Science 8
Unit 1: Water Systems
Topic 11: How Oceans Affect Climate

Weather: is the state of the atmosphere at a given time. Includes features such as temperature, wind, air pressure, and moisture.

Climate: is all the features of the weather for a certain region averaged over a long time.

Heat Capacity: A measure of how long it takes a material to heat up or cool down.

How can oceans affect weather and climate?

- Water has a high heat capacity. It takes a long time to heat up and a long time to cool down.

- The Sun's heat is most intense at the equator. The Sun's heat becomes less intense as you go farther north and south to the Poles. Warm ocean currents start near the equator. These currents affect weather and climate by giving off their heat to the air

- The high heat capacity of water means that ocean water can store a great deal of heat. Oceans move this heat all around the world

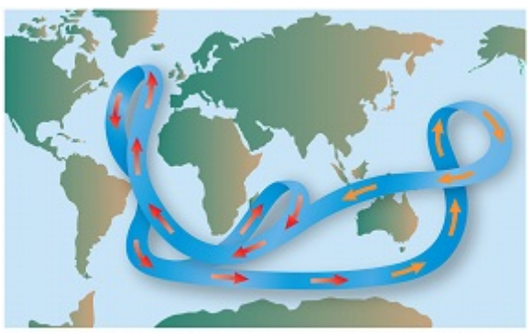
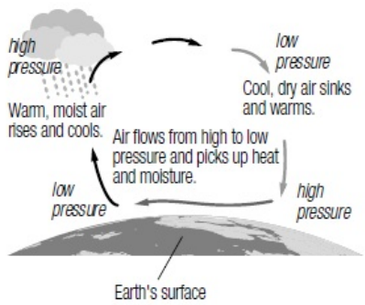


Figure 11.15 The different densities of ocean water in different parts of the world create density currents. These act like giant conveyor belts, moving enormous amounts of water around the globe.

- Convection: heat transfer resulting from circulation. Transfer of heat by wind is an example of convection. The wind that forms over water at the equator carries heat and moisture north and south toward each of the Poles. At the same time, the wind drives warm surface currents toward the Poles. This movement of air and water helps create Earth's weather systems.



- Due to ocean's high heat capacity:

  -Oceans stay warmer through the fall and into winter than land masses.

  -Oceans remain cooler through spring and into summer.

  This keeps the climate of coastal areas from being extremely hot in the summer and extremely cold in the winter. This is called a **Moderate Climate**

What is el Niño and what does it do?

Normally, the winds in the Pacific Ocean blow warm currents west along the equator. This creates very warm surface water temperatures in the western Pacific Ocean and upwelling in the eastern Pacific Ocean. Every few years, a change in this pattern happens. The Pacific winds are weaker and the warm water current starts to move east toward South America.

This event changes the patterns of wind and water currents. Wind currents are pushed off their common paths, so they deliver their heat and weather to different areas than usual. Places that usually get wet and cold weather get dry and warm weather. Places that usually have lots of rain get little or no rain. This change in the usual pattern of wind and water currents that produces unusual weather all over the world is called el Niño.

What is la Niña and what does it do?

An event that is like the reverse of el Niño is la Niña. La Niña is a period during which upwelling causes unusually cold water to rise to the surface off the coast of South America near the equator. It tends to bring wetter weather to places that are usually dry

How does Ocean Current affect climate in Newfoundland?

- Our weather patterns are rapidly changing due to the interaction of the Labrador Current and the Gulf Stream.
- Warm surface currents transfer tropical heat to the atmosphere and colder currents remove heat from the atmosphere
- When the warm, moist air above the Gulf Stream blows over the colder water of the Labrador Current, it cools and condenses, producing fog.

PART A: MULTIPLE CHOICE

Instruction: Circle the correct answer below each question. Also, transfer your answers to the bubble sheet provided.

1. If you say “Winters are mild where I live,” what are you describing?

   (A) Weather
   (B) Climate
   (C) Convection
   (D) Heat capacity

2. If you say "It's going to rain all day tomorrow," what are you describing?

   (A) Weather
   (B) Climate
   (C) Convection
   (D) Heat capacity

3. Which is the best description of the climate in Atlantic Canada for February?

(A) Hot muggy days with fog and rain
(B) Moderate temperatures with a chance of frost
(C) Warm temperatures and high winds
(D) Freezing temperatures with chance of snow storm

4. During which month would you expect the greatest snowfall in Atlantic Canada?

(A) August
(B) January
(C) May
(D) September

5. Which term refers to the measure of how long it takes a material to heat up or cool down.

(A) Convection
(B) Climate
(C) Heat Capacity
(D) Weather

6. Which of the following refers to the heat transfer process in the atmosphere that depends upon the movement of air is:

