Mr. Gillies - Science

Name _____

Background Information

Weather is the state of the atmosphere at any given time and place with respect to wind, temperature, cloudiness, moisture, pressure, and other factors. Most of Earth's weather occurs in the troposphere, the lowest layer of the atmosphere. Earth's atmosphere is made of a series of layers that surround the earth. It absorbs energy that radiates from the earth's surface. Without the atmosphere to insulate the earth, it would be uninhabitable. Air pressure, the force exerted on a surface by the weight of air, decreases as you move up in the troposphere. Differences in air pressure cause the movement of air, otherwise known as wind. Prevailing winds are global winds that constantly blow in the same direction over a certain area of the earth. The jet stream is a series of fast flowing air currents that can push air masses to other areas and influence weather patterns. The jet streams are more active in the winter when there are wider ranges of temperature differences between arctic and tropical air masses. Air moves from areas of higher pressure to areas of lower pressure, resulting in various wind speeds. High pressure systems are associated with clear skies while low pressure systems are associated with dark clouds and precipitation. Weather is different from climate. Climate is dependent on the range of weather over a period of time. Climate change occurs when changes in Earth's climate system result in new weather patterns, lasting for at least a few decades. An air mass is a body of air which has the same temperature and/or humidity throughout. Humidity is the amount of water vapor present in the air. A front is where two air masses of different densities meet. This can result in a cold front, cold air replacing the warm air, or a warm front, warm air replacing the cold air. A cold front results in cool, dry air, while a warm front results in warmer, wetter air. A stationary front is where two fronts meet but neither are strong enough to take over the other. There is also an occluded front, where a warm air mass is caught between two cooler air masses, pushing the warmer air upwards. Different patterns of weather and daylight throughout the year are used to distinguish between the four seasons—fall, winter, spring, and summer. Seasons are caused when different parts of the earth receive different amounts of daylight as the earth rotates around the sun on its tilted axis. Seasons are different, and sometimes opposite, depending on latitude and/or hemisphere. The equator is an imaginary line dividing the northern and southern hemisphere. When water is heated, it evaporates into a gas. When it cools, it condenses from a gas back into a liquid. Clouds form when there is too much water vapor in the air. The water vapor condenses into tiny droplets that form clouds. Eventually, the water droplets become too heavy and fall to the ground in the form of precipitation. This is mainly in the form of rain, snow, sleet, or hail. Cirrus clouds are high altitude, feathery, thin clouds made of tiny ice crystals. Cumulus clouds are low altitude, fluffy clouds that are often seen with hot weather. Nimbus clouds are dark and produce precipitation. Cumulonimbus clouds are tall, dark clouds that bring thunderstorms. Stratus clouds are low, thin clouds that can bring light drizzles. Fog is a cloud of small air droplets suspended over the earth's surface. 5th Grade Weather Unit 5 Northside Outdoor Wonder & Learning Initiative Basic weather instruments can be used to predict the weather. Some of which include, a rain gauge, thermometer, anemometer, barometer, and wind vane. A rain gauge measures the amount of liquid precipitation over a set period of time. A thermometer is used to measure temperature. An anemometer is used to measure the speed of wind. A barometer measures air pressure. A wind vane is used to detect the direction wind is blowing. A meteorologist uses these devices in order to forecast the weather. Meteorology is the branch of science concerned with forecasting and understanding weather.

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Vocabulary

• An **air mass** is a body of air that has the same temperature and/or humidity throughout.

• **Air pressure** is the force exerted onto a surface by the weight of air.

• The **atmosphere** is the layer of air that surrounds the earth.

• **Condensation** is the changing of gas back to a liquid.

• The **equator** is the imaginary line drawn around the middle of the earth.

• Evaporation is when a liquid changes back into a gas (water to water vapor).

• The **jet stream** is a narrow band of air that flows from west to east around the earth at relatively high speeds.

• A **high-pressure system** is a whirling mass of cool, dry air that generally brings fair weather and light winds.

• **Humidity** is a measure of the amount of water vapor in the air.

• A **low-pressure system** is a whirling mass of warm, moist air that generally brings stormy weather with strong winds.

• **Precipitation** is any liquid or solid form of water that falls from the atmosphere: rain, snow, hail, or sleet.

• **Prevailing winds** are global winds that blow constantly from the same direction.

• **Seasons** are periods of time during the year marked by specific weather patterns and daylight hours, resulting from the earth's changing position with regard to the sun.

• The **troposphere** is the lower layer of the atmosphere. All weather occurs in the troposphere.

