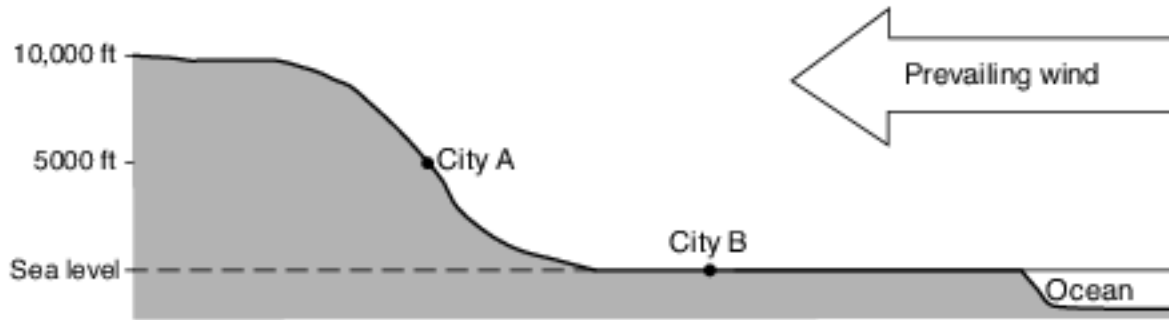


Effect Of Vertical Atmospheric Movement

1 During which month does the Sun rise north of due east in New York State?

- (1) February
- (2) July
- (3) October
- (4) December

2 The cross section below shows two cities, A and B, at different elevations.

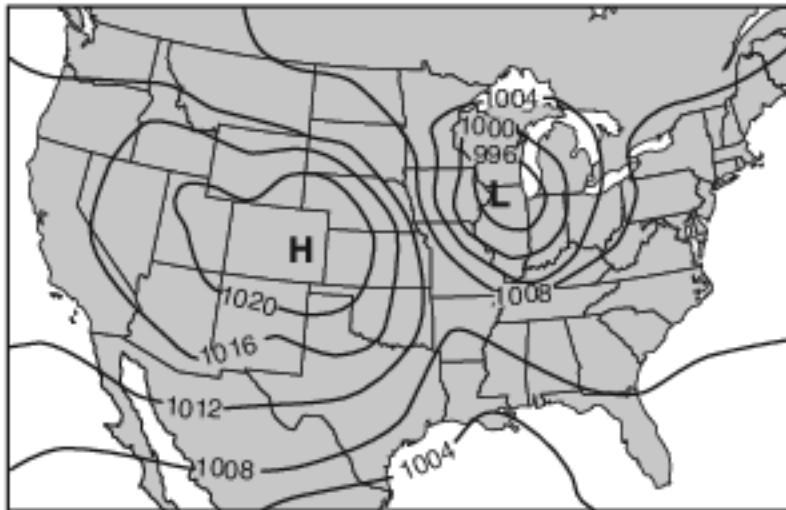


(Not drawn to scale)

Compared to the yearly temperature and precipitation at city B, city A most likely has

- (1) lower temperatures and less precipitation
- (2) lower temperatures and more precipitation
- (3) higher temperatures and less precipitation
- (4) higher temperatures and more precipitation

Base your answers to questions 3 on the weather map below, which shows the locations of a high-pressure center (H) and a low-pressure center (L) over a portion of North America. The isolines indicate surface air pressures.



3 Which map shows the most likely location of clouds associated with these pressure centers?

(1)



(2)



(3)



(4)



4 Which sequence of events affecting moist air within Earth's atmosphere causes cloud formation?

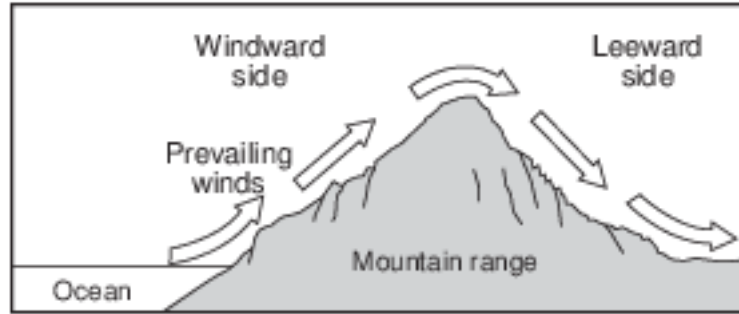
(1) rising → expanding → cooling → condensation

