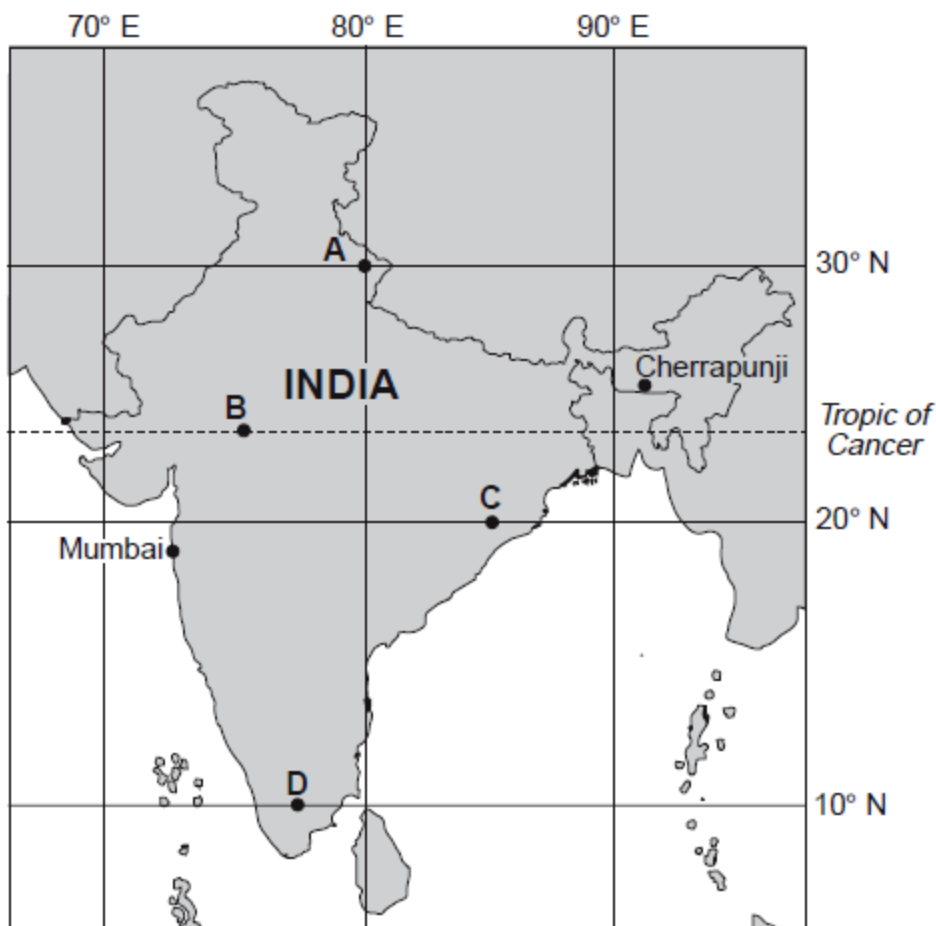

Base your answers to questions 1 through 4 on the map and the passage below and on your knowledge of Earth science. The map shows four different locations in India, labeled, *A*, *B*, *C*, and *D*, where vertical sticks were placed in the ground on the same clear day. The locations of two cities in India are also shown.



Monsoons in India

A monsoon season is caused by a seasonal shift in the wind direction, which produces excessive rainfall in many parts of the world, most notably India. Cherrapunji, in northeast India, received a record 30.5 feet of rain during July 1861. During the monsoon season from early June into September, Mumbai, India averages 6.8 feet of rain. Mumbai's total average rainfall for the other eight months of the year is only 3.9 inches.

Monsoons are caused by unequal heating rates of land and water. As the land heats throughout the summer, a large low-pressure system forms over India. The heat from the Sun also warms the surrounding ocean waters, but the water warms much more slowly. The cooler air above the ocean is more dense, creating a higher air pressure relative to the lower air pressure over India.

