How Do Storms Form?

7th Grade Earth Science Unit Materials

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How Will I Be Graded?

Assessment is an important tool for providing students with feedback to help them improve, as well as allow parents to monitor their child's progress. In science classes, students will receive standards based grades for their assignments. Their progress will be reported using grade reports online. This means that most assignments will be evaluated on a 4-point rubric with the following values:

How to Read Your Scores on Assignments

Rubric Value:	What it Means:	Should you redo this assignment?
Mastery	I can do this well enough to teach others.	No. You have finished this assessment.
Proficient	I am able to do this.	You can if you are not satisfied.
Developing	I am in the process of learning to do this.	You must redo this assignment.
Beginning	I have not started learning to do this.	You must redo this assignment.

Can I Redo an Assignment?

With the exception of Exit Slips, all assignments can be redone. You are encouraged to work on an assignment until you have a score that is satisfactory to both you and your teacher. Mrs. Ostrowski and Mr. Bingaman are satisfied with ratings of "proficient" or better. You may set higher standards for yourself. If an assignment does not meet these standards they should be redone until you have learned to complete them satisfactorily.

For a complete explanation of how to redo an assignment or retake a test please visit us at:

www.south7thscience.com

Name _____ Period _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 1: Why Are Temperatures Different?

Activity 1.1

Purpose

The purpose of this activity is to see how temperatures differ in different parts of the country.

Procedure

A complete set of video instructions for this lab can be found at: **goo.gl/2TZRzb**

1. You will need to assign colors for the temperatures in the key. Look at the highest and lowest temperatures on the map. Cross out the ranges in the key that are not represented on the map.
2. Next choose a color for each temperature range in the key. It is common to use cool colors such as blue for low temperatures and warm colors such as red for high temperatures.
3. Shade each temperature recorded on the map the appropriate color.
4. Starting with the highest temperatures, add smooth lines to contain regions of similar temperature. Shade the entire area the color for that temperature range.
5. Repeat the process for the next temperature range down. As you add lines and shade regions remember these rules.
    a. Isotherm lines never cross each other.
    b. Shaded regions that are not next to each other on the key will not touch each other on the map.
    c. There will never be a place where three or more colors meet each other.
6. When you have completed the map, answer the following questions

Analysis

What date was this data collected? _____

What time was it in Arlington Heights when this data was collected? _____

What is the general pattern that temperatures tend to fall in in the United States? _____

_____

Why do you think this happens? _____

_____

_____

Name _____ Period _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 1: How is Air Heated?

Activity 1.2

Purpose

The purpose of this activity is to show how sunlight can heat air.

✚ Safety

Be careful with the heat lamp. As the name implies, it gets hot.