(2) rising → contracting → warming → evaporation

(3) sinking → expanding → warming → condensation

(4) sinking → contracting → cooling → evaporation

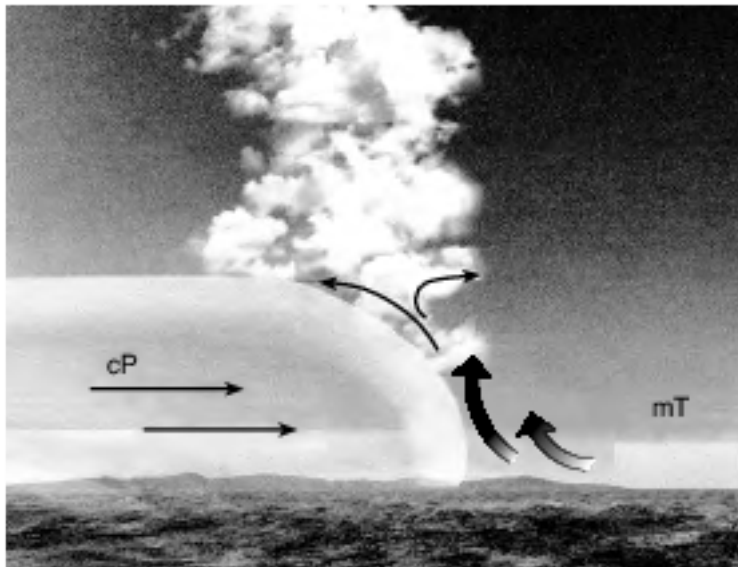
- 5 The cross section below represents a prevailing wind flow that causes different climates on the windward and leeward sides of a mountain range.



Compared to the temperature and moisture of the air rising on the windward side, the temperature and moisture of the air descending at the same altitude on the leeward side will be

- | | |
|---------------------------|---------------------------|
| (1) warmer and drier | (3) cooler and drier |
| (2) warmer and more moist | (4) cooler and more moist |
- 6 Clouds most likely form as a result of
- | | |
|--|--|
| (1) moist air rising, compressing, and warming | (3) dry air rising, compressing, and warming |
| (2) moist air rising, expanding, and cooling | (4) dry air rising, expanding, and cooling |
- 7 Most clouds form in the atmosphere when moist air
- | | |
|---|--|
| (1) rises, expands, and cools to the dewpoint | (3) sinks, compresses, and cools to the dewpoint |
| (2) rises, expands, and warms to the dewpoint | (4) sinks, compresses, and warms to the dewpoint |
- 8 Clouds are formed when moist, rising air
- | | |
|--|--|
| (1) contracts and cools, and water vapor condenses | (3) expands and cools, and water vapor condenses |
| (2) contracts and warms, and water evaporates | (4) expands and warms, and water evaporates |

Base your answers to questions 9 on the cross section below and on your knowledge of Earth science. The arrows on the cross section represent the air movement along a weather front between two different air masses. The air masses are labeled.



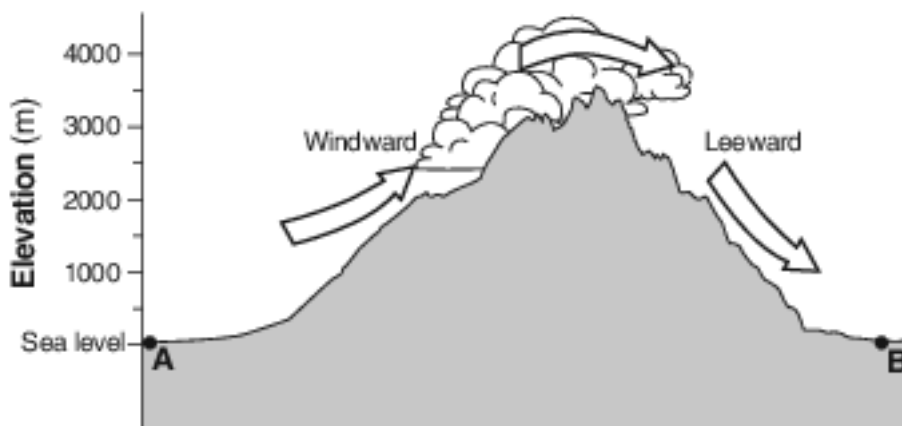
9 Clouds are forming along the front because the rising air is

