



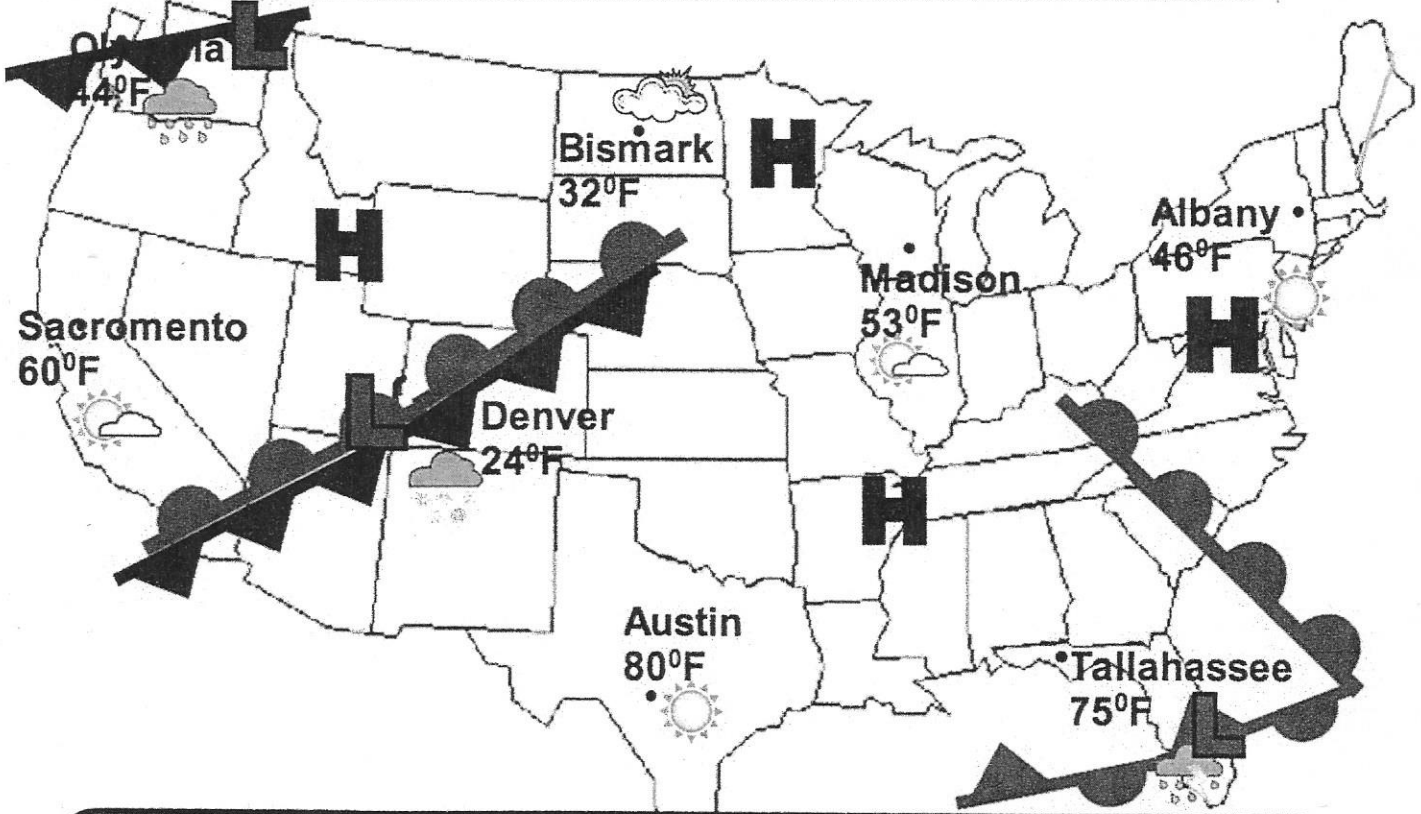








**Fronts Key:**

- warm front: 
- cold front: 
- stationary front: 
- occluded: 



**Weather Key:**

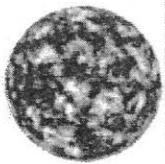
- mostly sunny: 
- thunderstorms: 
- sunny: 
- mostly cloudy: 
- heavy-rain: 
- snow: 

# Weather Packet with Flashbacks

Name \_\_\_\_\_

Teacher/Period \_\_\_\_\_

Sun



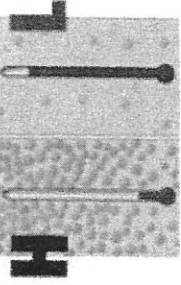
Uneven Heating



Changes in



Changes in Pressure



High  
Pressur  
Low  
Pressur

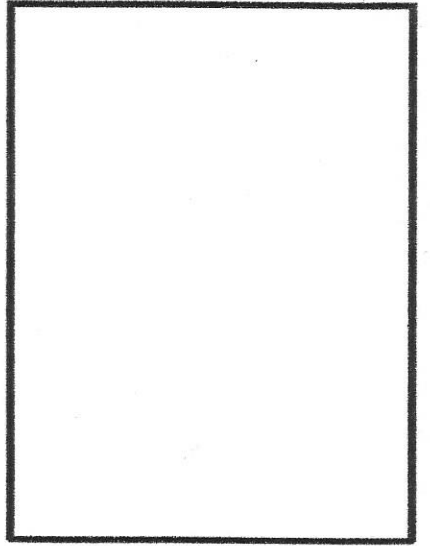
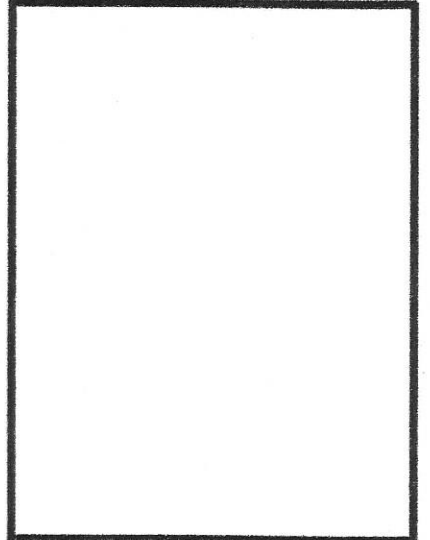
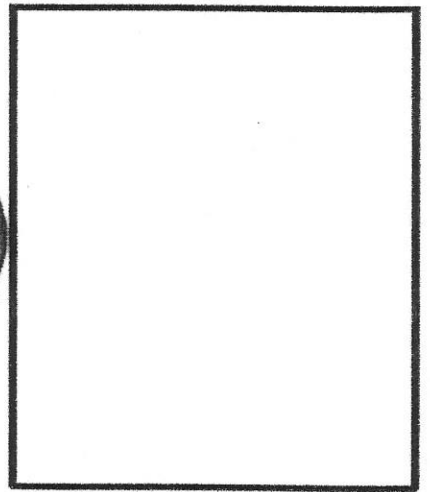
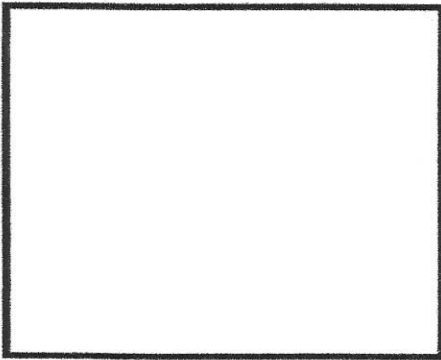
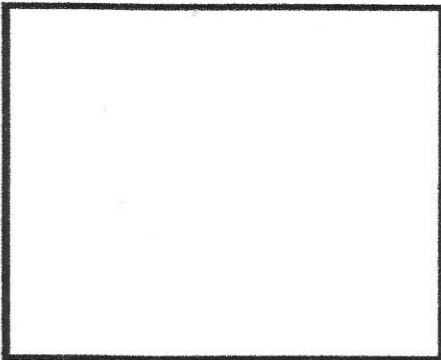
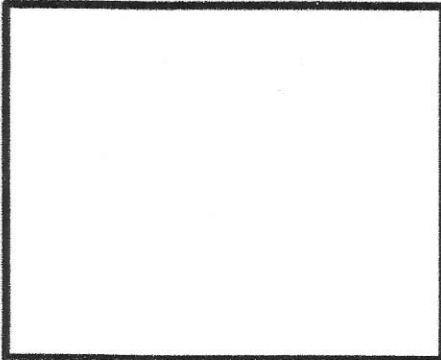
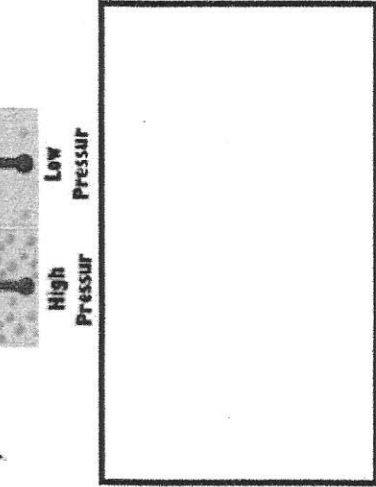
Weather



Ocean Currents



Wind



## ATTACK THE TEK

8.10A- recognize the Sun provides the energy that drives the convection within the atmosphere and oceans, producing winds and ocean currents

Verb	Action	Answer
Explain	how ocean currents form	
Explain	how winds form	
Describe	the effects of the ocean water on weather	

### Vocabulary

Atmosphere  
Conduction  
Convection  
Radiation  
Coriolis Effect  
Ocean current

### Pre-Fix

# Anchor Chart

# ATT

8.10(C) identify the role of the oceans in the formation of weather systems such as hurricanes

verb	action	answer
Identify	the conditions necessary for a hurricane to form	
Explain	How El Nino impacts the weather	

## Vocabulary

Tropical Depression

Tropical Storm

Hurricane

Eye

Eye Wall

Storm Surge

Storm watch

Storm warning

El Niño

## Safir-Simpson Scale

Category 1	Category 2	Category 3	Category 4	Category 5
Winds 75-95 Storm surge 4-5				
Some damage				

# Anchor Chart

## ATT

**8.10B-** identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts.

Verb	Action	Answer
<b>Describe</b>	<b>The air mass of a high pressure system</b>	
<b>Describe</b>	<b>The air mass of a low pressure system</b>	
<b>Explain</b>	<b>The interaction at frontal boundaries that causes more severe weather such as thunderstorms</b>	

### Vocabulary

Boundary

Front

Cold Front

Warm Front

Stationary Front

Occluded Front

# Anchor Chart



# Unequal Heating/ Weather Flow Map 1

## **Bell Ringer:**

For a laboratory investigation some students put a strip of shiny metal into a beaker of blue solution and then stored the beaker on a shelf overnight. The next morning, the students recorded observations about the metal and the solution.

The solution is lighter blue in color. • The volume of solution is the same. • The metal strip is shiny above the surface of the solution. • The metal strip is not shiny below the surface of the solution. • The metal strip below the surface of the solution has a dark coat of flaky material. • When the metal strip is touched, the flaky material falls off.