Procedure

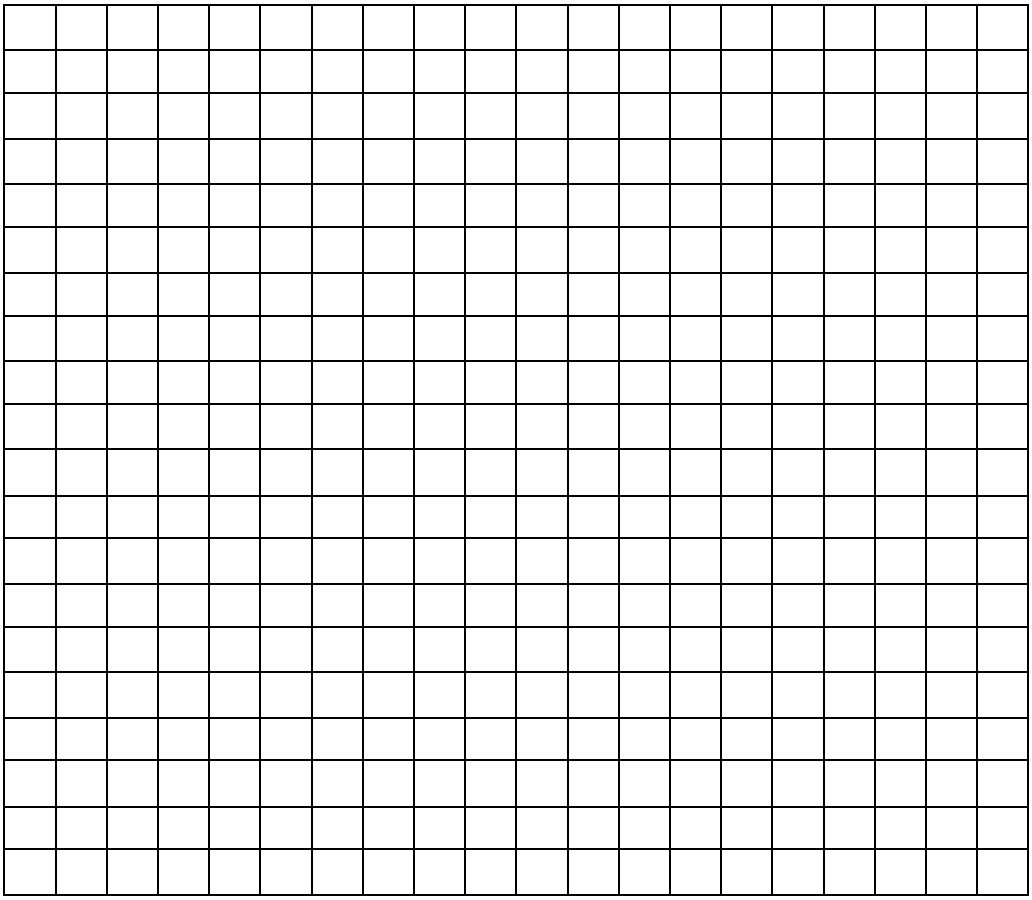
Place a sheet of aluminum foil, and black felt side by side on a table. Place a thermometer just above each surface. Record the temperature on each thermometer in the row labeled start. Place a heat lamp about half a meter above the table. Turn the heat lamp on. Record the temperature on each thermometer every 20 seconds for 5 minutes.

Data Table

Time	Air Temperature Above Aluminum Foil	Air Temperature Above Black Felt		Time	Air Temperature Above Aluminum Foil	Air Temperature Above Black Felt
Start				**2:40**		
0:20				**3:00**		
0:40				**3:20**		
1:00				**3:40**		
1:20				**4:00**		
1:40				**4:20**		
2:00				**4:40**		
2:20				**5:00**		

Analysis

Draw a line graph below using your data you collected.



Conclusion

Go to Google Classroom (classroom.google.com) and answer the following question:

How is air heated?

Make sure you answer the question with a clear and concise **claim**. Be sure to support your answer with **evidence** from this lab. Explain your **reasoning** using a scientific principle.

Name _____ Period _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 2: What Happens When Air is Heated or Cooled?

Activity 2.1

Purpose

Today we are making a model to help us understand what happens when air on the Earth is heated and cooled. You are going to make a closed system with a glove over a bottle.

✚ Safety

Take caution not to touch the hot plate or hot water as it may cause severe burns to skin.

Prediction

You will heat the bottle by putting it in a dish of very hot water. Then you will cool the bottle by placing it in a bowl of ice. Predict what will happen to the mass and volume of the system when it is heated or cooled.

	The mass of the system will:	The volume of the system will:
When place in hot water…		
When placed in cold water…		

Procedure

1. Place the glove over the bottle and pull it down until the top of the bottle fills the palm of the glove.
2. Weigh the bottle with the glove. **Record** the mass under "At Room Temperature (Before)".
3. In the chart, **describe** what the glove and bottle look like before you begin.
4. Stand the bottle in the beaker of hot water. Let the bottle sit for two minutes. You may need to gently push the bottle down and hold it there. Do let the water overflow!
5. **Record** your observations in the chart under "After Heating".
6. Remove the bottle from the hot water and immediately place it into the ice water bath two minutes.
7. **Record** your observations in the chart under "After Cooling".
8. Remove the bottle from the ice-water bath. Allow the bottle to return to room temperature. Dry the bottle off. Weigh the bottle and glove again. **Record** this mass under "At Room Temperature (After)". Be sure to **describe** what the room temperature bottle and glove look like too.