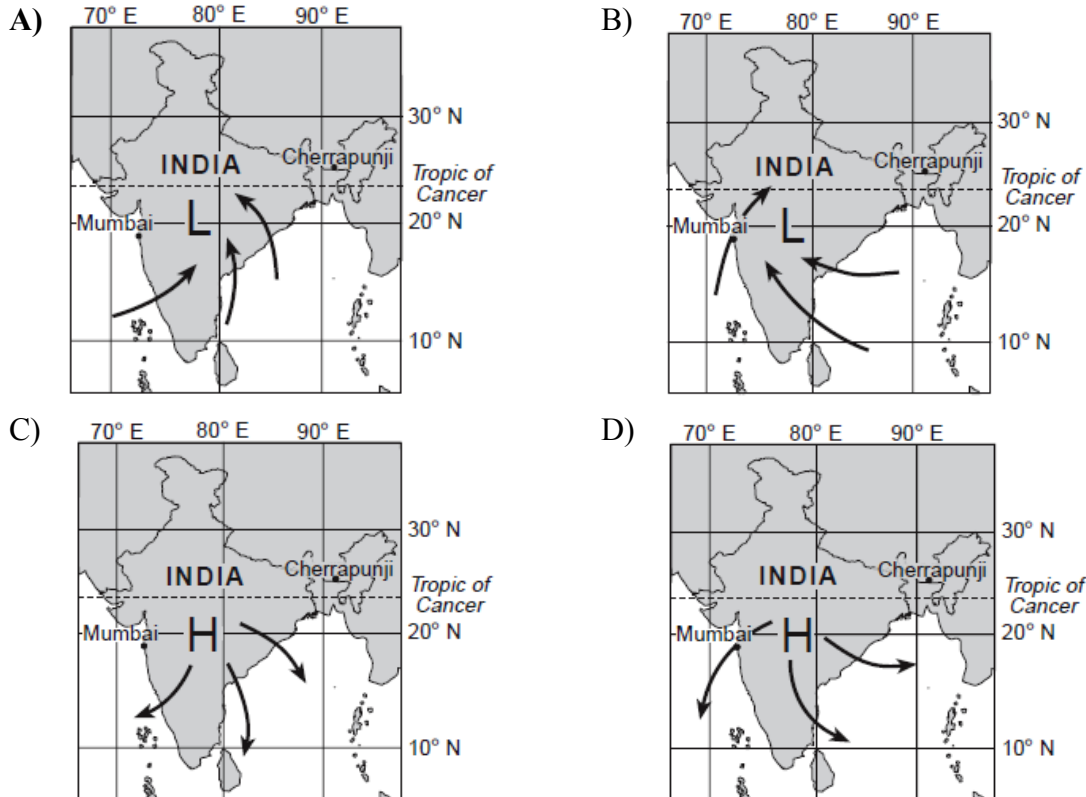
1. The unequal heating rates of India's land and water are caused by

- A) land having a higher density than water
- B) water having a higher density than land
- C) land having a higher specific heat than water
- D) water having a higher specific heat than land**

2. At which map location would no shadow be cast by the vertical stick at solar noon on the first day of summer?

- A) *A* **B) *B*** C) *C* D) *D*

3. Which map shows both the dominant air pressure system that forms over India in the summer and the direction of surface winds around this air pressure system? [High pressure = **H**, Low pressure = **L**]



4. Which processes lead to cloud formation when humid air rises over India?

- A) compression, warming to the dewpoint, and condensation
- B) compression, warming to the dewpoint, and evaporation
- C) expansion, cooling to the dewpoint, and condensation**
- D) expansion, cooling to the dewpoint, and evaporation

5. The cartoon below presents a humorous look at wave action.



"Here comes another big one, Roy, and here—we—
gooooowheeeeeeeoo!"

The ocean waves that are providing enjoyment for Roy's companion are the result of the

- A) **interaction of the hydrosphere with the moving atmosphere**
 - B) interaction of the lithosphere with the moving troposphere
 - C) absorption of short-wave radiation in the stratosphere
 - D) absorption of energy in the asthenosphere
6. The heavy lake-effect snowfalls in the Tug Hill Plateau region occur primarily because the plateau is located
- A) **in the path of prevailing winds from Lake Ontario**
 - B) in the Northern Hemisphere
 - C) near the Atlantic Ocean
 - D) west of the Hudson-Mohawk Lowlands

7. A cool breeze is blowing toward the land from the ocean on a warm, cloudless summer day. This condition is most likely caused by
- A) a high-pressure system over the land
 - B) a hurricane approaching from the ocean
 - C) a cold front that is slowly approaching the land from the ocean
 - D) **the air temperature being higher over the land than over the ocean**

