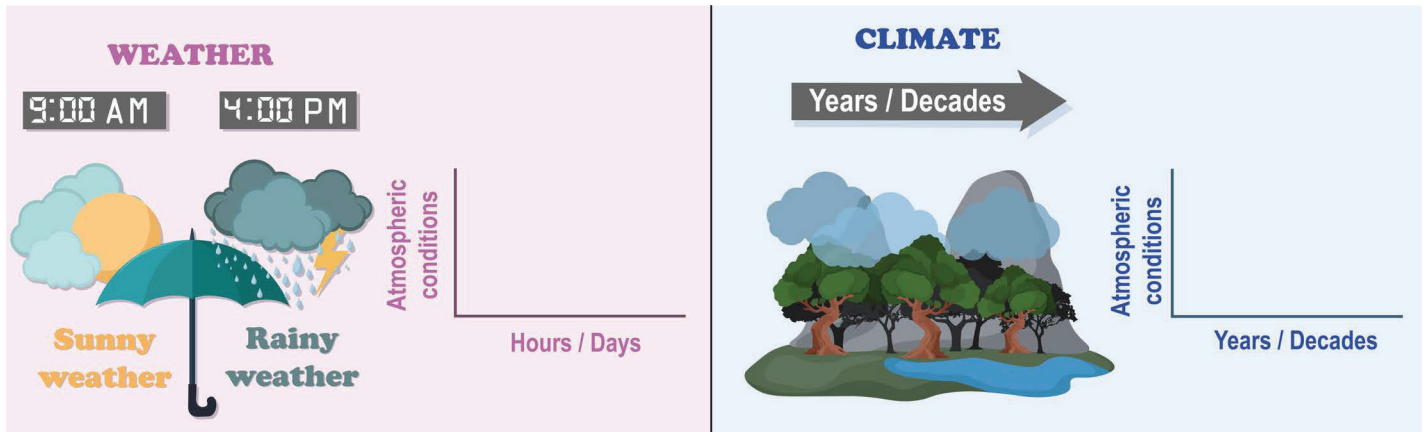


TOPIC: EARTH'S CLIMATE PATTERNS

Weather vs. Climate

- ◆ **Weather:** local _____-term atmospheric conditions (e.g. temperature, precipitation, cloud cover, & wind).
- ◆ **Climate:** _____-term *average* of weather conditions in a specific region (has _____ predictable patterns).



EXAMPLE

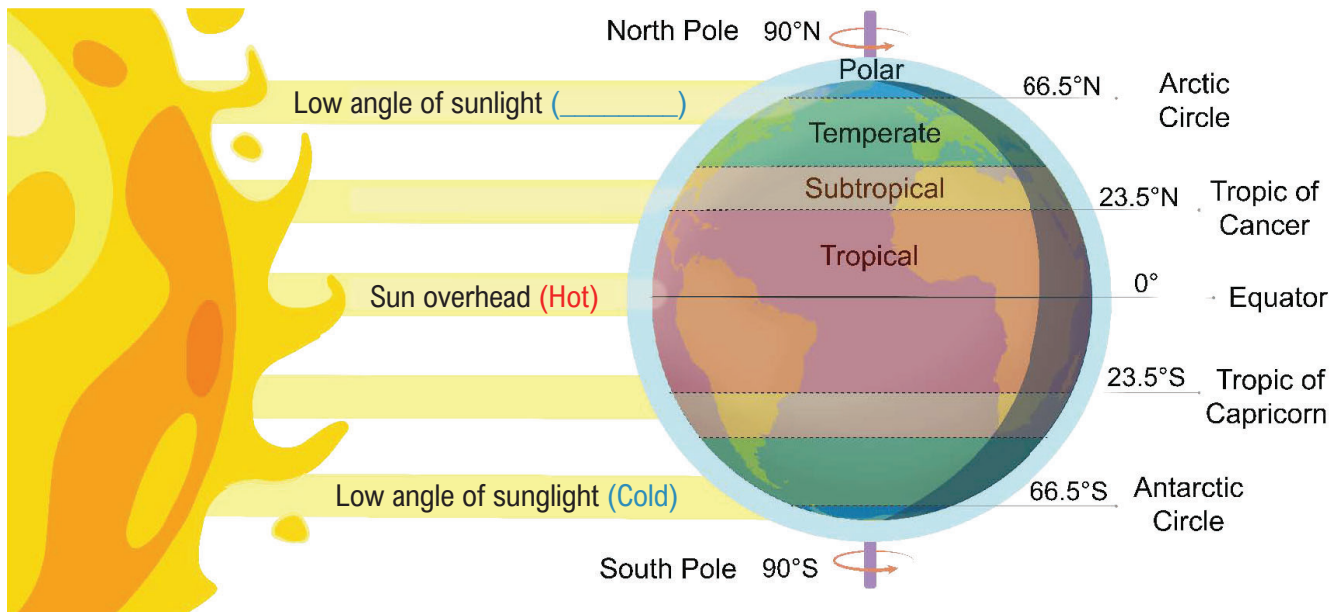
Which of the following would be considered an example of climate?