Data

	At Room Temperature (Before)	After Heating	After Cooling	At Room Temperature (After)
Description of the Bottle				
Description of glove				
Mass of glove and bottle				

Making Sense

Create a model to show what happened to the air particles in the bottle and the energy. Your model should show what happened to the matter and energy when the bottle was heated and then when it was cooled. Include:

- The bottle, glove, heat source and ice bath.
- The arrangement of air molecules in the bottle and the glove.
- Arrows to show the movement and speed of air particles.

Room Temperature:	Heated:	Cooled:

How does this experiment with the bottle and glove, compare with the demonstration with the lighter and ice?

Name _____ Class _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 3: How Fast Does Wind Move?

Activity 3.1

Purpose

The question this lab answers is "How fast does wind move?" Conduct an experiment with a partner. You will need a stopwatch, a compass, a meter stick and a jar of bubbles.

✚ Safety

Please do not spill the bubbles.

Instructions

1. Have one partner blow the bubbles in an open field.
2. The second partner should start the stopwatch when the bubbles are blown and follow one bubble until it pops.
3. Stop the stopwatch when the bubble pops.
4. Have the person with the bubble jar record the compass heading to the location of the popped bubble.
5. The student with the meter stick should measure the distance the bubble travelled.
6. Use the distance divided by the time to calculate speed in meters per second.
7. Use an online unit converter to translate this answer into miles per hour.

Data Table

Trial	Distance	Time	Speed (m/s)	Speed (mph)	Direction
1					
2					
3					
4					
5					
6					
7					
8					
Average					

Analysis

Find Arlington Heights on this map and draw a small star there. Draw an arrow from the star in the direction that the wind is traveling.

1. Where in the US did the air around us right now come from?

2. Thinking about activity 1.1 when we mapped temperatures, does the air tend to be colder or warmer there?

3. How does the wind **direction** affect the temperatures where you are?

4. When weather reporters talk about wind direction, they label the direction it is coming from, not where it is going. Why might this be more relevant?

Name _____ Period _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 3: What Will the Weather Be Like For Taft?

Activity 3.2

Purpose

The purpose of this assignment is to learn how to use online weather resources to plan for Taft.

Procedure

- Navigate to www.wunderground.com and use the Search Locations tool to look for Arlington Heights.
- Scroll to the 10-day forecast graph and fill in the weather conditions for the dates listed in the table.
- Repeat the process on the second table, for Oregon Illinois.

Weather Forecast For Arlington Heights:

Date	Forecasted High Temperature	Forecasted Low Temperature	% Chance of Rain	Weather Conditions
Monday 4/23/2018				
Tuesday 4/24/2018				
Wednesday 4/25/2018				
Thursday 4/26/2018				
Friday 4/27/2018				

Weather Forecast For Oregon, Illinois:

Date	Forecasted High Temperature	Forecasted Low Temperature	% Chance of Rain	Weather Conditions
Monday 4/23/2018				
Tuesday 4/24/2018				
Wednesday 4/25/2018				
Thursday 4/26/2018				
Friday 4/27/2018				

Implications

Based on the forecast for Oregon, Illinois, how do you think you should dress during the day while you are there? Is there anything special you need to pack for this weather?

_____

_____

_____

Based on the forecast for Oregon, Illinois, which team do you think will have the best weather for Taft? Why?

_____

_____

Looking at the forecast for Oregon, Illinois, and for Arlington Heights, how are they different? What factors might cause them to be different?

_____

_____

_____

Name _____ Period _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 4: What is Air Pressure?

Activity 4.1

Purpose

Air pressure is an important factor in what determines if it is pleasant or stormy weather. Today you will rotate through a series of stations to learn about air pressure.

