

Climate



To answer some questions, you will need to look at the Water Availability and Human Impact screens as well as Climate screens. Useful Fast Find codes are shown in SMALL CAPS

- 1a. Once you have filled in the blanks in the paragraph below, you should end up with an explanation of why fog sometimes forms over water.

Fog forms over the ocean when the water currents cool the air temperature at the surface. These cold ocean currents have moved into the tropics from the North and South Poles. The warm air often holds a lot of moisture (water vapor). When the water cools the air at the surface the water vapor condenses (forms tiny droplets of water).

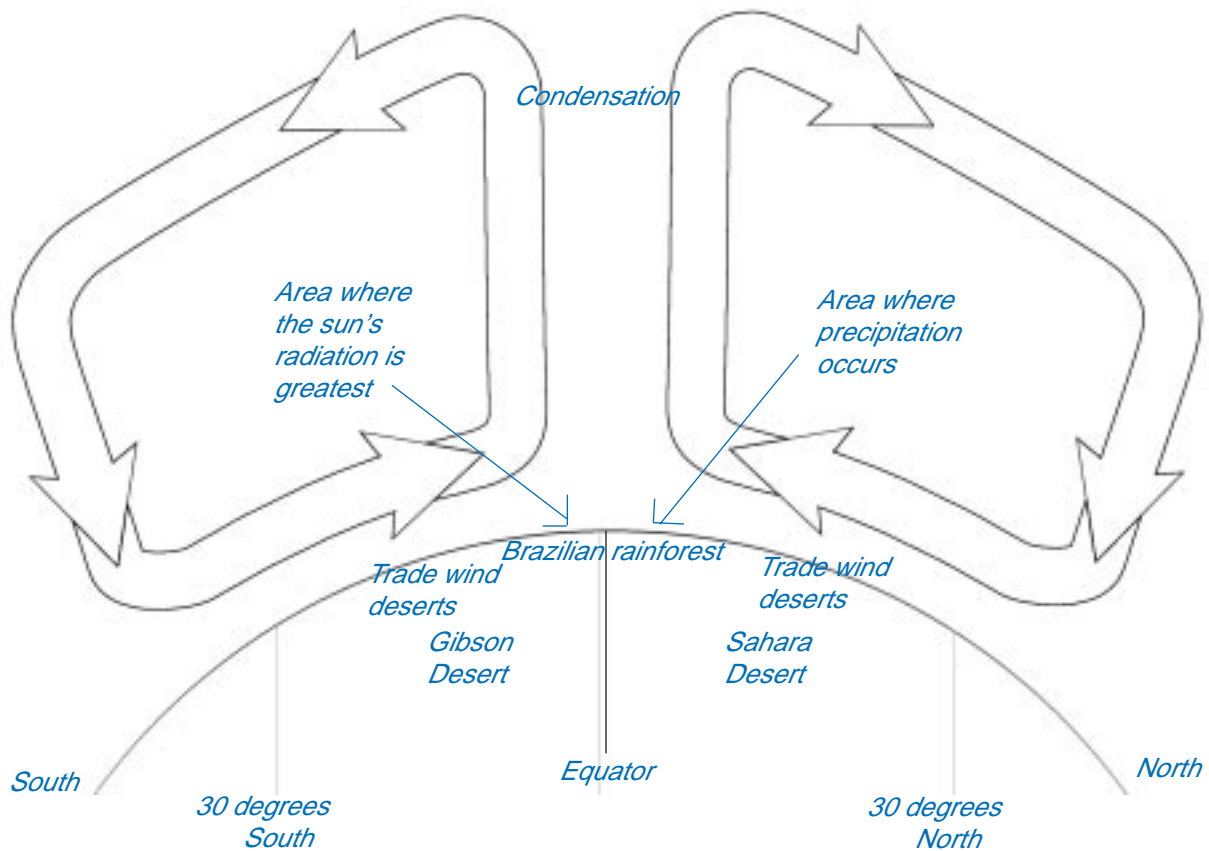
- 1b. Why do you often find deserts next to these foggy areas?
Moisture is trapped close to the ocean surface so it does not blow onshore as rain clouds.
- 1c. What happens if water condenses high above the Earth's surface?
It forms clouds.
- 1d. More rain falls on one side of a mountain than on the other. What is this called?
The rain shadow effect.
2. For each event, check off the appropriate climatic influences.

Hint: for each statement there may be more than one correct climatic influence.

