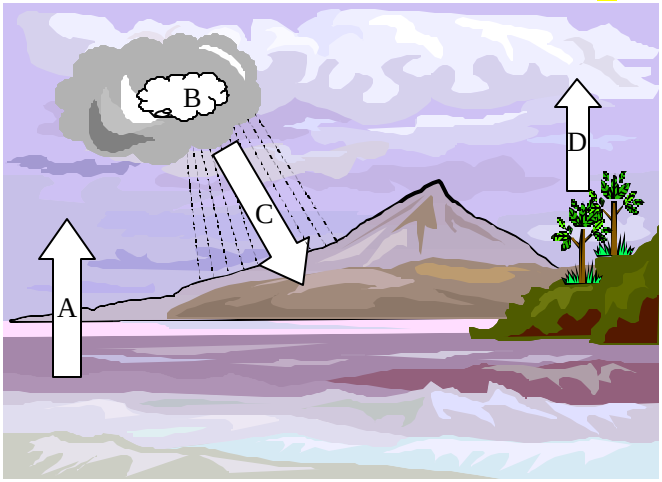
Geology 103
Fall, 2001
Prof. Paula Messina
Exam 2: Hydrosphere and Atmosphere

Directions: Read each question carefully, and decide which choice best answers the question or completes the sentence. Indicate your choice by marking the corresponding spot on the Scan-Tron provided. Use only a #2 pencil. If you need to change an answer, be certain to erase your original response completely. Incomplete erasures may be read as intended answers.

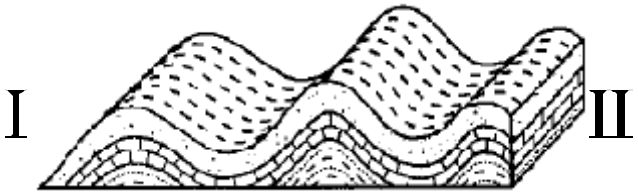
1. Most of Earth's fresh water can be found in: **A. Ice sheets or glaciers**; B. Rivers; C. Water vapor in the atmosphere; D. Ground water

2. The image below is a simplified diagram of the hydrologic cycle. Which of the labeled graphics represents the process known as *condensation*? **B**

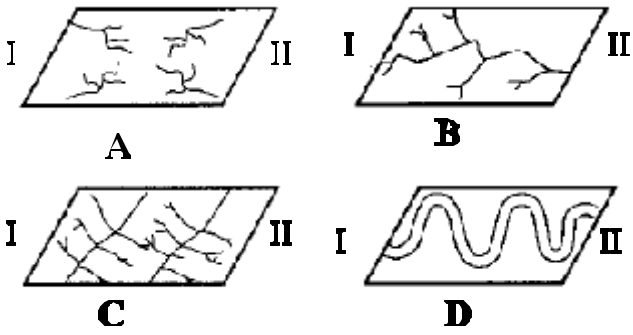


3. Which of the following characteristics would most likely be associated with a young river system?
A. Gentle slope, down-cutting erosion, wide flood plain;
B. Gentle slope, side-cutting erosion, V-shaped canyon;
C. Steep slope, V-shaped valley, waterfalls
D. Steep slope, ox-bow lakes, U-shaped valley

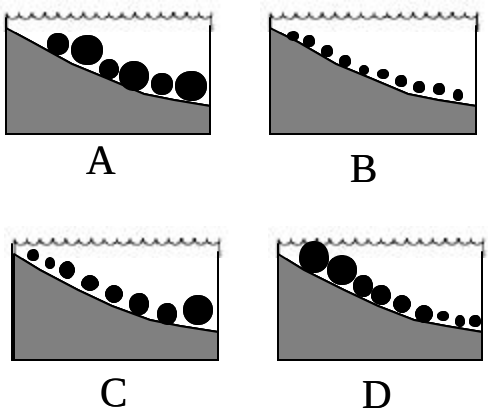
4. The following represents a landscape region and its underlying bedrock. **C**



Which of the following drainage patterns would most likely be found on this landscape?