Station 1: Can air crush a pop can?

At the start of the demonstration what is inside the can? _____

Water is heated. The water vapor takes up (more / less) volume than the water.

What does the water vapor do to the air inside the can? _____

Water vapor is condensed into water. The water takes up (more / less) volume than the water vapor.

Why does the can get crushed? _____

_____

Station 2: Can you pick up the paperclip?

Squeeze the sides of the bottle to control the diving hook. Try to pick up the paperclip at the bottom of the bottle.

Watch what is happening to the water level inside the diver as you squeeze the bottle. How does the pressure inside the bottle affect the pressure inside the diver?

_____

_____

_____

Station 3: Can the air hold up the water?

Fill the cup halfway with water and place the index card or Petri dish over it. Turn the cup upside down over a sink and carefully let go of the card or dish. Draw a diagram to show how you think the card is being held in place:

Station 4: Can we make a cloud in a bottle?

Watch the demonstration. Clouds that are formed present when the air pressure is (low / high).

Do you think clear skies would be associated with higher or low air pressure? Why?

_____

_____

Station 5: Do rising and falling air travel straight?

Flip the bottles over like an hourglass. Give it a brief spin to get the motion started.

What do you see happening to the water as it drains? _____

The top bottle has (higher / lower) pressure than bottom bottle.

As air moves downward or upward do you think it might spin as it moves the way the water does? Why or why not? _____

_____

Station 6: What is a Barometer?

Watch the video and draw a model showing each type of barometer and how they work:

Aneroid Barometer:	Standard Barometer

Name _____ Class _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Lesson 4: How Does Altitude Affect Pressure?

Activity 4.2

Purpose

The question this lab answers is "How does the altitude affect the air pressure?" Conduct an experiment with your partners. You will need an iPhone 6 or other smart phone with a barometer app.

✚ Safety

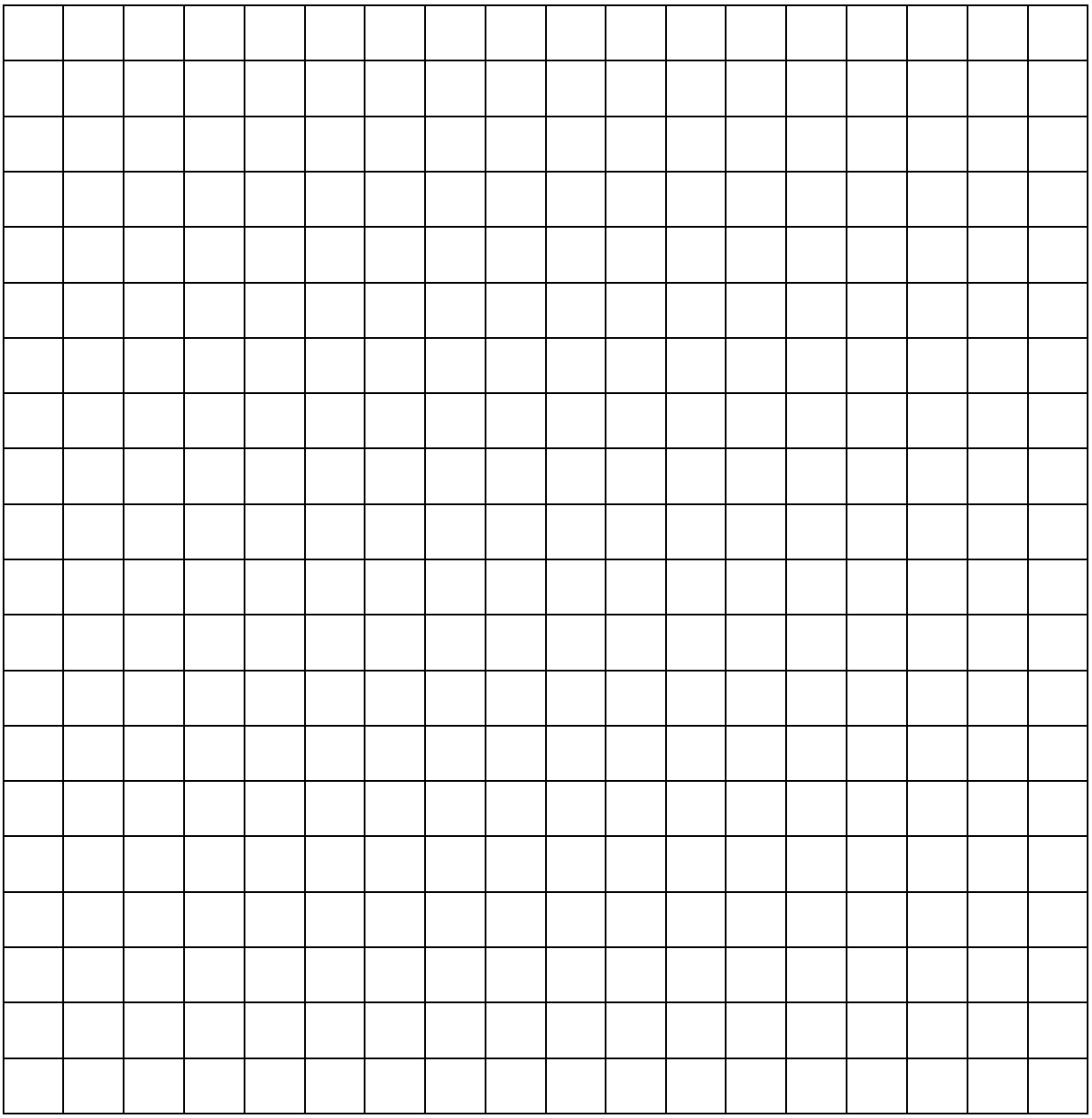
If you are using your own smart phone for this activity, please follow the appropriate use guidelines in the student handbook and only use the phone as directed for this lab.