• **Water vapor** is created when liquid water turns into a gas form due to heat.

• **Weathe**r is the state of the atmosphere at a given time and place with respect to wind, temperature, cloudiness, moisture, pressure, and other factors.

• **Wind** is the movement of air caused by earth's uneven heating of the land surfaces. Wind moves from high pressure to low pressure

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Weather Vocabulary Directions: Match the columns. Write the letters on the lines

1. _____ thermometer
2. _____ hot
3. _____ ° (symbol)
4. _____ F
5. _____ freezing
6. _____ warm
7. _____ sunny and clear
8. _____ weather forecast
9. _____ weather reporter
10. _____ temperature
11. _____ seasons
12. _____ predict
13. _____ raining
14. _____ snowflakes
15. _____ cloudy
16. _____ thunder
17. _____ lightning
18. _____ air conditioner
19. _____ humidity
20. _____ fog

a. 32° F or less
b. 98° F
c. a cloud on the ground
d. abbreviation for Fahrenheit
e. announces weather on TV
f. cold, cool, _____, hot
g. degree
h. flash of light in the sky
i. frozen water droplets
j. sunshine and no clouds
k. many clouds in the sky
l. measures temperature
m. moisture in the air
n. raindrops falling from the sky
o. sound during a thunderstorm
p. thermometers measure this
q. to tell the future
r. turn this on to cool a room
s. weather prediction
t. winter, spring, summer, fall

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Why Do We Have Seasons? Use the reading on the first page to answer these questions.

1. What causes day and night?

_____

2. What causes the seasons?

_____

3. What are seasons?

_____

4. What are the four seasons?

_____

Earth's Orbit:

1. Does Earth's orbit cause seasons? _____

Sun's Path in the Sky:

1. Why does the sun appear to move across the sky from east to west?

_____

2. When does sunlight strike the Earth's surface at a vertical angle?

_____

3. When does more solar energy reach the Earth's surface?

_____

4. Does this make it warmer or colder?

_____

5. When does the Earth's surface receive less energy from the sun?

_____

Sun's Angle:

1. Why does the Earth receive a small amount of energy?

_____

2. When is the sunlight more intense?

_____

3. When is the sunlight less intense?

_____

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Name: _____ Date: _____

What is a Jet Stream? Use the information on the first page to answer these questions.

1. What is a jet stream?

   _____

   _____

   2. Where are jet streams located?

   _____

   _____

   3. How does the rotation of the Earth affect the jet stream?

   _____

   _____

   4. How do jet streams affect the weather?

   _____

   _____

   5. What is the relationship between temperature and the jet stream?

   _____

   _____

   6. How fast does the wind move in a jet stream?

   _____

   _____

   7. Where are the two strongest jet streams located?

   _____

   _____

   8. Why do meteorologists track jet streams?

   _____

   _____

   9. Why are jet streams stronger in the winter?

   _____

   _____

   10. Why do pilots pay attention to jet streams?

   _____

   _____

The Water Cycle

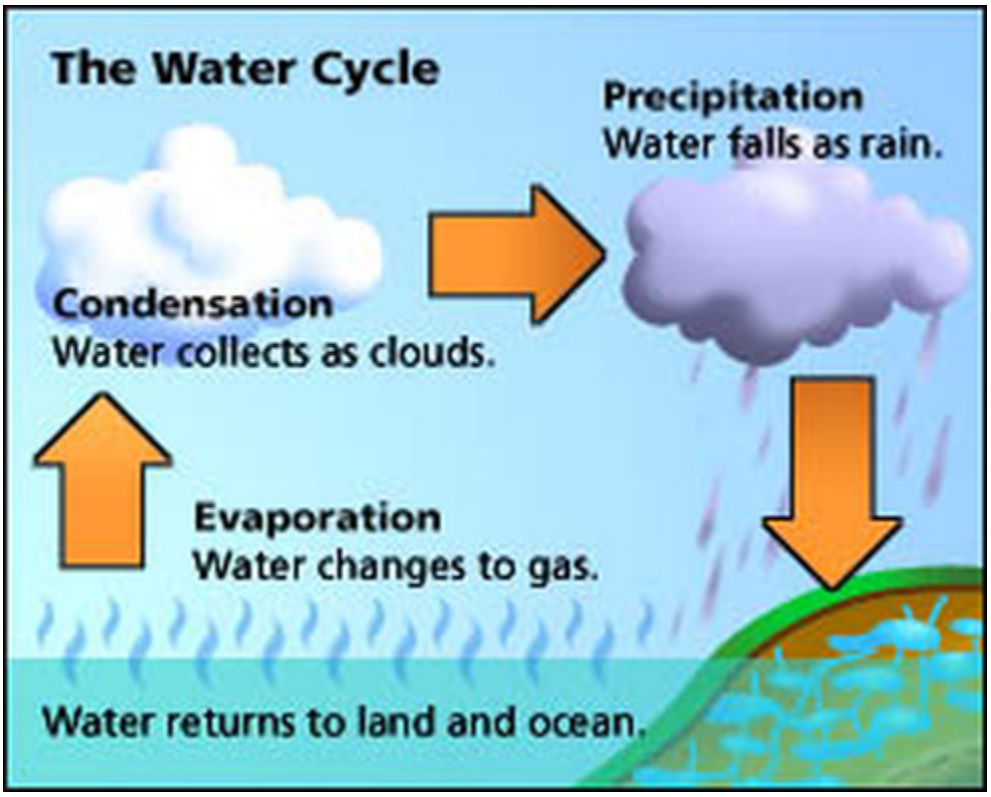
Water is always moving and changing. It changes its form (ice, snow, liquid, vapour) and location. Water is used by plants, animals and humans but it **always** goes back to nature.