- a) A sudden temperature drop at night in Chicago.
- b) The record rainfall received in Houston last week.
- c) The average annual rainfall in Buffalo over 50 years.
- d) The severe thunderstorm in Miami this afternoon.

TOPIC: EARTH'S CLIMATE PATTERNS

Variation in Sunlight Angles Across Latitudes

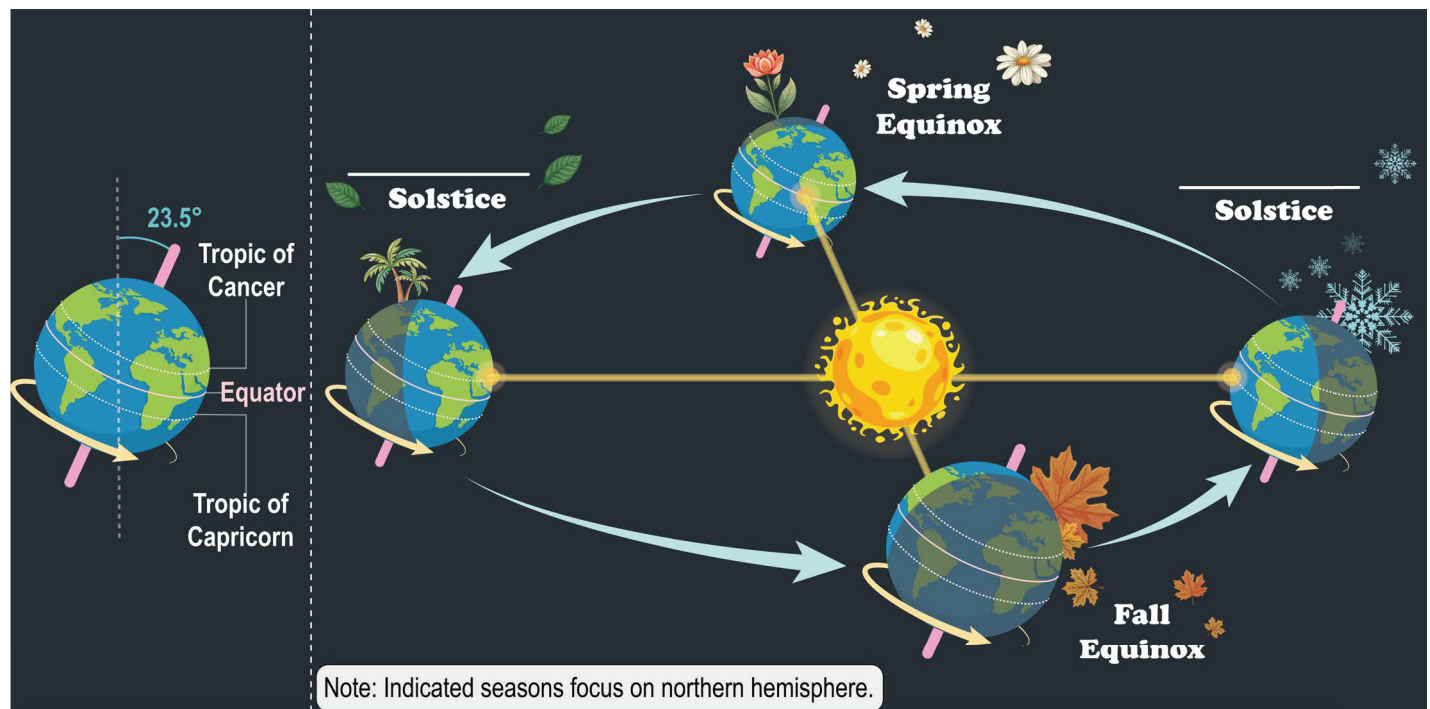
- ◆ Global climate is greatly impacted by the _____ Sun's rays hit Earth's surface, which varies across *latitudes*.
 - **Latitudes:** imaginary lines measuring distance North/South of *equator* in degrees (0° = equator, 90° = poles).
- ◆ Sun's _____ delivery of heat occurs when it is _____ & its rays hit Earth's surface at a 90° angle.
 - Regions near equator receive the most direct sunlight angles, giving the tropics _____ climate all year.