- | | |
|--|---|
| (1) contracting and warming, causing evaporation | (3) expanding and warming, causing condensation |
| (2) contracting and cooling, causing evaporation | (4) expanding and cooling, causing condensation |

Base your answers to questions 10 on the snowfall map of the Tug Hill Plateau region of New York State in image provided and on your knowledge of Earth science. A lake-effect snowstorm occurred on November 16–19, 2008. Snow depths are indicated in inches at several points and by two labeled isolines. Dashed line AB is a reference line on the map between two recorded snow depths.

10 This storm occurred while Lake Ontario was not frozen. Explain why snowfall amounts would have been less if the lake had had significant ice cover. [1]

Base your answers to questions 11 on the diagram below, which shows the windward and leeward sides of a mountain range. Arrows show the movement of air over a mountain. Points A and B represent locations at sea level on Earth's surface.

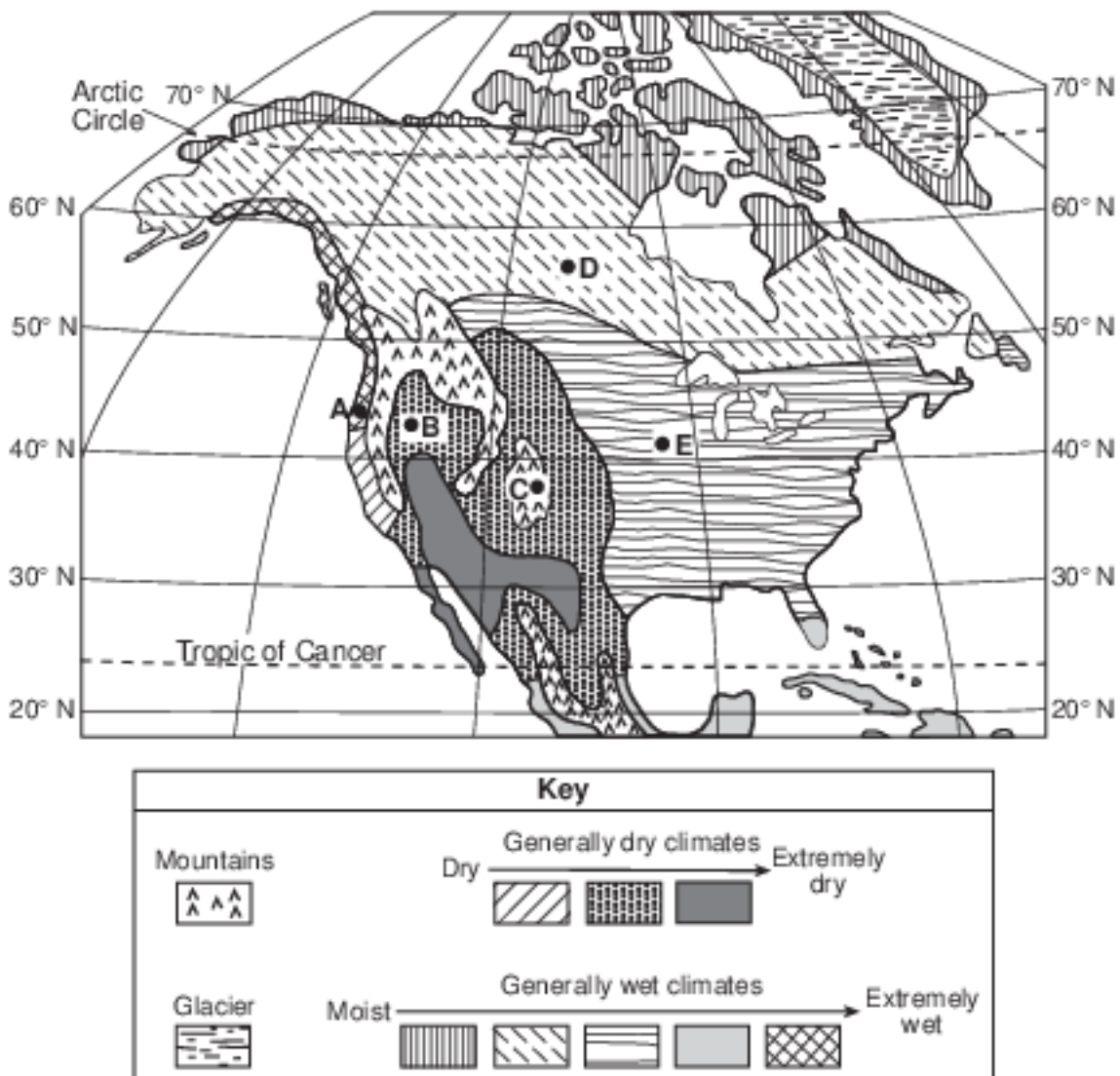


11 Explain why air cools as it rises up this mountain. [1]

Base your answers to questions 12 on the block diagram in image provided, which represents a house in New York State with a well that supplies water for people. A truck is spreading salt near a gasoline station to melt the snow on the road. Two soil zones are labeled on the diagram.

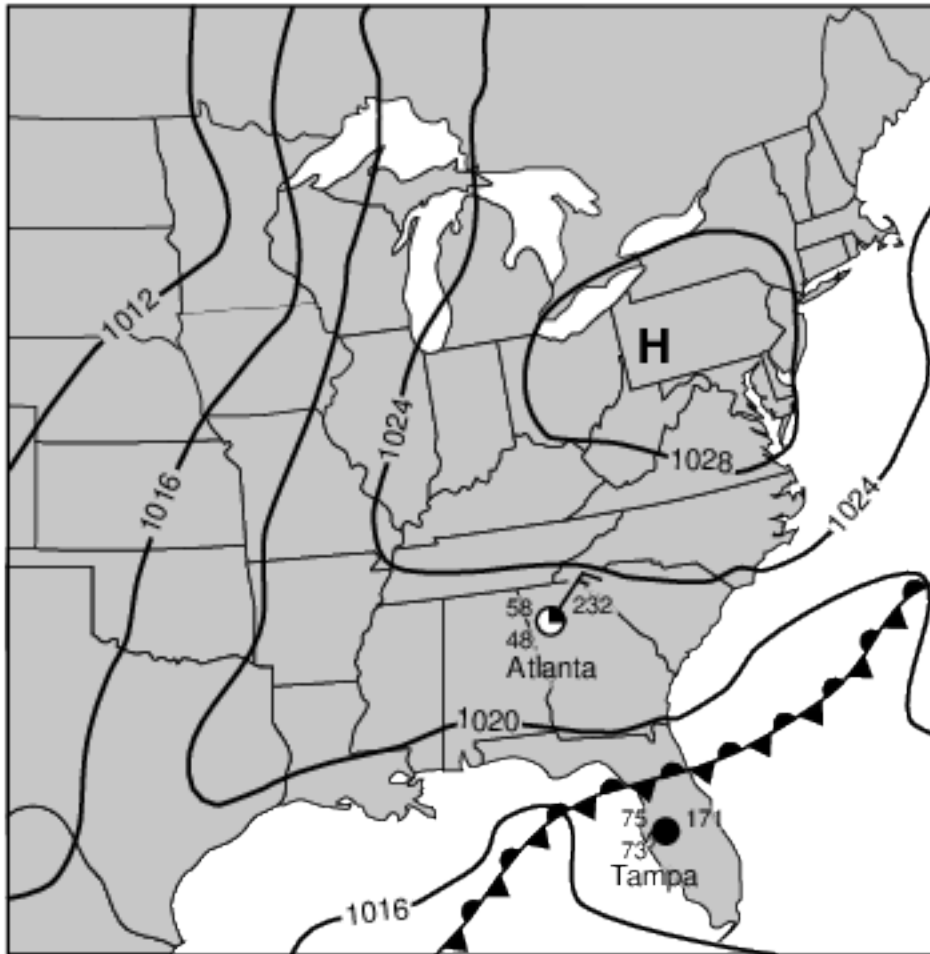
12 Identify one process that occurred in rising, moist air that caused the clouds to form at this location. [1]

Base your answers to questions 13 on the generalized climatic moisture map of North America below and on your knowledge of Earth science. Areas are classified as generally dry or generally wet, and then ranked by relative moisture conditions. Glacial and mountain climate areas are also shown on the map. Points A, B, C, D, and E indicate locations on Earth's surface.