5. Which of the following profiles most closely resembles the distribution of sediment on a continental shelf where a river enters the ocean? **D**

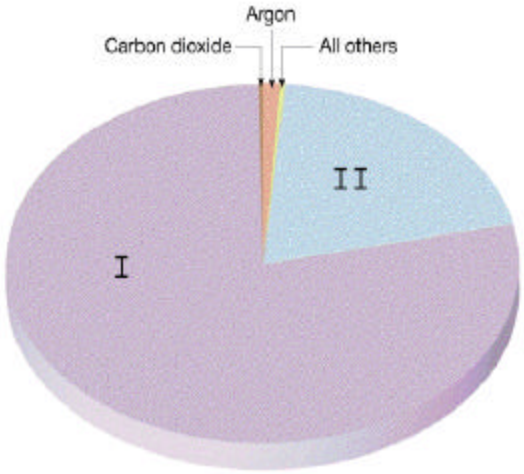


6. Surface ocean currents are driven by global wind patterns. These currents are influenced by the Earth's rotation, which causes them to be deflected:
A. To the right in the Northern Hemisphere, and to the left in the Southern Hemisphere;
B. To the left in the Northern Hemisphere, and to the right in the Southern Hemipshere;
C. To the right in both the Northern and Southern Hemispheres;
D. To the left in both the Northern and Southern Hemispheres.

7. The daily rising and falling of ocean levels is caused by: A. Wind, only; B. Wind, and Earth's rotation; **C. The gravitational pull of the Moon and Sun**; D. Ocean currents and Earth's revolution.

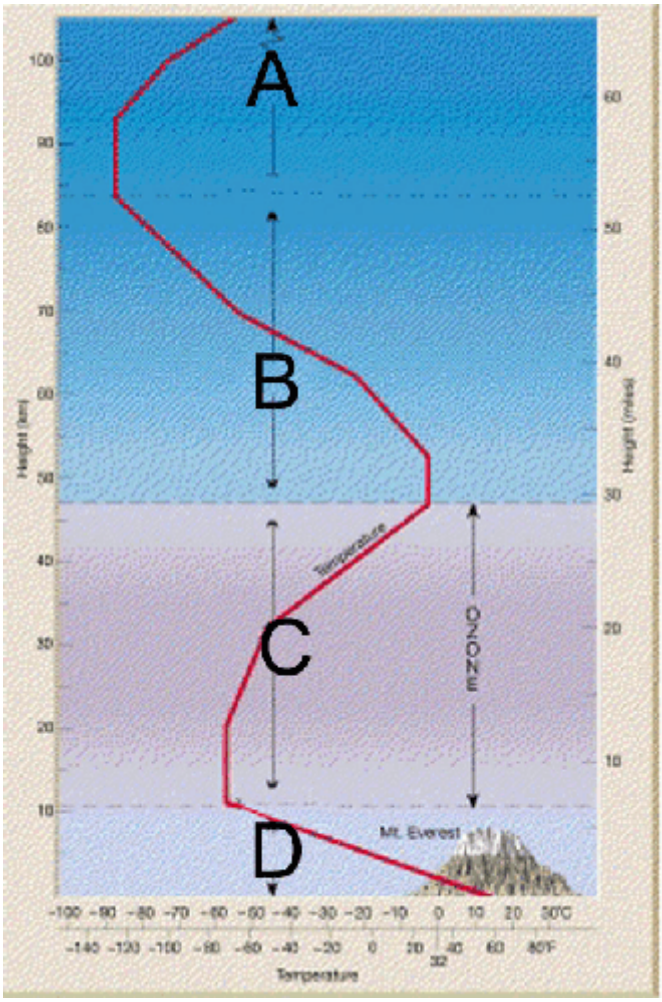
8. A transitional zone in sea water characterized by a significant change in salt concentration is known as the: A. Isocline; B. Salocline; C. Thermocline; **D. Halocline**

9. The pie chart below shows the relative composition of gases in Earth's atmosphere. What gas is represented by the area labeled "I ?"



A. Nitrogen; B. Oxygen; C. Water vapor; D. Ozone

Questions 10 and 11 refer to the diagram below, showing relative heights and temperatures through Earth's atmosphere.



10. The thermosphere is represented by the layer labeled: **A**, B, C, D

11. In which layer are almost all clouds formed?
A, B, C, **D**

12. Which of the following statements is true about conditions on June 21?
A. It is about the time of year when Earth and Sun are closest together; **B. It is the day when insolation is most intense in the Northern Hemisphere;** C. It is a day when the Sun does not set at the South Pole; D. It is an equinox, when the daylight and nighttime periods are equal at all points on the globe.