TOPIC: EARTH'S CLIMATE PATTERNS

Earth's Tilted Axis, Orbit, & Seasons

- ◆ Earth's axis of rotation is _____ 23.5° in a *constant* direction as it orbits the Sun.
 - Tilt & orbit causes *variability* in Earth's heating all year round, creating the _____.
 - **Seasons:** annual climate cycles during distinct periods of the year (e.g. Winter, Spring, Summer, & Fall).
 - Northern & southern hemispheres have _____ seasons.



EXAMPLE

Seasons are ultimately caused by:

- | | |
|-----------------------------------|--|
| a) The speed of Earth's rotation. | c) The time it takes the Earth to orbit the Sun. |
| b) The tilt of the Earth's axis. | d) Ocean currents. |

PRACTICE

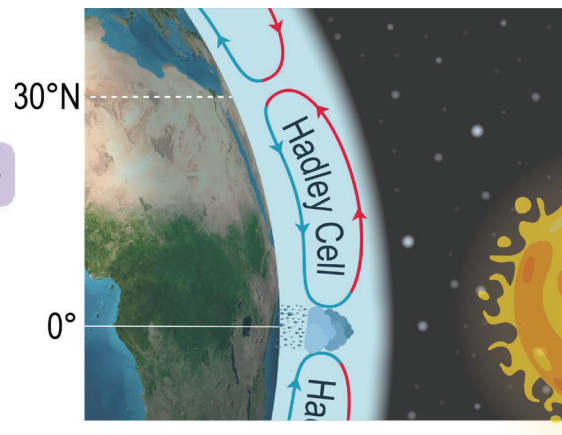
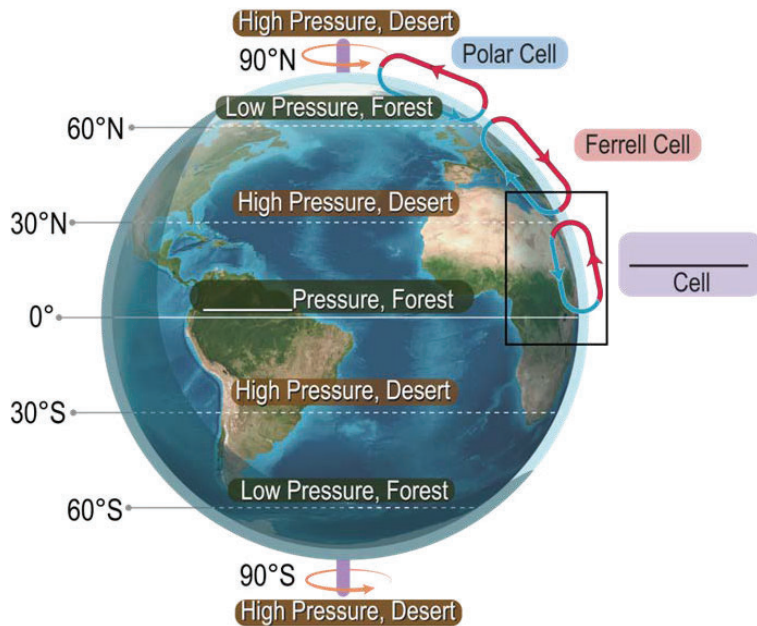
The amount of solar energy & heat delivered to different latitudes on Earth is ultimately determined by:

- | |
|--|
| a) The spherical shape of the Earth and the angle that solar radiation hits the Earth. |
| b) Earth's slightly elliptical orbit around the Sun. |
| c) The tilt of the Earth's axis with respect to its orbit around the sun. |
| d) Ocean currents. |

TOPIC: EARTH'S CLIMATE PATTERNS

Broad Patterns of Global Air Circulation & Precipitation

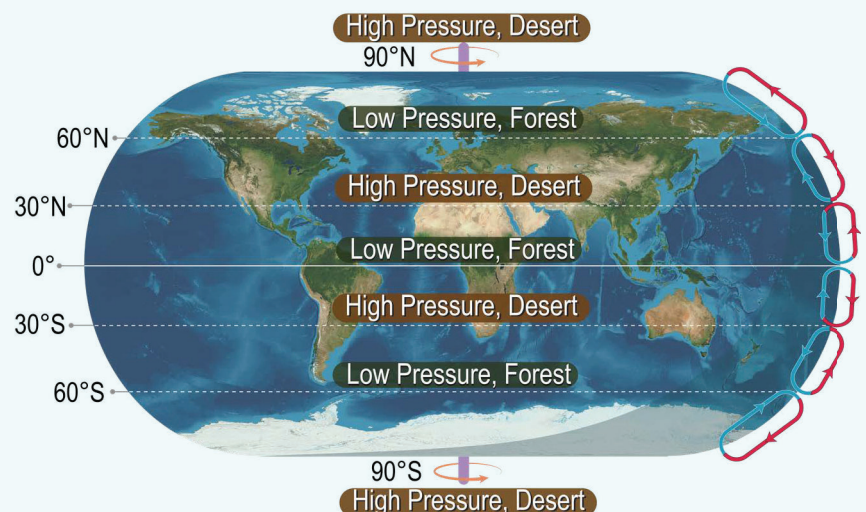
- ◆ **Hadley Cell:** a large-scale cycle in global air circulation & precipitation initiated near equator & extending to 30°N/S.
 - Creates surface air pressures that are _____ at equator & _____ at 30°N/S.
 - Results in a pattern of _____ forests near equator & _____ deserts near 30°N/S.
- ◆ Similar air circulation & precipitation cells occur at 30°-60° (Ferrell Cell) and 60°-90° (Polar Cell) latitudes.
 - Pattern of *alternating* high/low surface air pressures & deserts/forests at every _____° latitude.



EXAMPLE

Which global air circulation & precipitation cells contribute to the dry, desert terrain in Australia?