Based on their observations, can the students correctly conclude that a chemical reaction occurred? Explain.

## **Math Problem**

You arrive in science class 365 seconds after leaving math which is 90 meters away. During that time, you stopped for 5 seconds to pick up trash. Did you make it to class on time if you have a 4 minute passing period?

## **Texas Essential Knowledge and Skills**

**8.10A-** recognize the Sun provides the energy that drives the convection within the atmosphere and oceans, producing winds and ocean currents

**EQ:** Differentiate between convection, conduction, and radiation using diagrams or examples.

**STEM:** The main differences between convection, conduction and radiation are

# Convection Currents Demo Notes

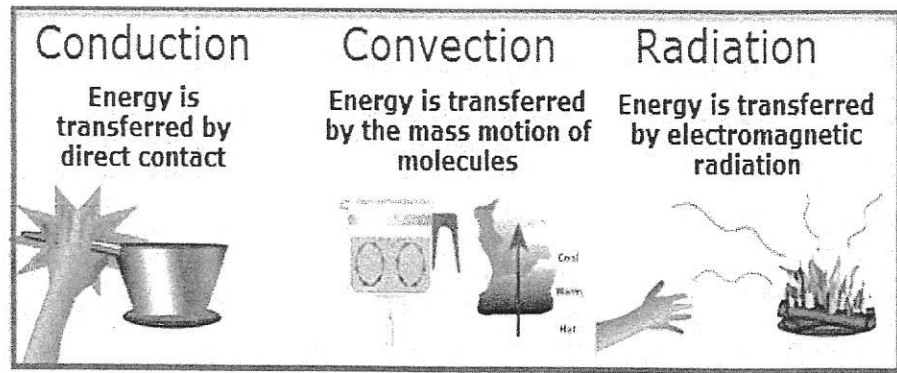
# Unequal Heating of the Earth

The source of almost all the Earth's heat energy is the Sun. The Sun gives off its heat in the form of electromagnetic radiation, which travels through space. About 45% of the Sun's radiation is actually absorbed by the oceans and land. The Sun's heat is distributed through the atmosphere, land, and the ocean by radiation, conduction, and convection, providing the energy to make weather.

**Conduction** is the transfer of energy from one molecule directly to another.

**Convection** is transfer of energy through a fluid (air is also a fluid). Heat rises and cools sinks.

**Radiation** is the transfer of energy through waves or rays.



Unequal heating of the Earth occurs due to the Earth's tilt. Areas closer to the poles receive indirect rays and have cooler temperature. The Sun's rays are more direct at the equator, resulting in warmer temperatures. Temperatures get cooler as you move away from the equator towards either of the poles. Convection or heat transfer occurs moving from areas of hotter air to areas of cooler air. Think about how the density of the air changes with the temperature changes. How would the pressure (density) changes affect the movement? What results from the movement of air?

The oceans also are heated unequally. When water is heated, it expands and its density decreases. Less dense matter tends to rise in fluids such as ocean water. As the area around the equator warms, convection occurs in the oceans distributing heat. This causes deep ocean currents and upwelling.

Winds move in a curved pattern across the surface of the earth because of the Earth's rotation. This is the Coriolis Effect. Global winds blowing across the ocean transfer energy to the ocean surface. Ocean surface currents are caused mainly by these global winds. The winds drag along the surface of the ocean, creating surface currents that move near the top of the ocean. The ocean surface currents also move in a curved pattern because of the Earth's rotation. Other factors, including the temperature of the ocean, influence the complex spirals of ocean currents.

The water cycle pulls moisture into the atmosphere. The combination of moisture, temperature and pressure are what cause our weather.

# Analysis Questions

1. What is the source for almost all the Earth's energy?
2. Are all areas of the Earth equally heated by the sun? Why or why not?
3. What happens to the density of air/water when it is warmed? What is the result of this density change?
4. What happens to the density of air/water when it is cooled? What is the result of this density change?
5. What happens as air/water heated in warmer places around the world rises?
6. Convection currents allow air at different temperatures to move through the atmosphere. What is another or more common name for moving air?
7. What happens as a result of convection in the ocean?
8. Explain the Coriolis Effect.

# Air Pressure/Convection Currents 2

## Bell Ringer: PSBM 16

Lions and cheetahs prey on wildebeests that graze in the grasslands of the African savanna. What likely effect would increased rainfall over several seasons have on the populations of wildebeests, lions, and cheetahs? Explain the relationships with a flow map or story map.

## Math Problem

How much time will it take for a bug that weighs 2g to travel 5 meters across the floor if it is traveling at 2 m/s ?

## Texas Essential Knowledge and Skills

**8.10A-** recognize the Sun provides the energy that drives the convection within the atmosphere and oceans, producing winds and ocean currents.

### Today's Activities:

- Can Crush Demo, Balloon Demo, Sponge Demo, Coriolis Effect Video
- Air Pressure Notes
- Convection Currents

**EQ:** What is the relationship between global winds and high/low pressure?

**Stem:** The relationship between high/low pressure and global winds is

# Air Pressure Notes

High  
Pressure

Low  
Pressure

(Day 3 Notes)  
Air Moves

Coriolis Effect

**Notes and Diagrams:**

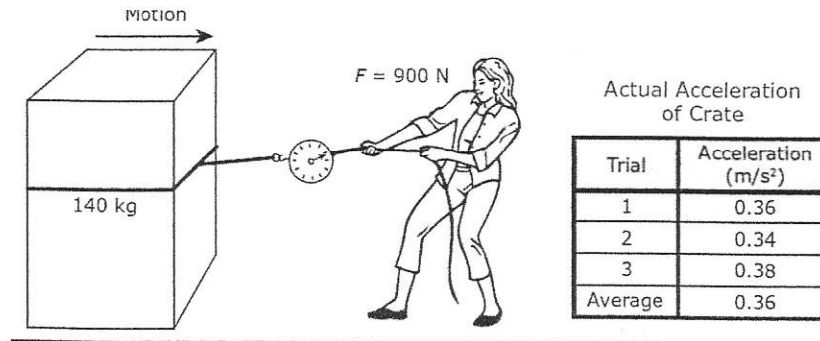
**Can Crush:**

**Balloon Demo:**

**Sponge Analogy:**

# Global Winds and Ocean Currents 3

## Bell Ringer:



The teacher asked the class to calculate the acceleration of the crate based on the crate's mass and the force she applied. What conclusion can be made about the difference between the calculated acceleration and the actual acceleration that occurred in the trials?

- A Another force in the direction of the motion produced a lower acceleration than calculated.
- B An opposing force caused by friction produced a lower acceleration than calculated.
- C Another force in the direction of the motion produced a higher acceleration than calculated.
- D An opposing force caused by friction produced a higher acceleration than calculated.

## Texas Essential Knowledge and Skills

**8.10A-** recognize the Sun provides the energy that drives the convection within the atmosphere and oceans, producing winds and ocean currents.

### Today's Activities:

- Coriolis effect globe demo
- Global winds plate notes
- Research

**EQ:** What is the relationship global winds and ocean currents?

**Stem:** The relationship between global winds and ocean currents is



# Ocean Currents and Weather

Ocean currents are a vital piece of the puzzle that explains how the global climate system works. Without them, there would be no way for Earth's oceans to distribute their incredibly large supplies of heat energy around the world, warming climates in some regions while cooling them in others.

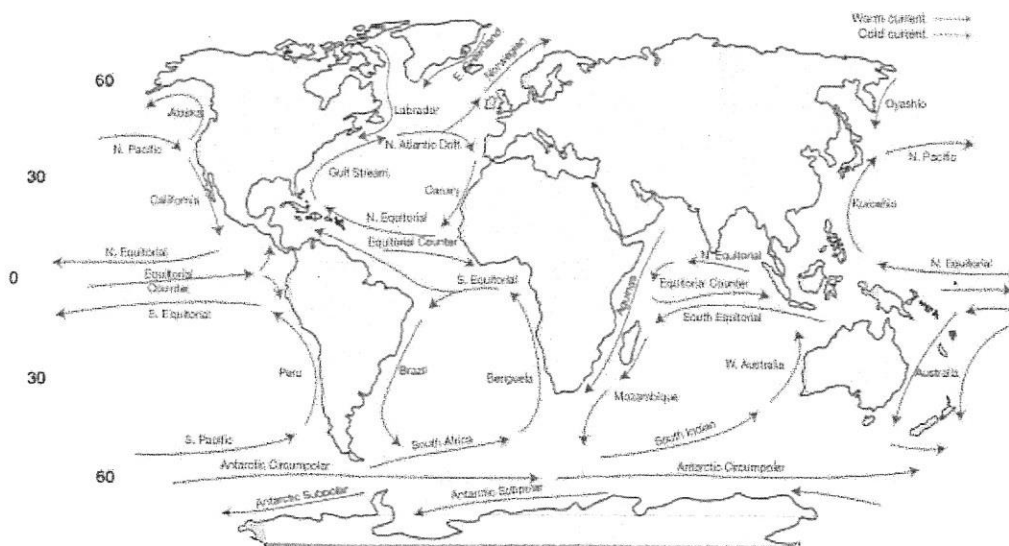
In the oceans, a *current* refers to the motion of water. There are different kinds of currents moving in paths in different parts of the world. *Tidal currents* move with the motion of high and low tides, flooding toward land and then ebbing away in response to the gravitational pull of the Moon. *Coastal currents*, such as the California Current described in the video, move in response to dominant, prevailing local winds. Open-ocean *surface currents*, meanwhile, are currents put in motion by global wind patterns, such as the tropical and sub-tropical winds that blow from the east (trade winds) or the west-to-east-flowing winds at mid-latitudes (the westerlies).

Surface ocean currents are also driven by an effect caused by Earth's rotation on its axis known as the *Coriolis effect*. The rotation of Earth acts to turn or *deflect* prevailing winds clockwise in the Northern Hemisphere and counterclockwise in the Southern Hemisphere, which deflects the surface currents.

When the winds that drive surface currents strengthen or weaken, they can cause profound changes in surface ocean currents. This is the case with the phenomenon known as *El Niño*, in which currents off the coast of South America slowdown in response to a weakening of the easterly trade winds.

In addition to surface ocean currents, there are also currents deep below the surface. *Sub surface currents* flow thousands of meters below the surface, and are driven by another mechanism: changes in the density of ocean water as it travels between the warm equator and the chilly polar regions of Earth. Warm water, as it nears the poles, becomes cooler and denser and sinks. The water, now a sub-surface current, moves in predictable patterns throughout the deep ocean, slowly mixing with less dense water.

Energy transfer is an essential function played by ocean currents. By transferring heat energy around the globe, ocean currents shape both local weather conditions and global climate. For example, warm ocean currents create the conditions that spawn tropical cyclones and hurricanes—local severe weather conditions. On a larger scale, warm ocean currents such as the Gulf Stream warm entire continents, and help create and sustain global climate conditions.