13 Explain why the climate at location A is more moist than the climate at location B. [1]

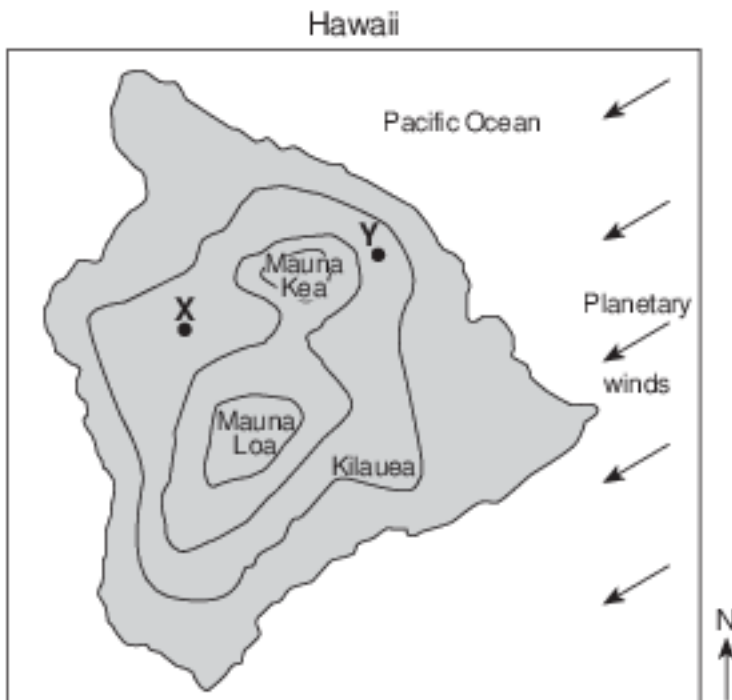
Base your answers to questions 14 on the weather map below and on your knowledge of Earth science. On the weather map, the location of the center of a high-pressure system (H) and a front are shown. Isobar values are labeled in millibars (mb). Weather station models represent the weather conditions at Atlanta, Georgia, and Tampa, Florida.



- 14 Describe one piece of evidence shown on the map that indicates that Tampa, Florida, has a high probability of precipitation. [1]

Base your answers to questions 15 on the topographic map of Hawaii in image provided and on your knowledge of Earth science. Points A and B represent surface locations on the island. Land elevations and Pacific Ocean depths are shown in meters.

- 15 The map below shows the locations of three volcanoes on the island of Hawaii. The arrows represent the direction of the planetary winds. Points X and Y represent surface locations on the island.



Explain why location X usually receives less annual precipitation than location Y. [1]

Answer Keys

1 2

2 2

3 2

4 1

5 1

6 2

7 1

8 3

9 4

10 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Not as much moisture would have evaporated from Lake Ontario, so the snowfall depths would not have been as great.
- — Less water vapor would have been picked up from the lake surface.
- — An unfrozen lake surface allows for more evaporation.

11 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Air expands as it moves up the mountain.
- — The molecules move farther apart as the air rises.
- — Lower pressure at higher altitudes allows molecules to move farther apart.
- — The less dense air at higher altitudes allows the air molecules to spread out.

12 Allow 1 credit. Acceptable responses include, but are not limited to:

- — expansion
- — condensation
- — cooling

13 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Location A is on the windward side of mountains.
- — Location A receives prevailing winds off the ocean.
- — Location A is closer to the ocean.
- — Location B is on the leeward side of a mountain range.
- — Adiabatic warming occurs in descending air at location B after losing most of its moisture on the windward side of a mountain/orographic effect.
- — The prevailing southwest winds bring moist air to location A.

14 Allow 1 credit. Acceptable responses include, but are not limited to:

- — The dewpoint and air temperature are close together./high relative humidity
- — 100% cloud cover/overcast
- — Tampa is close to a front.
- — The air pressure is low.

15 Allow 1 credit. Acceptable responses include, but are not limited to:

- — Location X is located on the leeward side of a mountain.
- — Location X is located on the rain shadow side of a mountain.
- — Location Y is located on the windward side of a mountain.
- — Moist air rises over location Y, resulting in precipitation.
- — orographic effect
- — A mountain/volcano barrier separates X and Y.
- — Planetary winds bring moisture to location Y, but lack this moisture by the time they get to location X.
- — Location X is farther from the ocean.