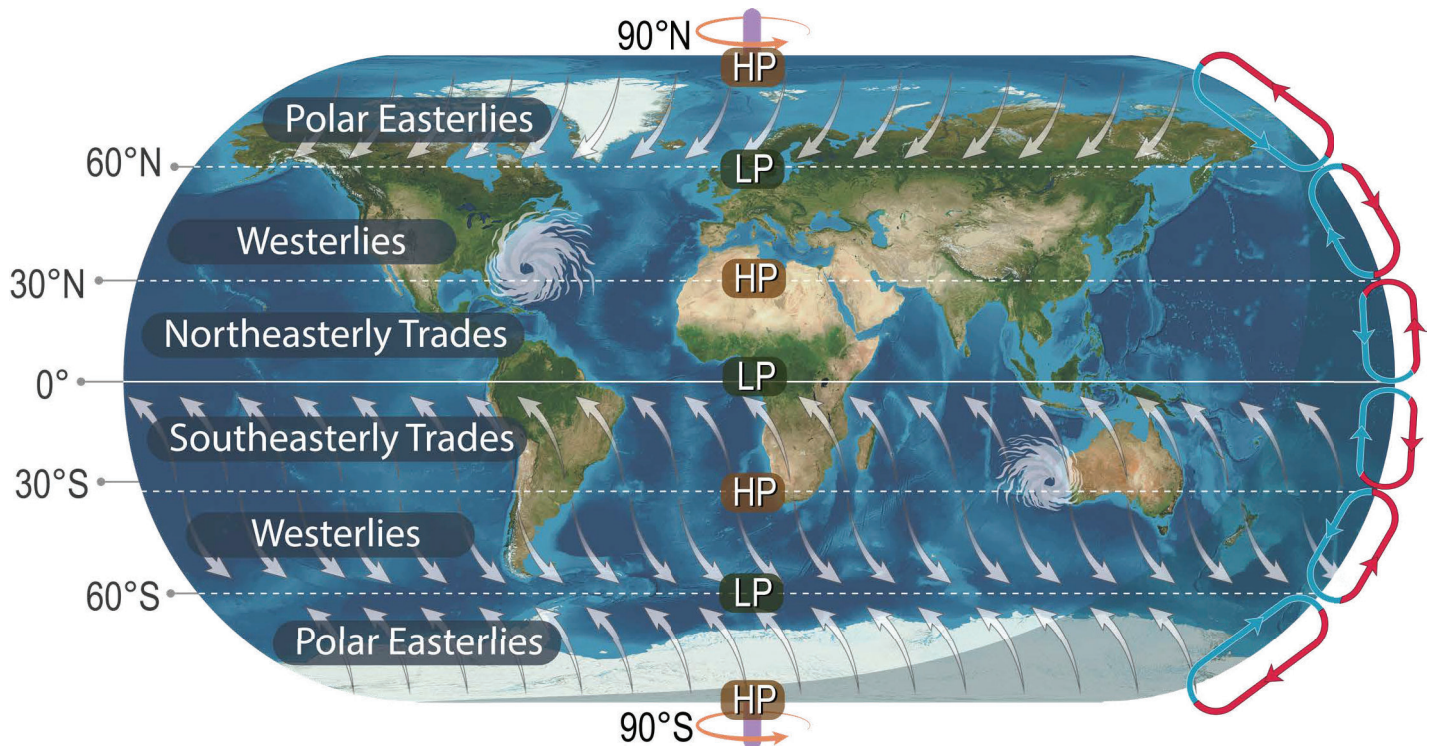
- a) Hadley & Polar cells.
- b) Ferrell & Polar cells.
- c) Hadley & Ferrell cells.



TOPIC: EARTH'S CLIMATE PATTERNS

Coriolis Effect Curves Prevailing Winds

- ◆ **Prevailing Winds:** winds near Earth's surface that, over a long time, blow in *consistent* directions over a large area.
 - Wind generally blows directly from _____ air pressure to _____ air pressure areas.
- ◆ **Coriolis Effect:** phenomenon caused by Earth's rotation that _____ paths of moving objects traveling far.
 - Winds moving towards the nearest pole curve _____ (west → east).
 - Winds moving towards the Equator curve _____ (west ← east).



NOTE: The Coriolis effect causes hurricanes to rotate counter-clockwise in the North & clockwise in the South.

EXAMPLE

If Earth rotated exactly as it does but in the opposite direction, which of the following would likely occur?

- a) The prevailing winds at the equator would blow from west → east (westerly).
- b) The prevailing winds at the equator would blow from east → west (easterly).
- c) Days would become shorter.
- d) Days would become longer.