Precipitation: Any or all of the forms of water, whether liquid (e.g. rain) or solid (e.g. hail) that falls from the clouds and reach the ground.

Run-off: The movement of surface water down slopes (e.g. mountains).

Evaporation: The process by which water is changed into water vapour. Water can evaporate from any moist surface, but about 84% of the water vapour in the atmosphere comes form the ocean.

Condensation: The changing of water vapour into droplets of liquid water in the form of dew, fog or clouds.



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Use the previous page to answer these true or false statements.

Statement		Statement	
In the Water cycle, water changes from one state of matter to another.	True or False	The water cycle has nothing to do with the weather.	True or False
Cooler temperatures cause condensation	True or False	Evaporation occurs when plants release water from leaves.	True or False
Energy from the sun heats up water on the Earth's surgace and the water goes into the air as water vapor.	True or False	Most of the water in the water cycle can be found in clouds	True or False
Sleet is a type of frozen precipitation.	True or False	If it is warm and sunny, most likely evaporation is not occurring.	True or False
Rain is not precipitation.	True or False	Most water on earth is salt water	True or False
The Earth is mostly water.	True or False	All living things require water.	True or False

NASA | The Ocean: A Driving Force for Weather and Climate

Earth is the water planet although 40% of Earth's population lives within or near coastal regions. The ocean impacts people everywhere. Most of Earth's water is stored in the ocean, a driving force for weather and climate. The earth's surface is warmed unevenly by the sun. Heat is a form of energy that helps drive ocean and atmospheric circulation. The ocean absorbs more heat than the atmosphere. Both the atmosphere and ocean move heat. The atmosphere does it quickly. The ocean slowly. At the ocean's surface winds drive the currents. Multiple forces keep the global ocean conveyor belt or Thermohaline Circulation, in perpetual motion. Below the surface deeper currents are driven by difference in density. Mixing and upwelling in the ocean transport nutrient rich water to the ocean's surface. Nutrients sustain biological productivity in the ocean. Extreme variation in sea surface height and sea surface temperature affect ocean and atmospheric circulation. El Nino and La Nina occur when changing wind patterns displace warm and cool water in the equatorial Pacific Ocean. Both have global impacts. During either of those events the displacement of cold water by warm water leads to air temperature swings and changes in humidity. This alters weather patterns by steering storms and rainfall to new locations. Shifts in rainfall affect plant growth in areas impacted by drought. When heat is exchanged between the ocean's surface to the atmosphere, it influences climate. For example, heat and moisture carried by the Gulf Stream northward brings warmer temperatures and a moderate climate to Europe. An eddy is a circular moving body of water that spins off a main current. Eddies play a major role transporting heat and nutrients. Thunderstorms are a frequent occurrence in the tropics. Some of these may become large rotating systems with strong winds growing into tropical storms or hurricanes. Tropical ocean basins like the Caribbean and the Gulf of Mexico retain substantial heat making these regions favorable for rapid storm intensification. By extracting large amounts of heat from the ocean, storms can become massive and destructive like hurricanes. A driving force for weather and climate, the ocean is essential for life on Earth. It is the primary store house for Earth's water. Without the ocean, our planet would be uninhabitable. NASA satellites and their unique view from space are helping to unveil the vast and largely unexplored oceans.

