended period of above-normal temperatures	
4. Extended period of below-normal temperatures	

Complete the table by writing the name of each weather pattern associated with each atmospheric event. Choose from the following: *cold wave, flood, heat wave, drought*.

Atmospheric Event	Weather Pattern
5. Large pools of extremely cold air develop strong high-pressure systems over polar continental areas. Jet streams move	
6. Large, warm, high-pressure system develops, remains over an area, and blocks cooler air masses from	
7. Sinking air from a strong high-pressure system stops air from rising and condensation from occurring over a long	
8. A thunderstorm unleashes heavy precipitation.	

In the slot canyons of Utah, flash floods may be disastrous. Illustrate and describe why.

Applying Scientific Methods

A meteorology class has set up a small weather station outside of school. It has a few simple instruments: a thermometer, a barometer, a rain gauge to measure rainfall, and a hygrometer. The students took measurements with the instruments once a day for a week. They then filled in the chart below. The barometer broke, so they were not able to finish collecting air-pressure data.

Use the chart and what you know about weather systems and weather forecasting to answer the following questions.

	Mon	Tue	Wed	Thurs	Fri	Sat	Sun
Average temperature (°C)	23.3	22.2	22.2	15.6	16.7	16.7	17.8
Rainfall (cm)	0	0	3.31	0	0	0	0
Relative humidity	40%	60%	100%	80%	60%	50%	40%
Air pressure (mb)	1000	998					

1. A cold front passed through the students' city during the week. Showers occur at fronts. On which day did the front pass through?

2. What evidence does the data provide of the arrival of the front? Give two examples.

3. The students did not record cloud cover data. If they had, what would their observations have been as the front arrived?

4. Low-pressure systems are associated with clouds and precipitation. If the students' barometer had continued to work, would the air pressure reading for Wednesday have been higher or lower than the one for Tuesday, when the weather was clearer?

5. Given the relative humidity on Thursday, would you expect clear or cloudy skies?

Name_____ 30 points **Date** **Period**

Understanding Main Ideas Chapter 12

Circle the letter of the choice that best completes the statement.

1. Low-pressure systems that heavily influence weather in the middle latitudes are
a. polar easterlies. b. wave cyclones. **c.** air masses. **d.** warm fronts.

2. A weather instrument that measures the height of clouds and estimates the amount of cloud cover is a(n)
a. hygrometer. **c.** ceilometer.
b. anemometer. **d.** barometer.

3. A balloon-borne package of sensors that gathers upper-level temperature, air pressure, and humidity is
a. a radiosonde. **c.** a hygrometer.
b. a satellite. **d.** Doppler radar.

4. The change in wave frequency of energy as it moves toward or away from an observer is the
a. Coriolis effect. **c.** convergence effect.
b. Doppler effect. **d.** radar effect.

5. Polar and tropical regions maintain fairly constant average temperatures because
a. the Sun always strikes these regions at the same angle.
b. air masses remain stationary near the poles and equator.
c. Earth radiates extra energy back into space.
d. the continual motion of air and water reallocates heat energy throughout Earth.

6. Differences in thermal energy can be detected with
a. ultraviolet imagery. **c.** infrared imagery.
b. visible light. **d.** sonar imagery.

7. A record of weather data for a particular site at a particular time is a(n)
a. station model. **c.** isopleth model.
b. topographic map. **d.** climate map.

8. Lines on a map that connect points of equal or constant values are
a. boundaries. **c.** fronts.
b. isopleths. **d.** station models.

9. The exchange of heat or moisture with the surface over which an air mass travels is known as
a. intertropical convergence. **c.** occlusion.
b. air mass modification. **d.** air mass exchange.

10. If the time between when you see lightening and hear thunder is increasing, what is likely to be happening to the storm?
a. storm is directly overhead **c.** storm is moving away
b. storm is coming closer. **d.** storm is in your head only

Understanding Main Ideas Chapter 13

Circle the letter of the choice that best completes the statement or answers the question.

1. A mound of water driven toward coastal areas by hurricane winds is called a
a. cyclone. **c.** storm surge.
b. supercell. **d.** cold front.