TOPIC: EARTH'S CLIMATE PATTERNS

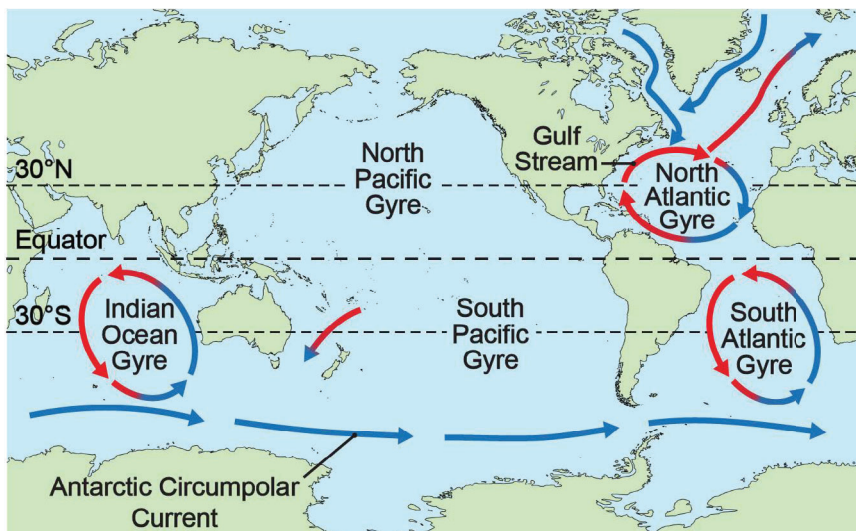
PRACTICE

Which method would be the most accurate way to find out the direction of prevailing winds?

- a) Randomly going outside one day to measure wind direction for a few hours.
- b) Measuring wind direction every day for one summer.
- c) Measuring wind direction every day for a few years.
- d) None of the above.

How Water Affects Climate

- ◆ Earth's global air circulation & ocean currents (_____) are closely interconnected.
 - **Gyre:** a massive system of _____ ocean currents transferring heat from equator towards poles.
 - Global air circulation physically impacts ocean surface currents, which is why the directions match.
- ◆ Large bodies of water tend to "_____" climates of nearby land.
- ◆ Water absorbs & sequesters _____, a greenhouse gas that traps heat in Earth's atmosphere.



TOPIC: EARTH'S CLIMATE PATTERNS

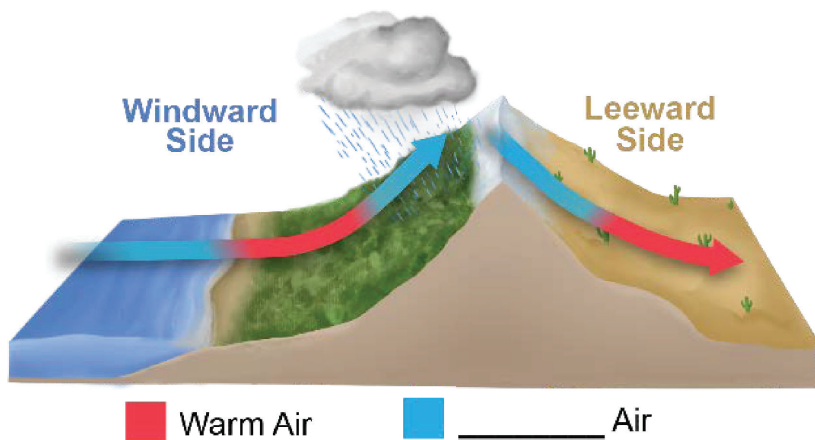
PRACTICE

Land's End in the southwest of England & Newfoundland in eastern Canada are both at similar latitudes, yet Newfoundland experiences significantly colder winters. Which of the following is likely the most accurate explanation for this phenomenon?

- a) Newfoundland is cloudier and therefore doesn't receive as much solar radiation.
- b) Newfoundland is more humid, and this moisture in the air makes it feel much colder.
- c) Warm ocean currents flow towards the UK, causing a relatively warm maritime climate.
- d) All of the above.