# Blown Away Surface Winds Demo

## Notes and Diagram

1. Draw and label your observations of the movement of the cinnamon and water. Include the straw in your drawing.
2. If the water represents the ocean, and your blowing through the straw represents the wind, what does this model show about the effect of wind on the surface of the ocean?
3. Newton's First Law states that an object at rest will remain at rest unless acted upon by an unbalanced force.
  - A. What was the visible object at rest in this activity? \_\_\_\_\_
  - B. What was the unbalanced force in this activity? \_\_\_\_\_
4. Based on your observations, how do you think wind causes currents in Earth's oceans?

## Independent Research

Research to answer the questions below. The links provided are just suggestions.

[oceanexplorer.noaa.gov/edu/learning/8\\_ocean\\_currents/ocean\\_currents.html#slide](http://oceanexplorer.noaa.gov/edu/learning/8_ocean_currents/ocean_currents.html#slide)

[www.nationalgeographic.org/media/ocean-currents-and-climate/](http://www.nationalgeographic.org/media/ocean-currents-and-climate/)

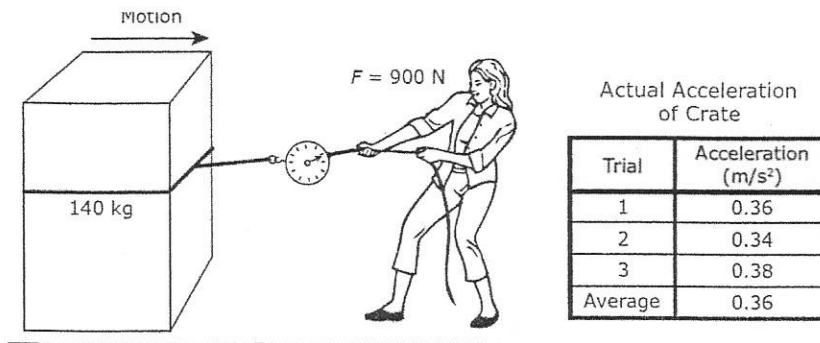
[www.pbslearningmedia.org/resource/ttv10.sci.ess.watcyc.currents/the-role-of-ocean-currents-in-climate/](http://www.pbslearningmedia.org/resource/ttv10.sci.ess.watcyc.currents/the-role-of-ocean-currents-in-climate/)

## Reflections and Conclusions

1. How are surface winds formed?
2. What are the two different types of ocean currents, and how are they formed?
3. What is the role of the Sun in the formation of convection currents in Earth's atmosphere and oceans?
4. What is the role of convection in the formation of wind and ocean currents?
5. How is thermal energy from the Sun distributed on Earth?

# El Nino 4

## Bell Ringer:



The teacher asked the class to calculate the acceleration of the crate based on the crate's mass and the force she applied. What conclusion can be made about the difference between the calculated acceleration and the actual acceleration that occurred in the trials?

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- B An opposing force caused by friction produced a lower acceleration than calculated.
- C Another force in the direction of the motion produced a higher acceleration than calculated.
- D An opposing force caused by friction produced a higher acceleration than calculated.

## Texas Essential Knowledge and Skills

8.10(C) identify the role of the oceans in the formation of weather systems such as hurricanes

**EQ:** Explain the effects of El Nino

## **El Nino Quiets Monster Storms**

The hurricane season of 2009 (June 1 through November 30) was quieter than normal. Scientists think El Niño was responsible.

### **What is El Niño?**

El Niño is a condition that sometimes occurs in the Pacific Ocean, but it is so big that it affects weather all over the world.

Weather depends a lot on ocean temperatures. Where the ocean is warm, more clouds form, and more rain falls in that part of the world. In the Pacific Ocean, near the equator, the Sun makes the water especially warm on the surface.

Normally, strong winds along the equator push the warm surface water near South America westward toward Indonesia. When this happens, the cooler water underneath rises up toward the surface of the ocean near South America.

However, sometimes these winds are weaker than usual. Sometimes they actually blow the other way (toward South America instead of Indonesia). In that case, the warm surface water along the equator piles up along the coast of South America.

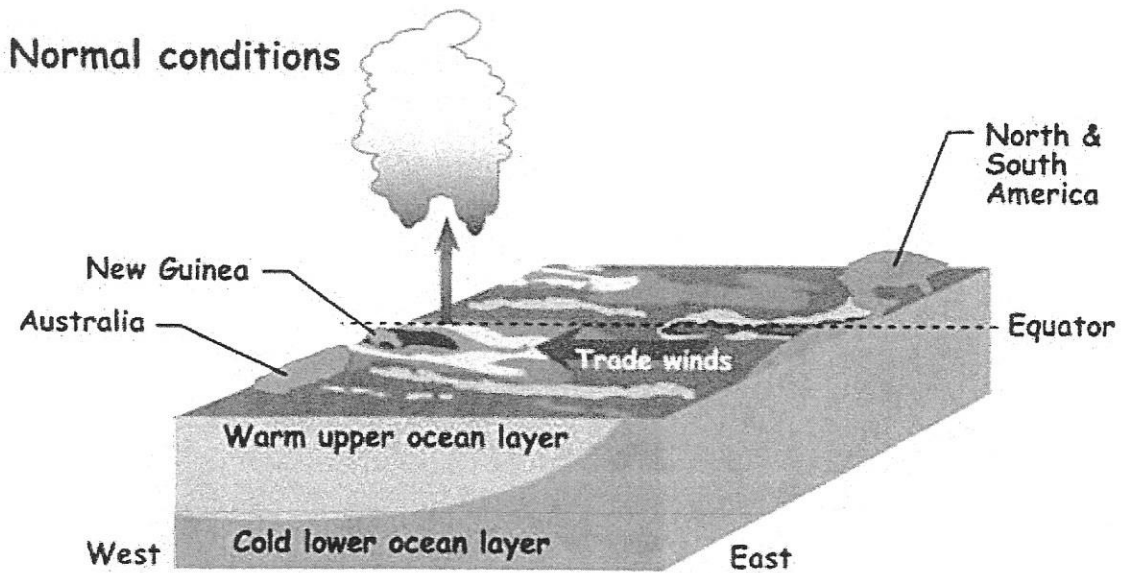
### **No fishing?**

Many fish that live in the normally cooler waters off the coast of South America move away or die. The fishermen call this condition of warm coastal waters and poor fishing "El Niño" meaning "the Christ Child," because in the occasional years it comes, it comes at Christmas time.

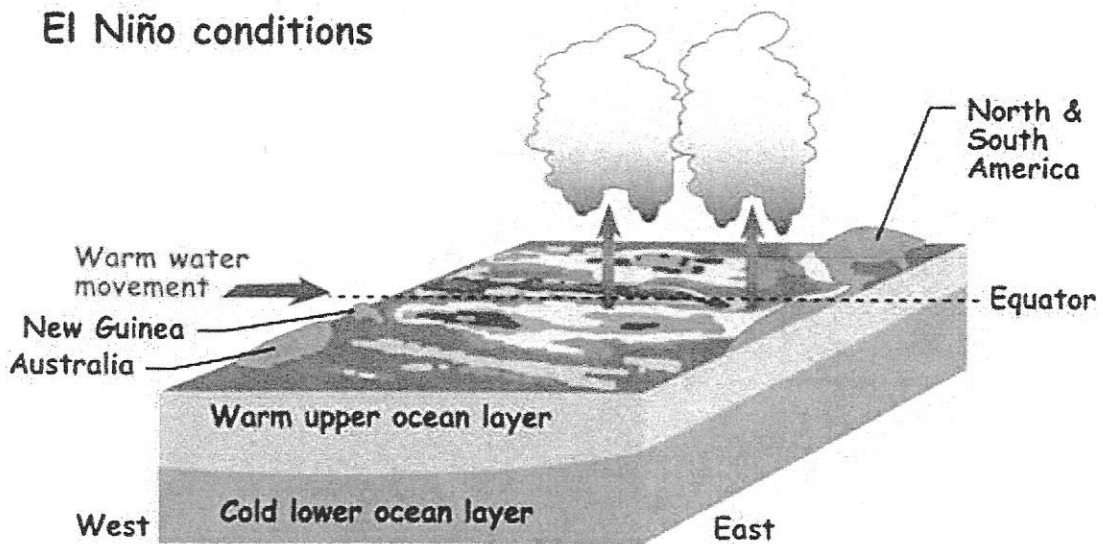
An El Niño in the Pacific Ocean affects weather patterns all over the world. One effect is that El Niño causes wind conditions in the upper atmosphere that slow down developing storms in the Atlantic Ocean. El Niño can impact U.S. weather by bringing milder conditions to northern areas and wetter conditions to the south, though not every El Niño event affects the U.S. in the same way.

La Niña is characterized by the opposite process: the trade winds strengthen, and warm water and rainstorms are pushed to the far western equatorial Pacific over Indonesia. This results in cooler surface water in the equatorial Pacific Ocean, dry conditions in Pacific coastal South America, and much wetter conditions in northern Australia and Southeast Asia. La Niña usually impacts U.S. weather by bringing cooler weather to the northwest and warmer weather to the southeast, though just like El Niño, not every La Niña event affects U.S. weather identically.

Remember Hurricane Katrina in 2005? Scientists think that climate change may cause more of these huge storms. But, at least for some years, El Niño seems to help.



*In most years, the trade winds blow across the Pacific from east to west. They push warm surface water toward Australia and Indonesia, allowing the colder, deeper water to rise up. The colder water carries more nutrients for fish than the warm water does.*



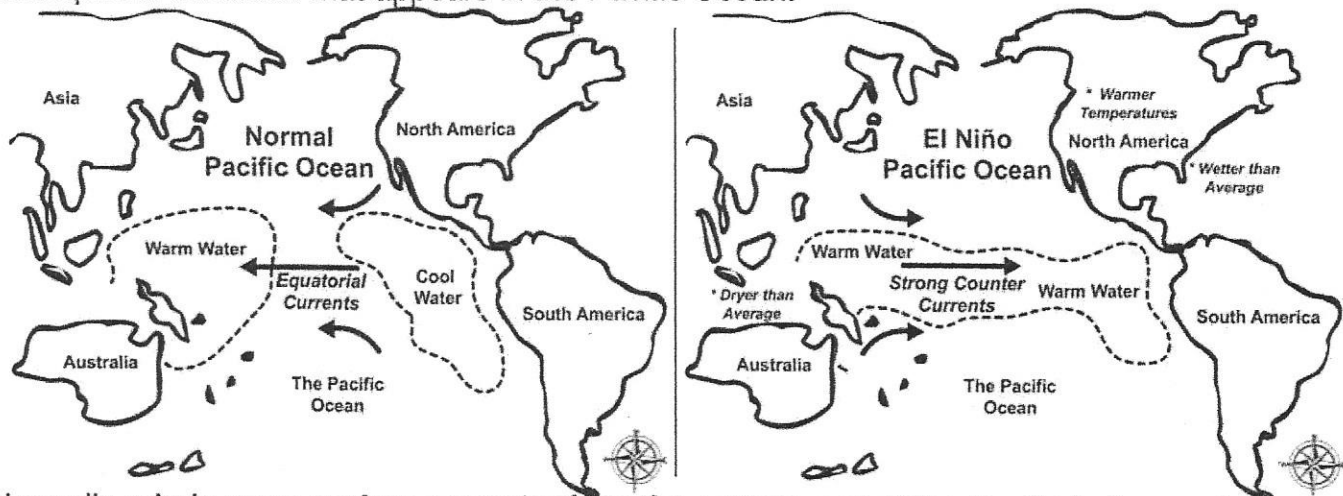
*In El Niño conditions, the trade winds are weak or may even blow in the opposite direction from normal. Warm surface water piles up near the west coast of South America, and colder water remains deep in the ocean. So the fish stay in the deeper water where the food is. More clouds form over the warmer surface water, causing more rain in some areas, and drought in others.*

# El Niño: Introduction:

Name \_\_\_\_\_

Read the information below. Then complete the "Fill-Ins".