Data Table

Use this data table to record the measurements from your experiment:

Location	Altitude Above Sea Level	East Stairwell Air Pressure (hPa)	West Stairwell Pressure (hPa)	Central Stairwell Pressure (hPa)	Average Pressure (hPa)
1st Floor Ground	694 ft				
1st Floor Reaching High	700 ft				
2nd Floor Ground	708 ft				
2nd Floor Reaching High	714 ft				
3rd Floor Ground	722 ft				
3rd Floor Reaching High	728 ft				

Use this grid to create a line graph of your data. Be sure to include a title and label the x and y axis:



What happens to the air pressure on an air mass as the air rises?

_____

_____

_____

Name _____ Class _____ Date _____

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Activity 5.1: What Can Weather Maps Tell Us?

We see weather maps all the time when we check weather online or watch it on the news. Let's take some time to figure out how to read and interpret them.

Surface Area Map

1. What types of information does this map show you?

2. What types of information do you think meteorologists need to make a map like this?

Cloud Cover Map

1. State the places that you think will have rain below.

2. How did you choose the places you think will have rain based on this map?

3. What type of air pressure system do you think is over Chicago in this map and why?

4. How do you think meteorologists get information for a making a cloud cover map? What type of technology are they using?

Precipitation Map

1. Where is it raining on this map?

2. Look back at the cloud cover map. What do you notice about the location and clouds and precipitation?

3. How are you able to figure out where the rain is heaviest and where the rain is lightest?

4. How do you think meteorologists get information for a making a precipitation map? What type of technology are they using?

Extension

1. Visit: http://www.ametsoc.org/amsedu/dstreme/. What are some of the other types of weather maps available aside from the ones you just used?

2. Radar maps are very common for weather. We have heard about radar maps before in the news. The process of making this type of map can be complicated to explain. Do a web search to write a basic explanation of how a radar map is made.

Name _____ Period _____ Date _____

Lesson 6: Does This Storm Fit The Model?