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NASA | The Ocean: A Driving Force for Weather and Climate Transcript Directions: Read the transcript from the NASA video: The Ocean: A Driving Force for Weather and Climate and answer the following questions. (previous page)

1. What does the atmosphere and ocean move?

_____

_____

2. Which holds more heat, the atmosphere or the ocean?

_____

_____

3. What drives the surface currents in the ocean?

_____

_____

4. How are nutrients transported in the ocean?

_____

_____

5. Why are the nutrients important?

_____

_____

6. When do El Nino and La Nina occur?

_____

_____

7. During an El Nino or La Nina a displacement of cold water by warm water occurs. What affect does this have on the weather?

_____

_____

8. Explain what an eddy is and why it's important.

_____

_____

9. What role do ocean basins have in the development of tropical storms?

_____

_____

10. What role does the ocean play in our weather? (Big or Small)

_____

_____

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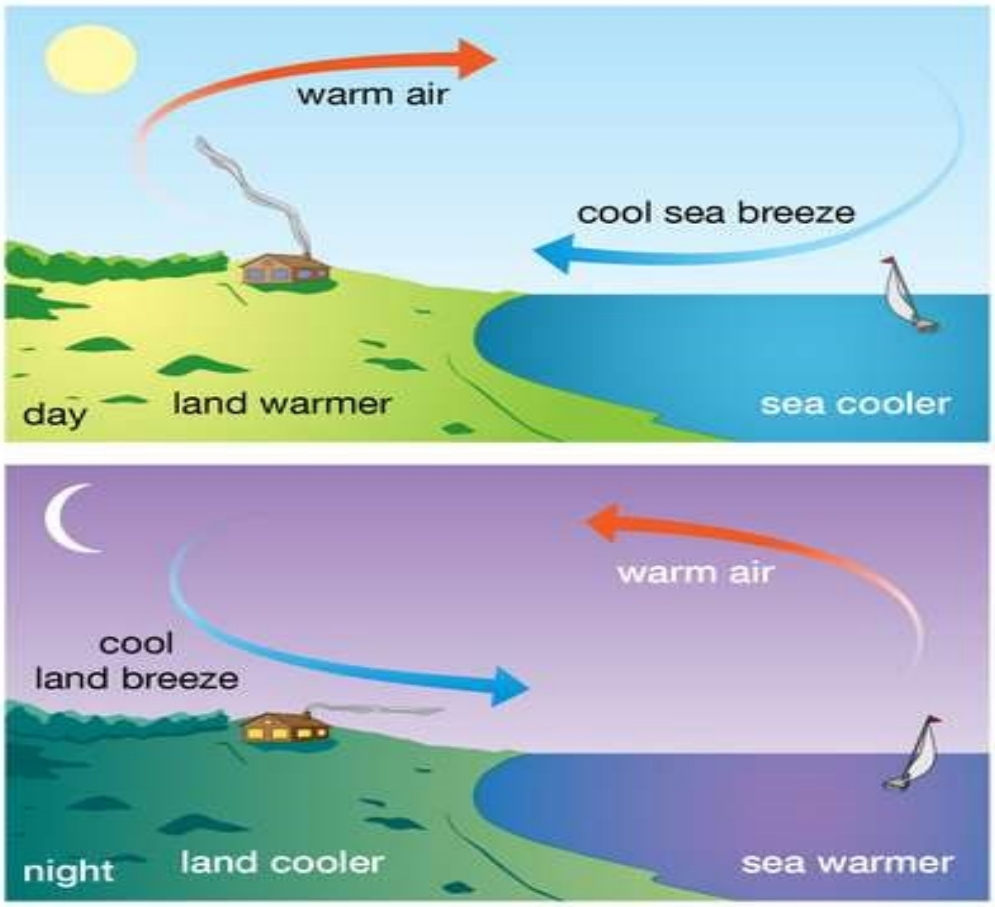

Land and Sea Breeze Questions Directions: Use your diagram to answer the questions.

1. What do you notice about the data?

_____

2. What happens to the blue arrows as the land temperatures decrease?

_____

3. What happens to the red arrows as the land temperatures decrease?

_____

4. What happens to the blue arrows as the land temperatures increase?

_____

5. What happens to the red arrows as the land temperatures increase?

_____

6. Why is the wind changing directions?

_____

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Take a look outside!

I would like you to put the date and take a look outside and describe the weather for 5 Days, I gave you 2 examples do 5 more and it is all done!

Date	Temperature	Precipitation	What is looks like
Saturday	32 degrees F	Snow	It was cold and snowy out because the temperature was below freezing it snowed.
Sunday	50 degrees F	None	It was sunny and cool out, great day to be outside