Mudslides in Ecuador, wildfires in Australia, and extreme California rainstorms. Is it possible that all these events are related? Yes, they can be. They are all affected by changes in the ocean and atmosphere. Scientists have studied these phenomena and have linked them to the El Niño. The El Niño, also known as the El Niño-Southern Oscillation (ENSO) is an ocean and atmospheric condition that appears in the Pacific Ocean.



Normally, winds move surface seawater from the eastern part of the Pacific to the western Pacific Ocean. Because the surface water is moving west, cold deep water comes to the surface in the eastern Pacific near Central America and South America in a process called *upwelling*. The warm water in the western Pacific creates *low* pressure causing wet weather in the region. The eastern Pacific experiences *high* pressure from the cooler water causing dry conditions. However, every few years the atmosphere and ocean change during the El Niño. During an El Niño year, the warm water is driven east by strong counter currents along the equator. Parts of North America experience warmer temperatures and wetter than average winters which can cause flooding. Western Pacific countries, such as Australia, experience dryer than normal weather which can lead to drought and crop failures.

Although El Niño is often in the news, the opposite extreme can also lead to global weather changes. The phenomenon known as La Niña is an extreme cooling of the Pacific Ocean. During the La Niña, cooler water stretches across the Pacific Ocean all the way to Australia. Both El Niño and La Niña events can have far-reaching effects such as; intense rainstorms, flooding, extreme droughts, and increased number of winter storms in many areas of the world.

Complete the "Fill-In" questions below using information from above.

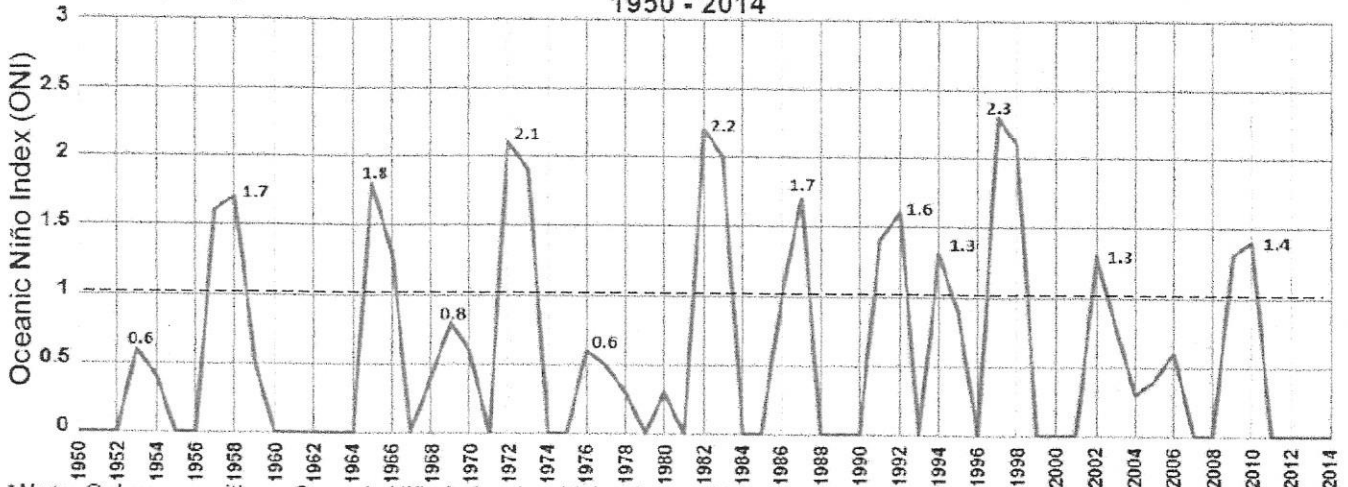
- 1 - \_\_\_\_\_ is the oceanic occurrence of warming the Pacific Ocean.
- 2 - ENSO stands for \_\_\_\_\_.
- 3 - El Niño occurs in the \_\_\_\_\_ Ocean.
- 4 - Normally, Pacific Ocean equatorial currents flow in a \_\_\_\_\_ direction.
- 5 - \_\_\_\_\_ is the process of bringing cooler water up to the ocean surface.
- 6 - During an El Niño year, parts of North America experience \_\_\_\_\_ temperatures.
- 7 - During an El Niño year, Australia may experience \_\_\_\_\_ that can cause crop failure.
- 8 - The opposite of El Niño is known as \_\_\_\_\_.

# El Niño: Lab Investigation:

Name \_\_\_\_\_

Use the graph and data below to complete the questions.

## Part 1: Comparing El Niño events El Niño Occurrences 1950 - 2014

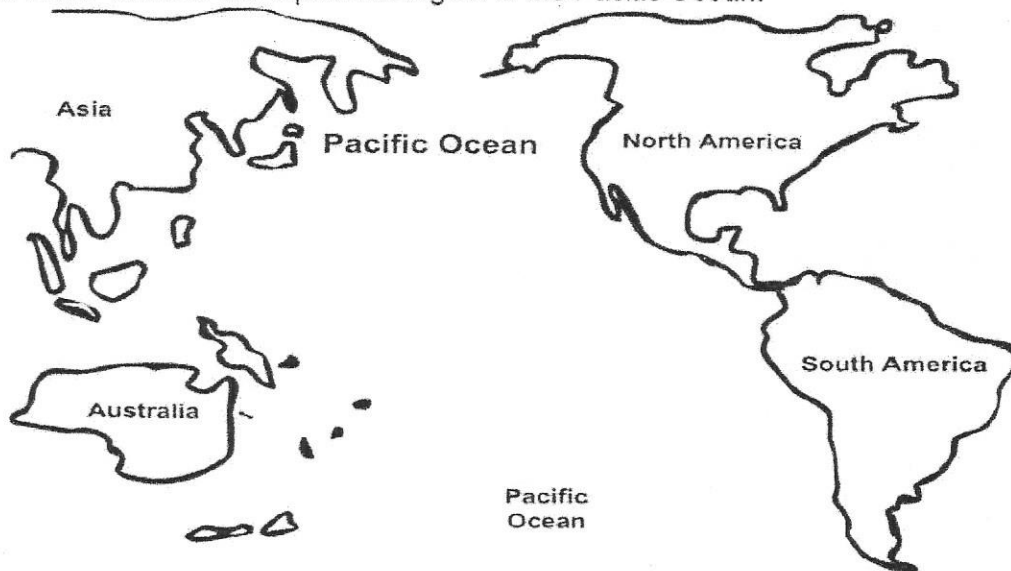


\*Note: Only years with an Oceanic Niño Index 1 or higher is considered an El Niño year.

- 1 – How many El Niño years (ONI above 1) are represented on the graph above? \_\_\_\_\_
- 2 – List the 3 most extreme El Niño years: \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_
- 3 – What was the most extreme ONI value during an El Niño year? \_\_\_\_\_
- 4 – Which two El Niño years occurred closest together? \_\_\_\_\_
- 5 – Which two El Niño years had the most time in between each event? \_\_\_\_\_
- 6 – What is the Oceanic Niño Index of the 2010 El Niño event? \_\_\_\_\_
- 7 – What decade had the most El Niño years? \_\_\_\_\_
- 8 – What are the Oceanic Niño Index for the years 1953 and 1976? \_\_\_\_\_

## Part 2: La Niña Map

As you have read about El Niño, the warming of the Pacific Ocean, you have also been introduced to La Niña, the cooling of the Pacific Ocean. Use Red and Blue colored pencils to color the map below to represent a La Niña event in the equatorial region of the Pacific Ocean.





# Hurricanes 5

## Bell Ringer:

Lake Victoria in East Africa is home to many species of fish called cichlids. In 1954 the predatory Nile perch was introduced to Lake Victoria. The Nile perch became the dominant fish species in the lake by the mid-1980s. The number of cichlid species in the lake decreased as the Nile perch population increased. The perch preyed heavily on cichlid species that fed on algae and debris on the bottom of the lake. Algae in the lake increased, and oxygen levels decreased. The surface area of the gills of some cichlid species has increased in just over 20 years. Increase in Gill Surface Area in Some Lake Victoria Cichlids 1977 1999

Which statement explains the increase in gill surface area seen in some of Lake Victoria's cichlids?

A Increased gill surface area has allowed the cichlids to change their diet and avoid competing with the Nile perch.

B Increased gill surface area has allowed the cichlids to be camouflaged and avoid being eaten by the Nile perch.

C Increased gill surface area has allowed the cichlids to leave Lake Victoria and establish populations in nearby bodies of water.

D Increased gill surface area has allowed the cichlids to better absorb the limited oxygen in the water.

## Texas Essential Knowledge and Skills

8.10(C) identify the role of the oceans in the formation of weather systems such as hurricanes

EQ: Explain why hurricanes weaken as they move northward in the Atlantic Ocean:

# Hurricanes

*Directions: Read the information, view diagrams and answer the questions in the worksheet.*

## Hurricane Basics

The ingredients for a hurricane include a pre-existing weather disturbance, warm tropical oceans, moisture, and relatively light winds aloft. If the right conditions persist long enough, they can combine to produce the violent winds, incredible waves, torrential rains, and floods we associate with this phenomenon. Each year an average of ten tropical storms develop over the Atlantic Ocean, Caribbean Sea, and Gulf of Mexico. Many of these remain over the ocean. Six of these storms become hurricanes each year. In an average 3-year period, roughly five hurricanes strike the United States coastline, killing approximately 50 to 100 people anywhere from Texas to Maine. Of these, two are typically major hurricanes (winds greater than 110 mph).

## What is a Hurricane?

A hurricane is a type of tropical cyclone, which is a generic term for a low pressure system that generally forms in the tropics. The cyclone is accompanied by thunderstorms and, in the Northern Hemisphere, a counterclockwise circulation of winds near the earth's surface.