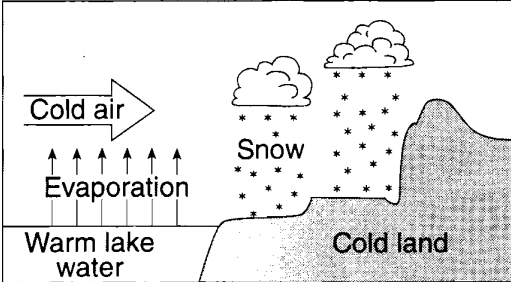
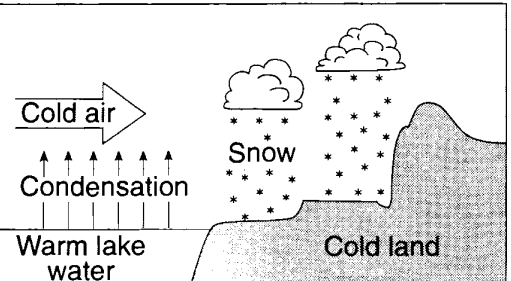
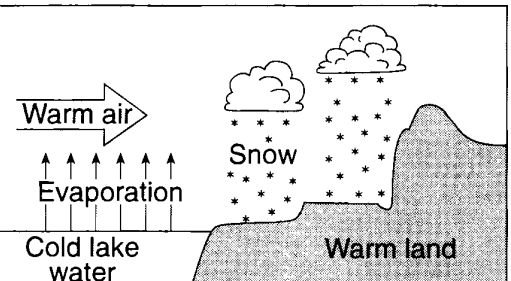
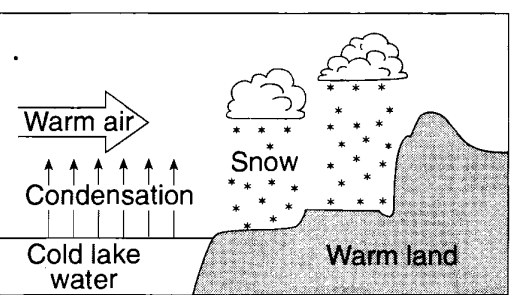
8. The striped areas on the map below show regions along the Great Lakes that often receive large amounts of snowfall due to lake-effect storms.



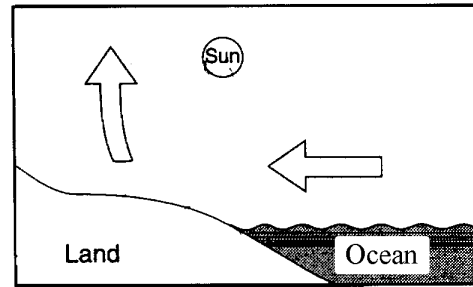
These storms generally develop when

- A) **cold air moves to the east over warmer lake water**
 - B) cold air moves to the west over warmer land regions
 - C) warm air moves to the east over colder lake water
 - D) warm air moves to the west over colder land regions
-
9. Why are most beaches often considerably cooler than nearby inland locations on hot summer afternoons?
- A) A land breeze develops due to the lower specific heat of water and the higher specific heat of land.
 - B) **A sea breeze develops due to the higher specific heat of water and the lower specific heat of land.**
 - C) The beaches are closer to the Equator than the inland locations are.
 - D) The beaches are farther from the Equator than the inland locations are.
10. Which conditions are most likely to develop over a land area next to an ocean during a hot, sunny afternoon?
- A) The air temperature over the land is lower than the air temperature over the ocean, and a breeze blows from the land.
 - B) The air temperature over the land is higher than the air temperature over the ocean, and a breeze blows from the land.
 - C) The air pressure over the land is higher than the air pressure over the ocean, and a breeze blows from the ocean.
 - D) **The air pressure over the land is lower than the air pressure over the ocean, and a breeze blows from the ocean.**
11. Large oceans moderate the climatic temperatures of surrounding coastal land areas because the temperature of ocean water changes
- A) rapidly, due to water's low specific heat
 - B) rapidly, due to water's high specific heat
 - C) slowly, due to water's low specific heat
 - D) **slowly, due to water's high specific heat**

12. Which cross section below best represents the conditions that cause early winter lake-effect snowstorms in New York State?

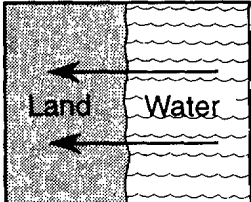
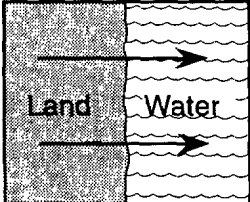
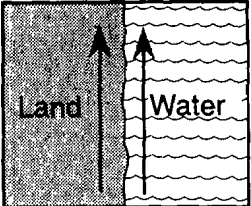
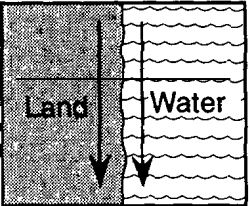
- A) 
- B) 
- C) 
- D) 