Activity 6.1

Your Progress:

- Mastery
- Proficient
- Developing
- Beginning

Purpose

We will look at the data from a recent storm and see if it matches the storm model we have developed.

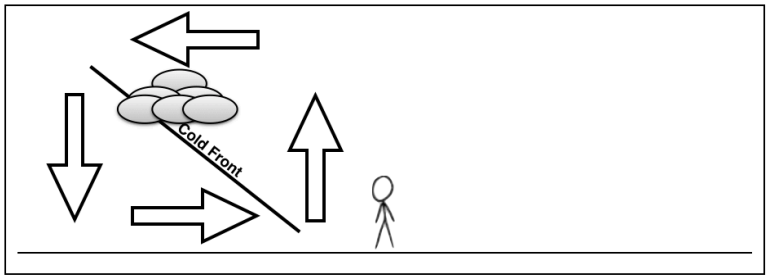
Word Wall Words

Storm:_____

Cold Front:_____

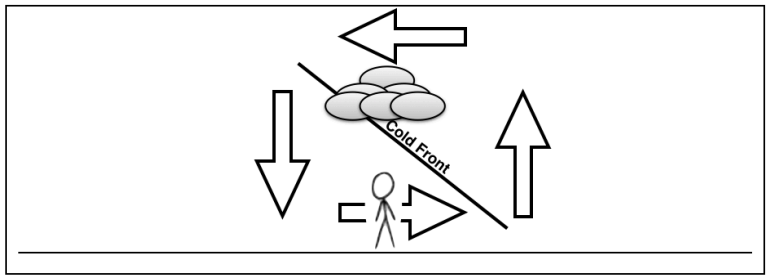
Preparing

Look at the images below. In the cartoon you see a cold front moving past the person standing still. **Circle the word** that best describes the weather condition where the person is standing.



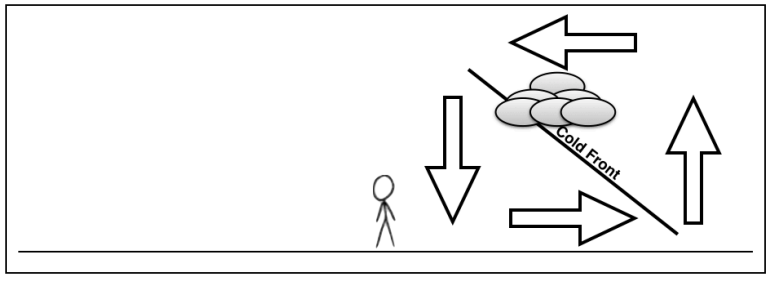
Before the Storm

Temperature:	Warm	Cool
Pressure:	High	Low
Humidity:	Dry	Moist
Wind Speed:	Windy	Calm
Precipitation:	Rain	None



During the Storm

Temperature:	Warm	Cool
Pressure:	High	Low
Humidity:	Dry	Moist
Wind Speed:	Windy	Calm
Precipitation:	Rain	None



After the Storm

Temperature:	Warm	Cool
Pressure:	High	Low
Humidity:	Dry	Moist
Wind Speed:	Windy	Calm
Precipitation:	Rain	None

Directions

1. Decide on a storm to analyze. (September 5, 2014 was a good one.)

   Date of Storm: _____ Approximate Time of Storm: _____
2. Open your web browser and go to the following page:
   http://www.wunderground.com/history/
3. Enter the city of Arlington Heights, IL. Enter the data for the storm.
4. Scroll down to "Daily Weather History Graph", and "Hourly Weather History & Observations".
5. Fill out the data table below.

Weather Conditions in Arlington Heights	Before the Storm	During the Storm	After the Storm
Temperature			
Air Pressure (Barometric Pressure)			
Humidity (Use Dew Point)			
Wind Speed and Direction			
Precipitation (scroll up for this information)			

Making Sense

1. Do the **temperature, pressure, humidity and wind speed** changes during the course the storm match the model's changes from the first page? Support your answer with evidence from the lab data.

_____

_____

_____

_____

_____

_____

_____