Tropical cyclones are classified as follows:

### Tropical Depression

An organized system of clouds and thunderstorms with a defined surface circulation and maximum sustained winds of 38 mph or less

**Tropical Storm** An organized system of strong thunderstorms with a defined surface circulation and maximum sustained winds of 39-73 mph

**Hurricane** An intense tropical weather system of strong thunderstorms with a well-defined surface circulation and maximum sustained winds of 74 mph or higher. Hurricanes are categorized according to the strength of their winds using the Saffir-Simpson Hurricane Scale. A Category 1 storm has the lowest wind speeds, while a Category 5 hurricane has the strongest. These are relative terms, because lower category storms can sometimes inflict greater damage than higher category storms, depending on where they strike and the particular hazards they bring. In fact, tropical storms can also produce significant damage and loss of life, mainly due to flooding.

## Hurricane Names

When the winds from these storms reach 39 mph the cyclone is given a name. Years ago, an international committee developed six separate lists of names for these storms. Each list alternates between male and female names. The use of these easily remembered names greatly reduces confusion when two or more tropical cyclones occur at the same time. Each list is reused every six years, although hurricane names that have resulted in substantial damage or death are retired.

### Saffir-Simpson Hurricane Scale

**CATEGORY ONE: Winds 74-95 mph:** No real damage to building structures, Damage primarily to unanchored mobile homes, shrubbery, and trees. Also, some coastal road flooding and minor pier damage.

**CATEGORY TWO: Winds 96-110 mph:** Some roofing material, door, and window damage to buildings. Considerable damage to vegetation, mobile homes, and piers. Small craft in unprotected anchorages break moorings.

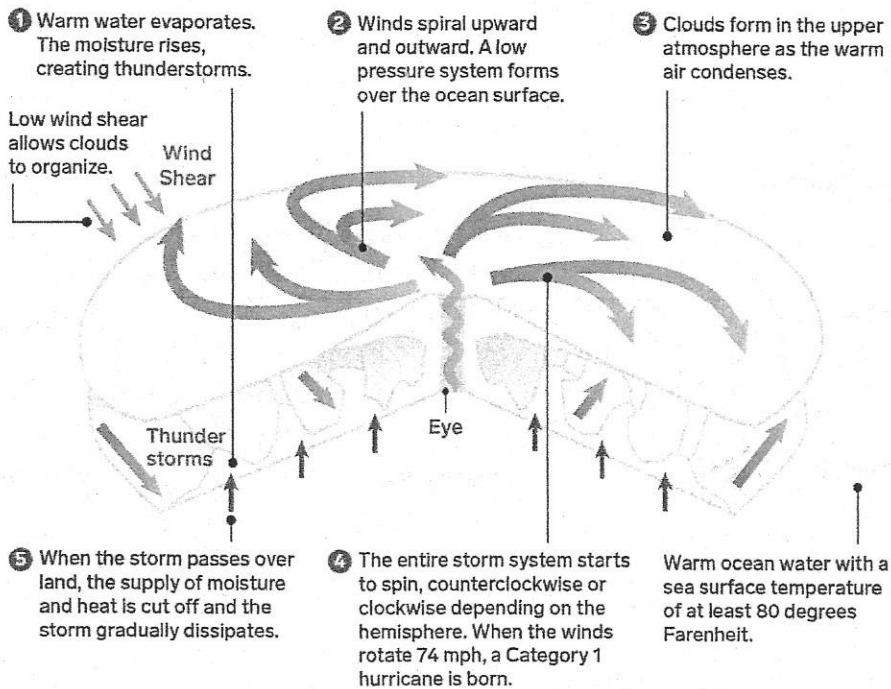
**CATEGORY THREE: Winds 111-130 mph:** Some structural damage to small residences and utility buildings with a minor amount of curtainwall failures, Mobile homes are destroyed. Flooding near the coast destroys smaller structures with larger structures damaged by floating debris. Terrain may be flooded well inland.

**CATEGORY FOUR: Winds 131-155 mph:** More extensive curtainwall failures with some complete roof structure failure on small residences. Major erosion of beach areas. Major damage to lower floors of structures near the shore Terrain may be flooded well inland.

**CATEGORY FIVE: Winds greater than 155 mph:** Complete roof failure on many residences and industrial buildings. Some complete building failures with small utility buildings blown over or away. Major damage to lower floors of all structures located near the shoreline. Massive evacuation of residential areas may be required.

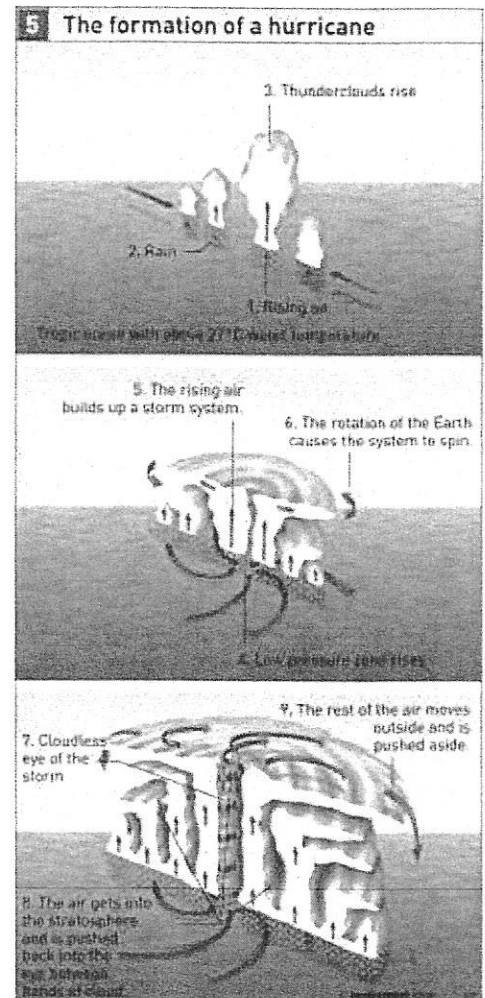
1. What conditions are necessary for a hurricane to form?
2. On average, how many hurricanes form each year?
3. Which direction do hurricanes rotate?
4. What factor determines whether a storm is considered a tropical depression, tropical storm, or hurricane?
5. What is the name of the scale used to measure hurricane strength and what is the range of that scale?
6. How do hurricanes receive their names?

## How a hurricane forms



Source: The National Hurricane Center

Insider Inc.



## ULTIMATE GUIDE EXTREME WEATHER

### DAY 1

#### Intro

The Earth would be a lifeless rock without the \_\_\_\_\_, Or more specifically the bottom \_\_\_ miles known as the troposphere. The troposphere is saturated with \_\_\_\_\_. All weather happens in the \_\_\_\_\_ level.

The \_\_\_\_\_ drives the weather by heating the \_\_\_\_\_. The 3 things you need to get weather are \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

#### Hurricanes

Hurricanes, \_\_\_\_\_, cyclone are different name from different latitudes for the same kind of storm.

All tropical systems start in the same general \_\_\_\_\_ and in the same \_\_\_\_\_. The ocean has been warmed to at least \_\_\_\_\_ degrees F.

When the ocean surface is \_\_\_F or more, the \_\_\_\_\_ carries \_\_\_\_\_ with it. As it rises, the air \_\_\_\_\_ causing rain. Heat is released and creates a \_\_\_\_\_. More wet air rushes to replace it. The Earth's \_\_\_\_\_ causes the wind to \_\_\_\_\_ around the eye.

The 3 dangers of hurricanes are \_\_\_\_\_, \_\_\_\_\_ and storm surge.

#### Thunderstorms

Every year in the US, lightning strikes \_\_\_\_\_ million times. Thunderstorms are most common in the \_\_\_\_\_ months because of the \_\_\_\_\_ from the sun. When the heat hits the ground, the \_\_\_\_\_ rises. As it gets higher, it cools and \_\_\_\_\_ producing clouds. \_\_\_\_\_ clouds are the biggest clouds of all. The static charge that builds up produces \_\_\_\_\_. Lightning is \_\_\_\_\_ times hotter than the sun. It makes the air around it explode which we hear as \_\_\_\_\_.

# Extreme Weather 6

## Bell Ringer:

A student must complete the column of the table that lists the dates of the full moons.

Dates of New Moons	Dates of Full Moons
February 10	
March 11	
April 10	
May 9	

What are the most likely dates of the full moons?

A February 5, March 7, April 5, May 4

B February 15, March 17, April 15, May 14

C February 25, March 27, April 25, May 24

D February 29, March 31, April 29, May 28

## Texas Essential Knowledge and Skills

**8.10B-** identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts.

**EQ:** Explain the role of convection in violent weather:

## DAY 2

### Tornados, the \_\_\_\_\_ winds on Earth

There are about a \_\_\_\_\_ tornadoes a year in the US. \_\_\_\_\_, Oklahoma and \_\_\_\_\_ are where \_\_\_\_\_ of all American tornadoes are born. Moist breezes from the \_\_\_\_\_ sweep towards Canada. Very high up, the \_\_\_\_\_ barrels down from west Canada. Sandwiched between is a layer of dry, warm \_\_\_\_\_. Thunder clouds are created by convection. They rise until they hit the "ceiling" called a \_\_\_\_\_ which keeps them from rising further. Sometimes they burst through the barrier up into the \_\_\_\_\_. The \_\_\_\_\_ puts the "twist" into the twister. At the \_\_\_\_\_ the clouds blow one way. At the \_\_\_\_\_ they blow the other. From the ground you see a \_\_\_\_\_ with a fast, spinning center.

### Monsoons

\_\_\_\_\_ bring the World's heaviest rain. There are monsoons in Africa and all over southern Asia, but the \_\_\_\_\_ monsoons are the biggest. They start with an extreme \_\_\_\_\_ of rain and extreme heat. The hot air rises and is replaced by sea breezes that carry \_\_\_\_\_ full of moisture to the area. This starts the \_\_\_\_\_ season. The clouds cross the mountains and settle in the \_\_\_\_\_ pressure left by the heat. Unlike other extreme weather, the monsoons are \_\_\_\_\_.

### Flash Flood

A flash flood is the result of a lot of \_\_\_\_\_ over a \_\_\_\_\_ area being funneled into a \_\_\_\_\_ area. What makes a flash flood so destructive is its \_\_\_\_\_.

### Blizzards

A blizzard is snow blown in a wind at more than \_\_\_\_\_ mph. Antarctica is actually more like a \_\_\_\_\_ because it gets so little snowfall.

### Ice Storms

Ice storms are the result of \_\_\_\_\_ falling on very \_\_\_\_\_ ground. Large droplets spread out on impact, coating surfaces with \_\_\_\_\_ ice known as \_\_\_\_\_.

### Predicting Weather

The most you can do about the weather is to try to \_\_\_\_\_ it.

What are some tools that we use to predict weather?

# Reading Weather Maps and Predicting 7

## Bell Ringer:

A group of scientists studied some trees in a pine forest. In the densely forested areas, the trees were within 1m of each other. The scientists observed that these trees had dead branches near the ground. They measured the height above the ground at which the first living branches were found on different-sized trees in the forest. Then they repeated this procedure on the same kind of trees in an open meadow. This graph summarizes the scientists' data.