(A) Conduction
(B) Absorption
(C) Convection
(D) Radiation

7. How would you describe the heat capacity of water?

(A) High
(B) Little change
(C) Low
(D) No change

8. Due to water's heat capacity?

(A) Oceans can store a great deal of heat
(B) Oceans cannot store heat
(C) Oceans can get very cold
(D) Oceans can get very hot

9. Which of the following helps to keep Newfoundland's temperatures moderate?

(A) Rain-shadow effect
(B) Sun
(C) Exploits River
(D) Ocean

10. As ocean currents move,

(A) They release heat quickly.
(B) They influence the amount of solar energy an area receives.
(C) They carry warm or cool water to different locations.
(D) They bring warm temperatures to the West Coast.

11. What is one way that oceans affect weather and climate?

(A) By depositing sediment to make beaches
(B) By transferring heat to the air
(C) By taking a short time to cool down
(D) By taking a short time to heat up

12. What occurs in an el Niño year?

(A) There are warmer than usual surface water temperatures in the western Pacific Ocean
(B) There are warmer than usual surface water temperatures in the eastern Pacific Ocean
(C) Unusually cold water rises to the surface of the eastern Pacific Ocean
(D) Unusually cold water rises to the surface of the western Pacific Ocean

13. What currents cause fog for the Avalon Peninsula?

(A) Labrador Current and Humboldt (Peru) Current
(B) Labrador Current and Gulf Stream Current
(C) Gulf Stream Current and Humboldt (Peru) Current
(D) Gulf Stream Current and Kuroshio (Japan) Current

14. How would you describe the following currents?

(A)	Gulf Stream Current is warm	Labrador Current is cold
(B)	Gulf Stream Current is warm	Labrador Current is warm
(C)	Gulf Stream Current is cold	Labrador Current is cold
(D)	Gulf Stream Current is cold	Labrador Current is warm

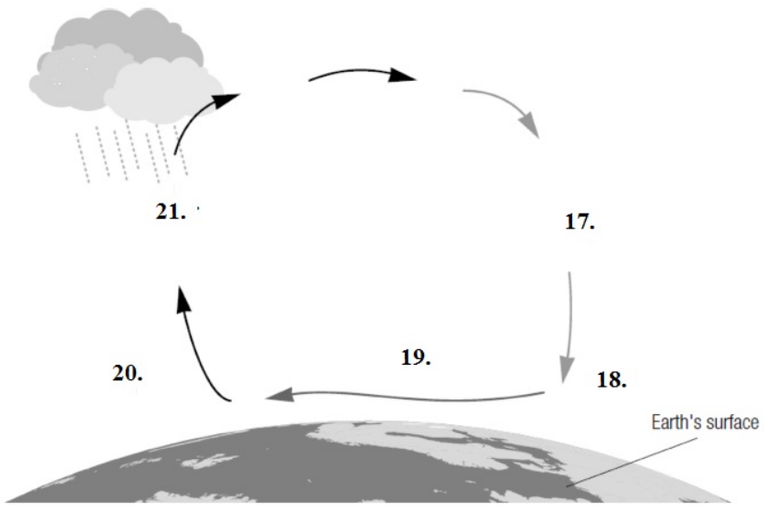
PART B : MATCHING

Instruction: Match each term on the left with the best descriptor on the right. Each Descriptor may be used only once. Place your answer on the Scantron.

Term	Descriptor
12. _____climate 13. _____ convection 14. _____ el Niño 15. _____ heat capacity 16. _____ la Niña	A. a warm ocean current that develops every few years B. the process of heat transfer through the flow of a heated fluid C. the weather characteristics of a region averaged over a long time D. a measure of how long it takes for a material to heat up or cool down E. Colder than normal water coming to the surface due to upwelling

PART C : MATCHING

Instruction: Match each term on the left with the best descriptor on the right. Each Descriptor may be used only once. Place your answer on the Scantron.



Term	Descriptor
17. _____	A. Air flows from high to low pressure and picks up heat and moisture.
18. _____	B. Cool, dry air sinks and warms.
19. _____	C. high pressure
20. _____	D. low pressure
21. _____	E. Warm, moist air rises and cools.

PART F: WRITTEN RESPONSE

1. What is the difference between climate and weather?

_____

_____

_____

_____

2. Water has a high specific heat capacity. What does that mean?

_____

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_____

3. How does a cold current moderate summer temperatures on land?

_____

_____

4. How does a warm current moderate winter temperatures on land?

5. What is convection?

6. How does the transfer of heat create weather?

7. What causes El Niño?

8. What causes La Niña?