13. In the diagram below, arrows represent air movement near an ocean coastline on a summer afternoon.



Compared to the air over the ocean, the air over the land has a

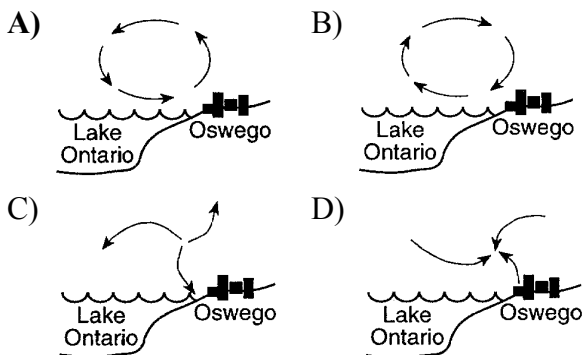
- A) lower temperature and lower barometric pressure
 B) lower temperature and higher barometric pressure
 C) **higher temperature and lower barometric pressure**
 D) higher temperature and higher barometric pressure
14. Adjacent water and land surfaces have the same temperature at sunrise on a clear, calm day. A surface wind develops after the water and land are heated by the Sun for a few hours. On which map do the arrows best represent the direction of this wind?

- A) 
- B) 
- C) 
- D) 

15. During the warmest part of a June day, breezes blow from the ocean toward the shore at the beach. Which statement best explains why this happens?

- A) Winds usually blow from hot to cold areas.
- B) Winds never blow from the shore toward the ocean.
- C) **Air pressure over the ocean is higher than air pressure over the land.**
- D) Air pressure over the land is higher than air pressure over the ocean.

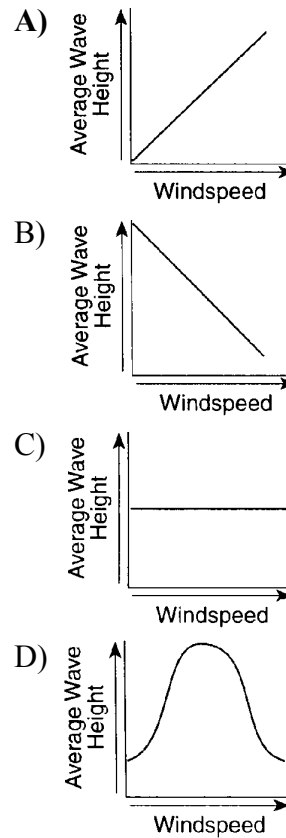
16. Which cross section best shows the normal movement of the air over Oswego, New York, on a very hot summer afternoon?



17. On sunny summer days, a breeze often develops that blows from large bodies of water toward nearby land masses because the

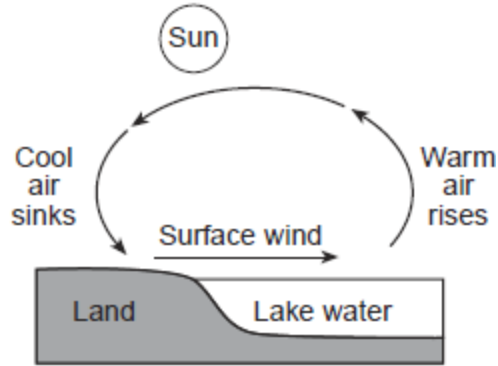
- A) **temperature of the air above the land masses is greater**
- B) specific heat of the land masses is greater
- C) temperatures of the bodies of water are greater
- D) air over the bodies of water becomes heavier with additional water vapor

18. Which graph best shows the relationship between windspeed and the average height of ocean waves formed by the wind?

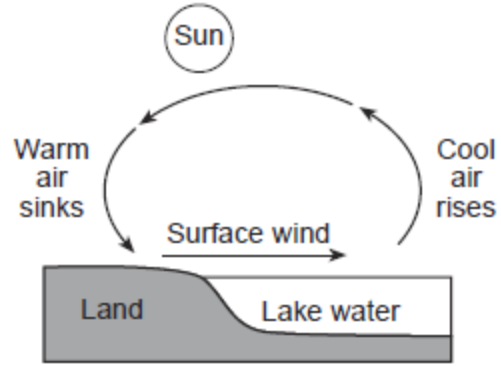


19. Which cross section best represents how surface winds form by midafternoon near a shoreline on a hot summer day? [Diagrams are not drawn to scale.]

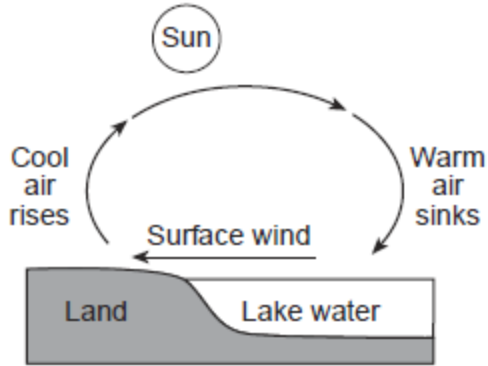
A)



B)



C)



D)