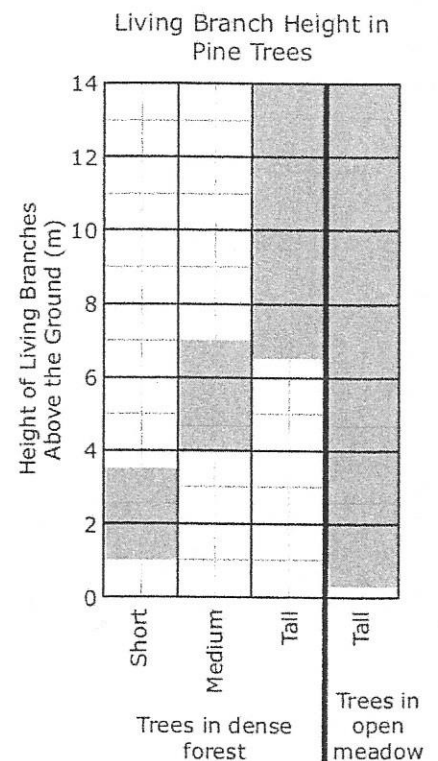
Which inference is best supported by these data?

A Pine trees in a dense forest can grow taller than pine trees in an open meadow.

B Pine trees in a dense forest compete for sunlight with the surrounding trees.

C Pine trees in a dense forest are part of a less-complex food web than pine trees in an open meadow.

D Pine trees in a dense forest have more living branches than pine trees in an open meadow.



## Texas Essential Knowledge and Skill

**8.10B-** identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts.

**EQ:** If you were going on vacation to the lake this summer. What type of pressure system would you want to experience and why?

# Guided Weather Map Notes

## Air Pressure

<p><b>High Pressure</b></p> <p>symbol</p>	<p><b>Density</b></p> <p><b>Amount of moisture</b></p>	<p><b>Weather</b></p>
<p><b>Low Pressure</b></p> <p>symbol</p>	<p><b>Density</b></p> <p><b>Amount of moisture</b></p>	<p><b>Weather</b></p>



Explain why it would be a nice day to be outside in Texas on May 4 2017:

Explain why the Mississippi Valley is under a Flash Flood Warning:

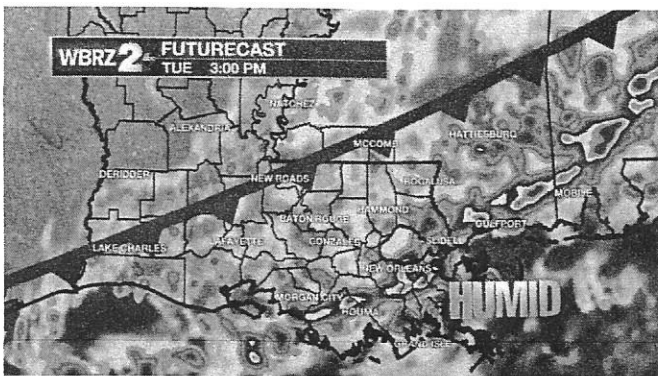


## Fronts:

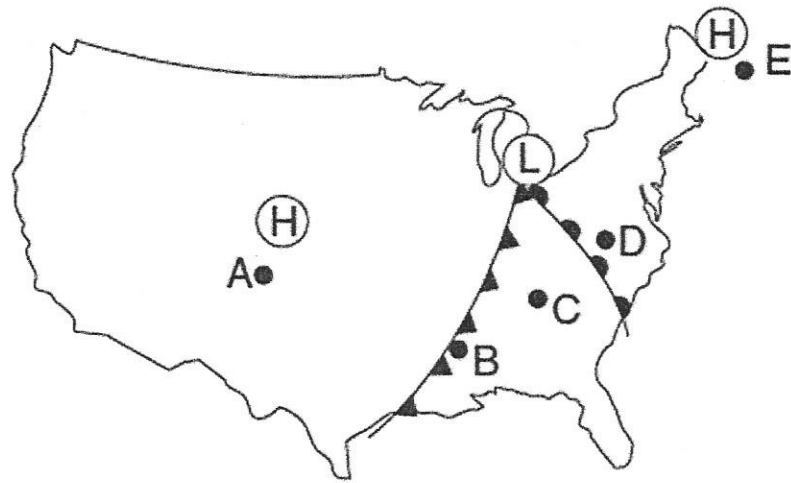
Cold	Density	
Warm	Density	
Stationary		
Occluded		

In the USA fronts tend to move:

“Bad weather” occurs-



Explain the occurrence of thunderstorms on the map focusing on the density and moisture content of the air masses:



Key	
(H)	High pressure
(L)	Low pressure

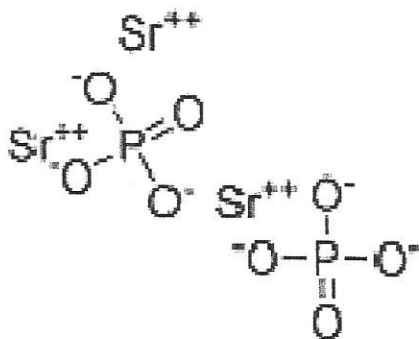
Explain the weather today, tomorrow and 2 days from now for each of the cities shown by the letters:

Example: City E is currently having dry, sunny weather. Tomorrow there is a chance of more humidity and warmer temperatures as low pressure and a warm front approaches. Day 3 will bring strong thunderstorms and cooler temperatures as the cold front overtakes the warm air mass.

## Weather Maps and Predicting Practice 8

### Bell Ringer:

Strontium phosphate,  $\text{Sr}_3(\text{PO}_4)_2$  is a crystalline substance used in medicine and industry. How many total atoms are represented in 4 molecules of Strontium Phosphate?



### Texas Essential Knowledge and Skill

**8.10B-** identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts.

**EQ:** Why is it a benefit to have a high pressure system over Texas when there is a hurricane forming in the Caribbean?

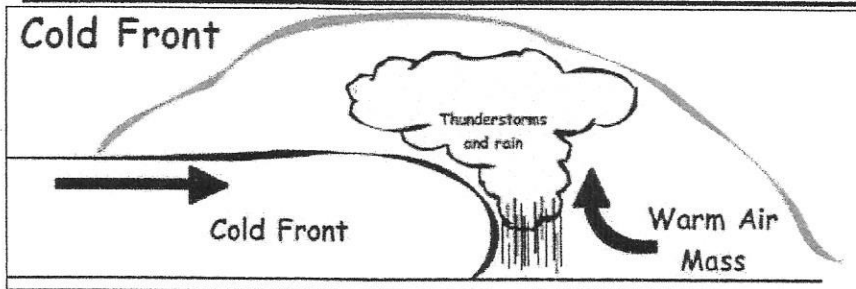
# Weather Fronts: Introduction

Name \_\_\_\_\_

Instructions: Read through the Weather Front descriptions.

Then complete the "What Type" questions at bottom of page.

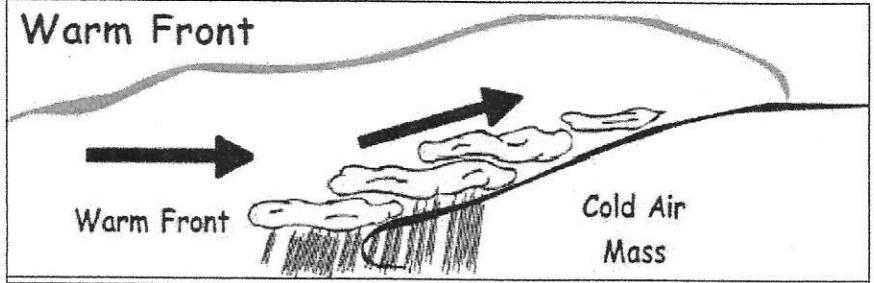
## Cold Front



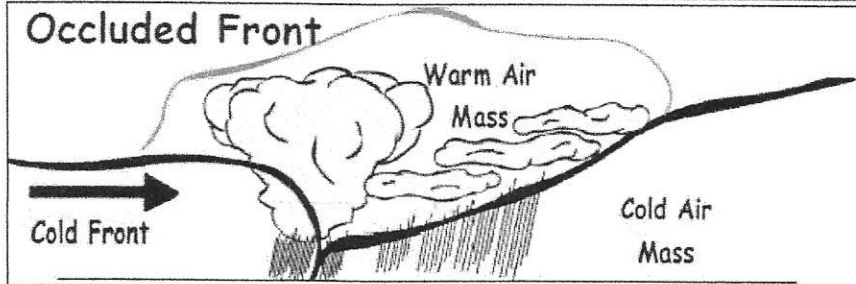
A Cold Front moves faster than a warm air mass. The warm humid air is pushed up and results in a short period of heavy rain and possibly violent thunderstorms.

A Warm Front moves slower than a cold air mass. The warm air rises steadily above the cooler air mass and causes gentle rain showers for longer periods of time.

## Warm Front



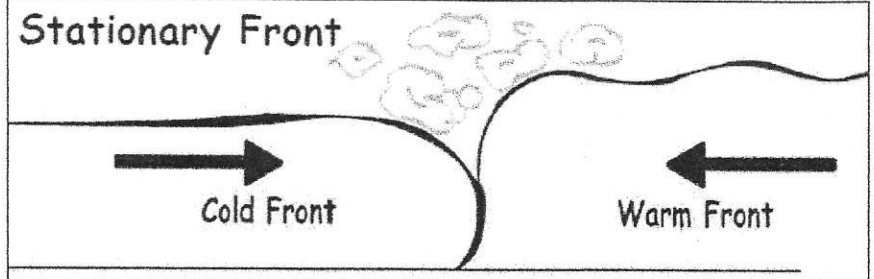
## Occluded Front



An Occluded Front is a combination of two fronts that form when a cold front catches up and overtakes a warm front. The result is a mix of rain showers and thunderstorms.

A Stationary Front is the boundary between two air masses when neither is moving. Clear skies to partly cloudy skies may result, with occasional light rain.

## Stationary Front



What Type?

Cold Front

Warm Front

Occluded Front

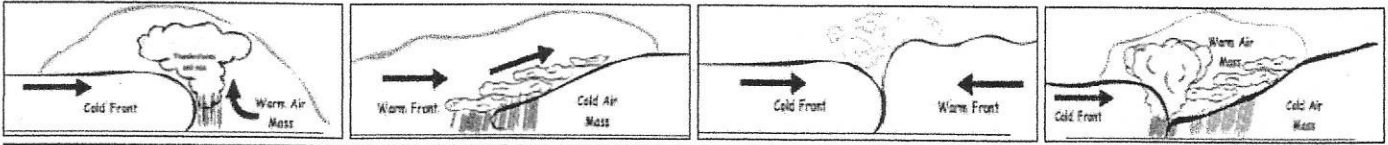
Stationary Front

- 1- What type of front produces gentle rain showers? \_\_\_\_\_
- 2- What type of front involves 3 different air masses? \_\_\_\_\_
- 3- What type of front may have clear skies? \_\_\_\_\_
- 4- What type of front creates violent thunderstorms? \_\_\_\_\_
- 5- What type of front is stalled or still? \_\_\_\_\_
- 6- What type of front has rain showers and thunderstorms? \_\_\_\_\_

# Weather Fronts: Investigation

Name \_\_\_\_\_

Instructions: Use the word bank to fill in the blanks in the weather front paragraph.