2. An extended period of well-below-normal rainfall is a
a. flood. **c.** heat wave.
b. drought. **d.** tropical cyclone.

3. The phenomenon in which the effects of cold air are worsened by wind is the
a. supercell. **c.** wind chill factor.
b. sea breeze. **d.** cold wave.

4. Which of the following conditions does NOT contribute to the formation of hail?
a. the ability of water droplets to exist in a liquid state in parts of a cloud where the temperature is below freezing
b. the encounter between supercooled water droplets and ice pellets
c. the dissipation of warm, moist air at Earth's surface by downdrafts
d. the existence of strong updrafts and downdrafts side by side within a cloud

Answer each question.

5.Which conditions are needed for the towering clouds of thunderstorms to develop?

6. List the dangers associated with severe thunderstorms.

7. For each area, describe the severe weather that is most likely to occur:
Arctic Ocean

tropical Atlantic Ocean

tropical Pacific Ocean

central United States

Name_____ **Date** **Period**

_____
50 points

Video Worksheet:
Core Meteorology: Weather

Chapter 1 Introduction, What is Weather

1. _____ is what's happening right here, right now in the atmosphere
2. There are 6 fundamental weather conditions – t_____, w_____, b_____ p_____, r_____ h_____, c_____ c_____ and p_____.

Chapter 2 Weather Variables

1. Weather information is gathered in three ways today - s_____, w_____ b_____ and surface weather s_____.
2. _____measure temperature, precipitation, cloud cover, relative humidity, barometric pressure, and wind speed and direction
3. Using _____, all of this data from all the sources can be plotted on a map, and then a picture of the weather across a region can then be displayed on a computer screen.

Chapter 3 What Causes Weather

1. The principal driving force behind weather - all weather on Earth is ultimately produced _____ _____.
2. The _____ earth on it axis in relationship to the sun contributes in a major way to our constantly changing weather conditions
3. The planet's surface near the _____ is more highly heated than the surfaces near the poles.
4. This produces a large-scale air circulation that flows from the equator to the _____ and back.
5. Because the Earth spins faster at the equator than at the poles, it produces an effect known as the _____ Effect, which means that air also moves in East-West patterns
6. Weather is really complex due to is moisture: cloud cover, relative humidity and _____.

Chapter 4 Moisture

1. _____ is the most miraculous chemical on our planet is essential for life.
2. The largest reservoir of water is contained in _____, _____, and _____ in the liquid state.
3. Water in the _____ state is also stored in snow, ice sheets and glaciers.
4. The smallest reservoir of water is in the _____in the form of water vapor
5. Through the _____cycle, water moves from one reservoir to another and back again
6. In the atmosphere, the behavior of water vapor has some interesting properties.
   The amount of water vapor in any given parcel of air is limited by _____.

Name_____ **Date** **Period**

7. When the maximum amount of water vapor is present in a parcel of air, the air is said to be _____. and can appear as fog.
8. When warm air rises, it _____.
9. When _____air sinks, it heats up and compresses
10. From clouds we get _____: rain or snow
11. Weather is driven by _____energy from the sun, the _____of the earth on it axis, the _____heating from equator to poles, the differential heating of the various surfaces found on the earth, the rising and falling of heated parcels of _____, and finally the distribution relative humidity or _____vapor in the atmosphere

Chapter 5 Weather Forecasting

1. _____ today is done by gathering weather data from satellites, radar, weather balloons and ground weather stations

2. At weather forecasting facilities the values for the initial state of global weather are fed into a computer where the laws of _____ are applied using a complicated set of interconnected equations

Chapter 6 Hazardous Weather

Describe the dangers of each type of hazardous weather:

1. Thunderstorms

2. Floods

3. Hurricanes

4. Ice storms and snowstorms

5. Extreme heat and cold

6. Drought

Chapter 7 Global Warming

1. In the 21st century, meteorologists have been tracking the pushing of weather extremes brought about by _____
2. Climate change that has resulted in a general warming of lower atmosphere as a result of added greenhouse gases produced by excessive burning of fossil fuels: _____and _____
3. In general high impact _____events will become more frequent and damaging. It has been predicted that weather extremes will become more extreme.