Event	High-pressure Zones	Cold Ocean Currents	Continental Interiors	Rain Shadow Effect
Temperature differences on the Earth's surface drive air mass and ocean current movements that are fairly predictable.	✓	✓		
Air saturated with gaseous water condenses to form water droplets at lower temperatures.	✓	✓		✓
Moisture is lost from an air mass when it falls as precipitation. The air mass remains dry as it moves across the Earth's surface, unless it gathers moisture from large water bodies .	✓	✓	✓	✓
Warm air rises.	✓			✓
Air temperature drops as altitude increases.	✓			✓
Most clouds form over oceans and move inland.			✓	✓

- 3a. The following diagram shows a HADLEY CELL on either side of the equator. On the diagram label these features:
- North and South
 - the equator
 - area where sun's radiation is the greatest
 - area where condensation occurs
 - area where precipitation occurs
 - trade wind deserts
 - 30 degrees north and south of the equator
 - color the arrows blue for cold air, white as the air warms up, yellow as it gets even warmer and red where it is the warmest.
 - from the CLIMATIC INFLUENCES QUIZ indicate where on the Hadley Cell you expect to find the Sahara Desert, the Gibson Desert and the great rainforest of Brazil

Students can either label directly on their diagrams or they can assign numbers to each feature and put the numbers on their diagrams.



- 3b. The Hadley Cell represents only part of the water cycle: evaporation, condensation and precipitation. The other part of the water cycle is concerned with what happens to the water after it reaches the ground. Describe all of the possible things that can happen to a raindrop before it evaporates into the atmosphere again. Make sure you consider other biomes, such as the rainforest, in addition to the desert.

Rain that is not absorbed into the ground is called surface runoff. Some of this runoff will immediately evaporate into the atmosphere. In the desert, this is what will happen to most of the water. In other biomes such as rainforests, most of the water will be collected elsewhere first. Much of the runoff will go into streams, rivers and lakes. This is called surface water. From there, some will evaporate or seep into the ground, but most of the water will end up in the oceans before evaporating.

Plants and animals will also use some of the water.

Some water will seep into the soil and eventually into underground aquifers where it can stay for thousands of years. This is called groundwater. This water may reach the surface again at a spring where it will either evaporate or make its way to the oceans by way of streams, rivers, and lakes.

Humans use both surface water and groundwater for residential, industrial and agricultural purposes. This water eventually enters the environment again as surface water or groundwater.

- 4a. What is the source of energy that causes the Hadley Cell to run?

The sun

- 4b. What role does gravity play in the Hadley Cell?

In the high-pressure zone the cool, dense air is pulled toward the Earth's surface by gravity. In the low-pressure zone the warm air expands and becomes lighter. Gravity does not hold it close to the Earth's surface.

- 4c. How does this movement of air cause trade winds?

When the dense air is pulled down towards the Earth's surface by gravity, it needs somewhere to go. The natural path for it to follow is towards the equator where air is constantly being drawn upwards. The suction of the air from the high-pressure zone to the low-pressure zone is what causes tradewinds.

- 5a. What is the primary cause of mid-latitude deserts? Subtropical deserts?

Mid-latitude deserts are primarily caused by continentality. Subtropical deserts are primarily caused by high pressure.

- 5b. Continentality can either create desert conditions or enhance them. Name at least one desert caused by each of the following conditions:

Continentality

Gobi Desert

Continentality and high pressure

Gibson Desert

Sahara Desert

Above and beyond

- 1a. We've learned that the movement of COLD OCEAN CURRENTS into areas of warm air temperatures results in a temperature conversion – cold air near the surface and warmer air above. This produces fog at the surface.

What effect do you think the movement of warm ocean currents into areas of cooler temperatures would have?

The water would warm the air at the surface of the ocean. This would increase the ability of the air to hold moisture. The warm moist air rises and forms clouds that may blow onshore.

- 1b. Take a look at the map on the CLIMATIC INFLUENCES QUIZ screen. Where on the planet might you expect to get a lot of rain due to warm ocean currents? You may also need to consult an atlas for this question.

One possible example could be the British Isles.

- 1c. Cold ocean currents move along the coast of Greenland. Is this factor responsible for arid conditions at this latitude? Why or why not?

Both the water and the air at the surface of the water are cold. Therefore, there is no temperature inversion at the ocean surface to cause fog to form.

2. Take a look at an atlas. In which hemisphere, North or South, are mid-latitude deserts more common? Why?

They are most common in the Northern Hemisphere because there is a greater landmass at mid-latitude north of the equator.

3. If the prevailing winds were reversed across Asia, would the Gobi Desert still be a desert? Why or why not?

The Gobi Desert would likely not be a desert if the prevailing winds across Asia were reversed. This is because the main factor that makes the Gobi a desert is its continentality. If the winds were reversed they would not have to travel as far from the ocean before they reached the Gobi. Therefore the air would not lose as much of its moisture by the time it reached the Gobi and that area would be more humid than it is currently.