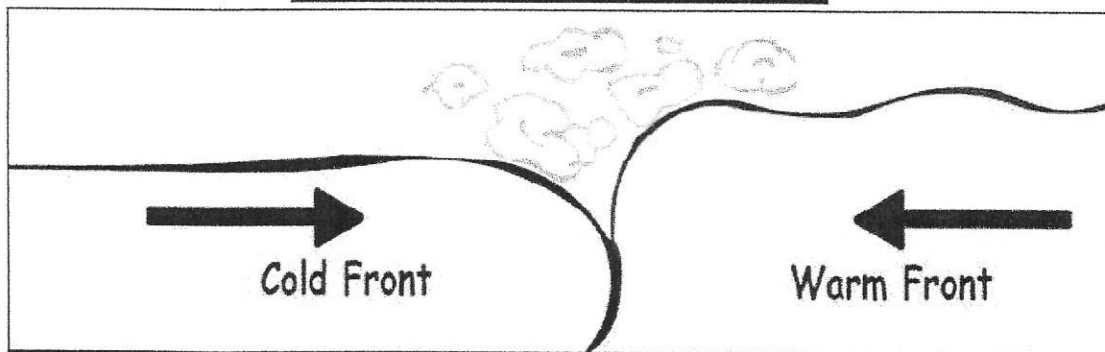


- Word Bank -

above    change    masses    boundary    two    direction  
 period    cloudy    thunderstorms    cold  
 overtakes    temperature

**Weather Fronts** mark the \_\_\_\_\_ between two air masses. The air masses can have large \_\_\_\_\_ differences on either side of the front. When a weather front passes, there is often a \_\_\_\_\_ in wind \_\_\_\_\_ as well as changes in temperature. **Cold Fronts** occur when a colder air mass \_\_\_\_\_ a warmer air mass. This can create a short \_\_\_\_\_ of heavy rain and strong \_\_\_\_\_. **Warm Fronts** move slower than cold air \_\_\_\_\_. A warm front will steadily rise \_\_\_\_\_ the cooler air and create gentle rain showers. An **Occluded Front** is formed when a \_\_\_\_\_ front catches and overtakes a warm front. A mix of rain and thunderstorms can occur as a result. A **Stationary Front** is the boundary between \_\_\_\_\_ air masses that are not moving. Clear skies or partly \_\_\_\_\_ skies may occur, with occasional light rain.

Instructions: Color the Warm Air RED and the Cold Air BLUE. Then label the diagram with the correct weather front name.

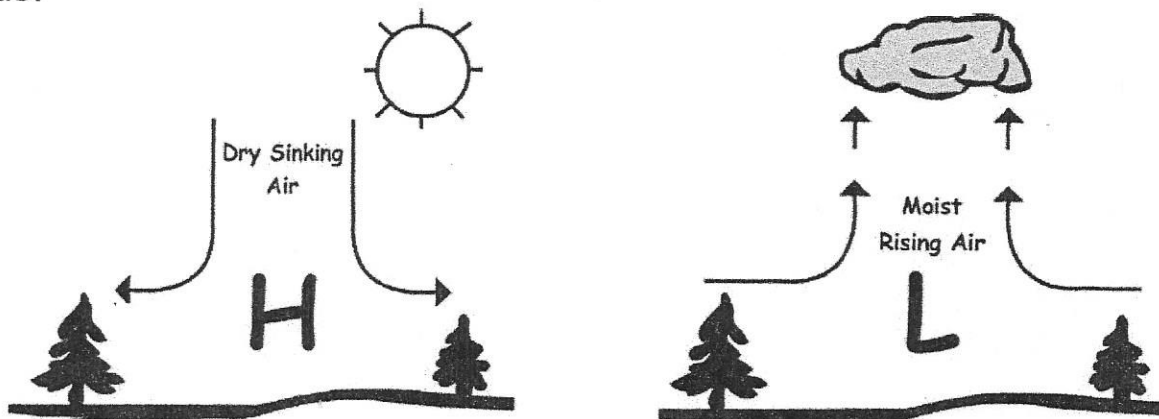


# High and Low Pressure: Introduction

Name \_\_\_\_\_

Instructions: Read through the information below. Then complete the High / Low statements at bottom of page.

Weather can vary day to day and place to place. One of the many factors of our daily weather is Air Pressure. **Highs** and **Lows** are areas where the air pressure is higher or lower than surrounding areas. Weather maps show these areas using a large "H" to represent High pressure and a large "L" to represent Low pressure. As these Highs and Lows travel across the country, they bring changes in weather. Generally High pressure areas bring fair weather with clear skies, while Low pressure brings stormy weather and clouds.



Each type of pressure has its own characteristics. High pressure systems rotate clockwise and contain sinking dry air. Low pressure systems rotate counterclockwise and contain moist rising air.

Circle the correct choice for each statement as High or Low :

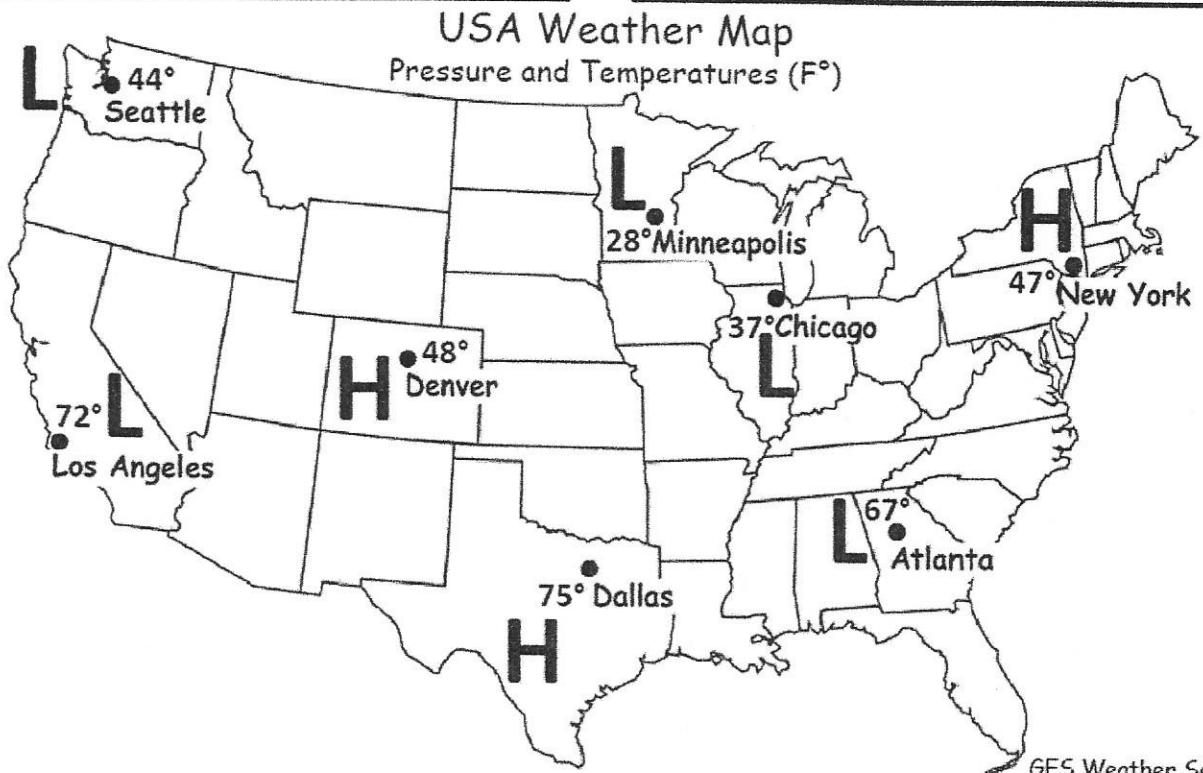
- 1- This type of air pressure is sinking. High or Low
- 2- This type of air pressure causes rain and clouds. High or Low
- 3- This type of air pressure is rising. High or Low
- 4- This type of air pressure rotates clockwise. High or Low
- 5- This type of air pressure means sunny skies. High or Low
- 6- This type of air pressure rotates counterclockwise. High or Low
- 7- This type of air pressure is represented by an "H". High or Low
- 8- This type of air pressure contains dry air. High or Low

# High and Low Pressure: Weather Map

Name \_\_\_\_\_

Instructions: Look at the USA weather map below. Then complete the weather forecast for the chosen cities.

<p>High pressure, "H" usually means clear skies and nice sunny weather.</p>		<p>Low pressure, "L" usually means cloudy skies, rain, and snow if temperatures are cold enough.</p>	
---	--	--	--



USA City Forecast – Select the best weather forecast for each city by circling your choice.

City	Forecast 1	Forecast 2	Forecast 3
Dallas	Sunny Skies	Rain Showers	Snow Flurries
Seattle	Sunny Skies	Rain Showers	Snow Flurries
Minneapolis	Sunny Skies	Rain Showers	Snow Flurries
Atlanta	Sunny Skies	Rain Showers	Snow Flurries
Denver	Sunny Skies	Rain Showers	Snow Flurries
New York	Sunny Skies	Rain Showers	Snow Flurries
Chicago	Sunny Skies	Rain Showers	Snow Flurries
Los Angeles	Sunny Skies	Rain Showers	Snow Flurries