How Mountain Ranges Affect Climate

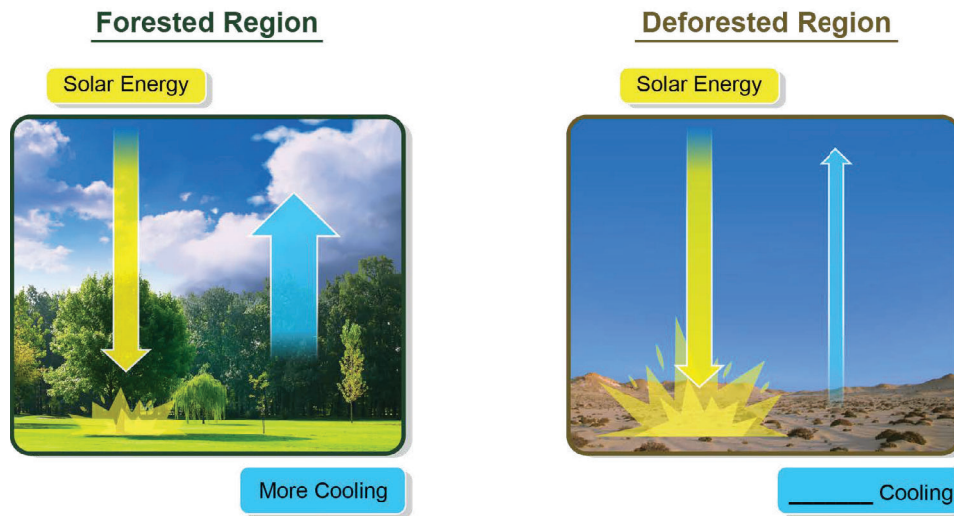
- ◆ Mountains can affect local climates by creating a _____ to air flow.
- ◆ Prevailing winds bringing moist air to mountains from _____ direction can create a "Rain _____."
 - **Rain Shadow:** a _____ area on the *leeward* side of a mountain range.



TOPIC: EARTH'S CLIMATE PATTERNS

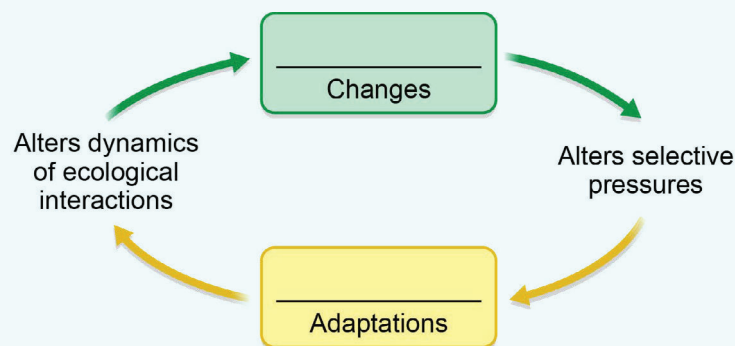
Environment & Life are Interconnected

- ◆ There is a dynamic interplay between the environment/climate & living organisms.
 - Species adapt to environmental conditions & in turn, these adaptations influence environmental chan-
- ◆ Forests create a “_____” effect via several methods:
 - **Photosynthesis:** converts solar to chemical energy & *removes* _____ (a greenhouse gas that traps
 - **Transpiration:** the evaporation & release of _____ as a gas (forms rain



EXAMPLE

Analyze the diagram and fill in the blanks. Consider an example of the complete cycle.



TOPIC: EARTH'S CLIMATE PATTERNS

PRACTICE

Earth's largest rain shadow occurs in south Asia, where northward-directed winds encounter the Himalayan mountains. Which of the following statements about this rain shadow is correct?

- a) Areas to the north and the south of the Himalayas have a drastically different climate.
- b) The area north of the Himalayas does not get a lot of rainfall & is a desert.
- c) As air moves northward over the Himalayas, moisture condenses & precipitates on the windward side.
- d) All of the above.

PRACTICE

Deforestation contributes to climate change because fewer trees mean that _____ CO₂ is removed from the atmosphere, and less _____ is absorbed, causing a hotter environment.

- | | |
|----------------------------|---------------------------|
| a) Less; H ₂ O. | c) More; solar radiation. |
| b) Less; solar radiation. | d) More; greenhouse gas. |