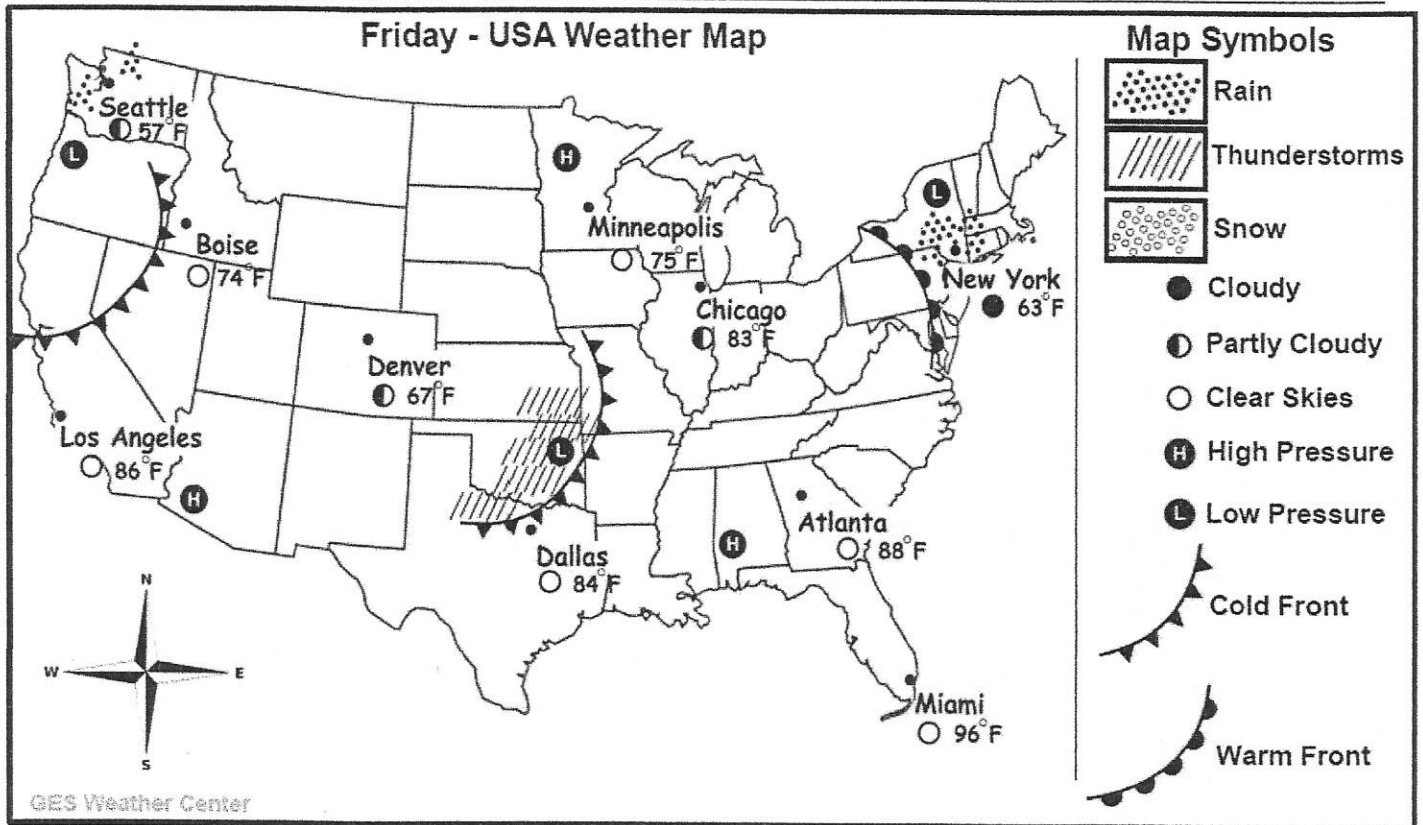


# Weather Maps I: Forecast Practice

Name \_\_\_\_\_

Read the information below. Then use the weather map and symbols to complete the weather forecast questions below.

In the United States, the weather generally moves across the country from west to east. Meteorologists can use this pattern to help predict the weather, as fronts, storms or pressure systems move across the country. Meteorologists can accurately predict the weather between 24 and 48 hours in advance. Accurately predicting the weather helps communities be better prepared for any weather condition.



### Weather Forecast questions:

Circle the best weather Forecast for Saturday for each city based on the map above.

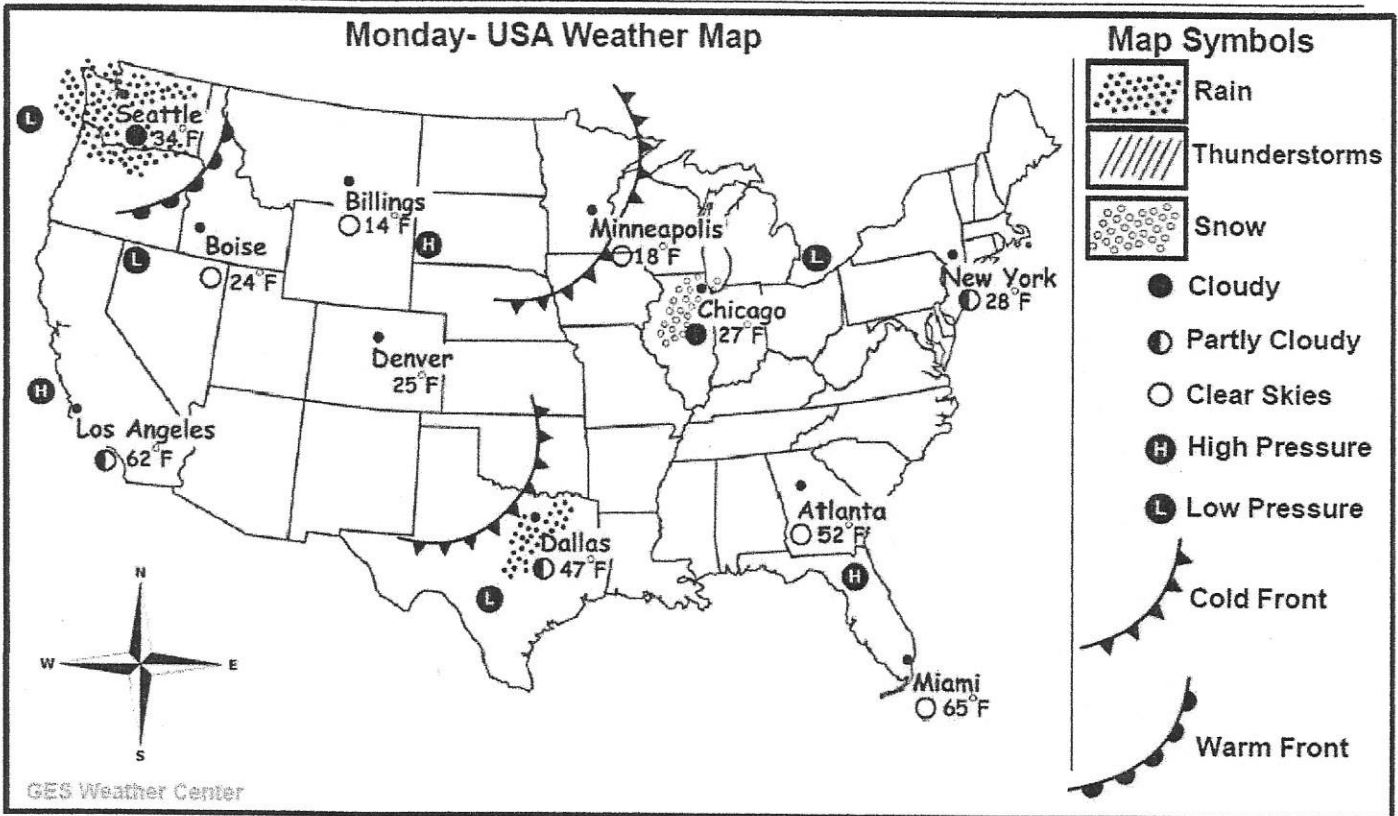
City	Forecast 1	Forecast 2	Forecast 3
1 - New York	Sunny Skies	Warmer Temperatures	Snow
2 - Los Angeles	Cooler Temperatures	Rain	Thunderstorms
3 - Dallas	Thunderstorms	Warmer Temperatures	Clear Skies
4 - Minneapolis	Snow	Cloudy	Sunny Skies
5 - Boise	Cloudy	Cooler Temperatures	Snow
6 - Miami	Sunny Skies	Warmer Temperatures	Rain
7 - Chicago	Rain	Warmer Temperatures	Sunny Skies
8 - Seattle	Sunny Skies	Rain	Warmer Temperatures

# Weather Maps II: Forecast Practice

Name \_\_\_\_\_

Read the information below. Then use the weather map and symbols to complete the weather forecast questions below.

In the United States, the weather generally moves across the country from west to east. Meteorologists can use this pattern to help predict the weather, as fronts, storms or pressure systems move across the country. Meteorologists can accurately predict the weather between 24 and 48 hours in advance. Accurately predicting the weather helps communities be better prepared for any weather condition.



### Weather Forecast questions:

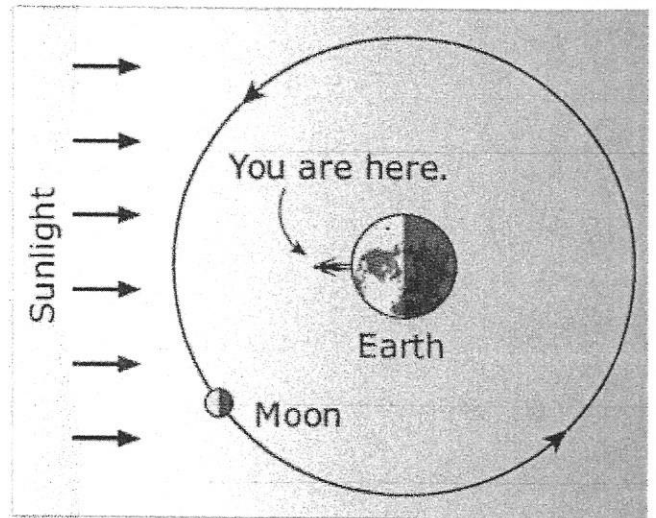
Circle the best weather Forecast for Tuesday for each city based on the map above.

City	Forecast 1	Forecast 2	Forecast 3
1 – New York	Sunny Skies	Thunderstorms	Cloudy
2 – Chicago	Cooler Temperatures	Thunderstorms	Warmer / Rain
3 – Boise	Cooler Temperatures	Warmer / Rain	Clear Skies
4 – Minneapolis	Clear Skies / Cold	Snow	Sunny Skies
5 – Dallas	Cloudy	Cooler Temperatures	Warmer Temperatures
6 – Billings	Sunny Skies	Warmer / Rain	Cold / Snow
7 – Los Angeles	Rain	Thunderstorms	Sunny Skies
8 – Seattle	Sunny Skies	Rain	Cooler Temperatures

# Weather Map Project 9

## Bell Ringer:

A student shows a model of Earth and the moon to a class. Draw how the moon appears from Earth when it is in the position shown in this model.



## Texas Essential Knowledge and Skill

**8.10B-** identify how global patterns of atmospheric movement influence local weather using weather maps that show high and low pressures and fronts.

**EQ:** Explain why weather systems move (hint density/pressure). Describe the general movement of weather in North America.

# **Weather Project (Test Grade)**

## **2 day Activity**

**Goal:** Read weather maps for current and future weather patterns.

**Assessment:** Weather Map- 20 points

Summary of your weather map (current and future)-50 points

Gallery Walk summary of weather (current and future) in 3 cities- 30 points

### **Weather Map Day 1**

- 1. Identify and label at least 5 cities on your map. All sections of the USA should be represented.**
- 2. Using yarn for your front boundaries, create a weather map. Glue the yarn down**  
**Red marker- Warm Fronts**  
**Blue marker- Cold Fronts**
- 3. Using a black marker, label areas of high (H) and low (L) pressure**
- 4. Write a weather report discussing the current and future weather for 5 cities. Be sure to include the date of the weather report. Write as if you are actually the weather reporter. This will be turned in stapled to the map.**

### **Gallery Walk Day 2**

**Write a weather report discussing the current and future weather for 2 cities. The cities must be on different maps. Be sure to include the date of the weather report. Write as if you are actually the weather reporter.**

**Be prepared to present your report for at least one city to the class. Not everyone will present (Random Number). The map will be placed under the document camera.**

DRAFT Copy