13. Most heat in the atmosphere is transferred from one place to another as a result of the movement of cool and warm air due to density differences. This process is known as: A. Reflection; B. Conduction; **C. Convection**; D. Refraction

14. Which of the following is true about forms of electromagnetic energy? A. The Sun produces a single wavelength of electromagnetic energy; B. Most of the Sun's energy received by Earth is absorbed at Earth's surface; **C. Infrared energy is sensed as heat**; D. Electromagnetic energy can travel through a solid, liquid, or gas, but cannot travel through empty space.

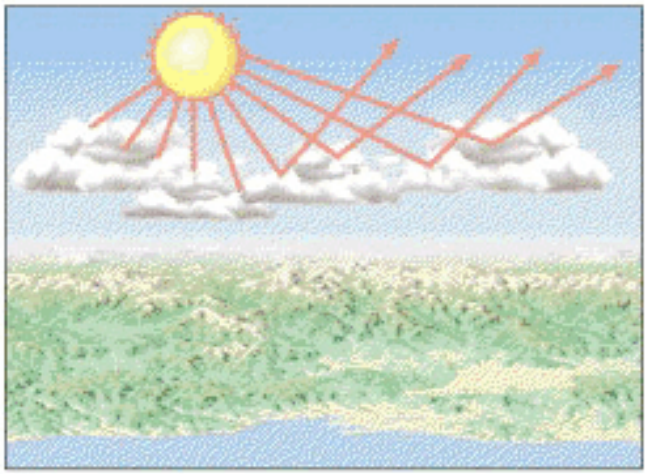
Note: To answer questions 15 and 16, use the following information:

- *The specific heat of liquid water is 1 calorie per gram per degree, Celsius.*
- *The latent heat of fusion of water is 80 calories per gram.*
- *The latent heat of vaporization of water is 600 calories per gram.*

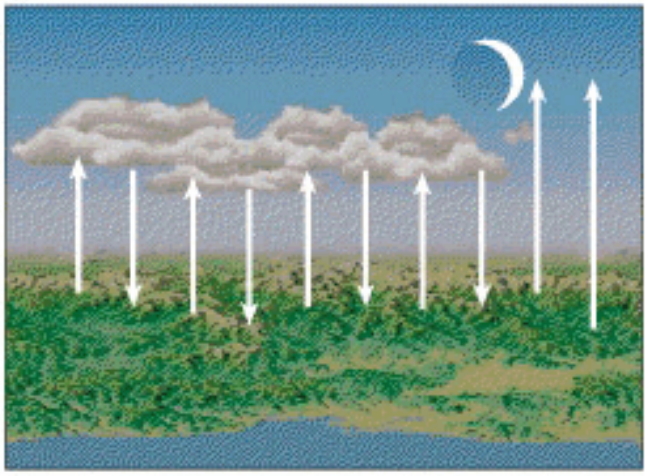
15. If 5 grams of liquid water increases in temperature from 40°C to 50°C, how many calories of heat did the water absorb?
A. 1 calorie; B. 5 calories; C. 10 calories; **D. 50 calories**

16. One hundred grams of ice is removed from a freezer, and melts at room temperature. Which of the following energy transformations must have taken place?
A. The ice absorbed 8000 calories of heat from surrounding air in the room; B. The ice released 8000 calories of heat to the surrounding air in the room; C. The ice absorbed 60,000 calories of heat from surrounding air in the room; D. The ice released 60,000 calories of heat to the surrounding air in the room

Question 17 refers to the diagrams below, labeled A and B.



A.



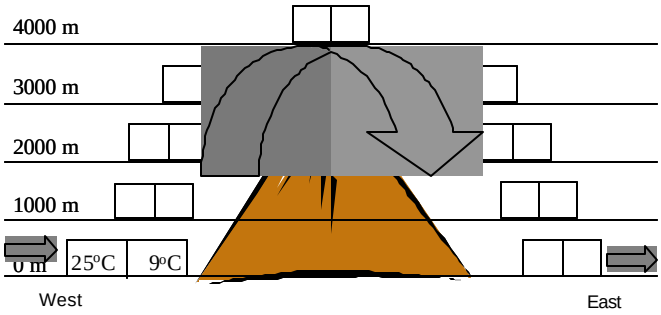
B.

17. The diagrams above show how clouds interact with energy received by Earth from the Sun during the day, and energy radiated by Earth at night. These diagrams illustrate that: A. Clouds absorb insolation from the Sun, but transmit energy re-radiated by Earth; **B. Clouds cause temperatures to be lower during the day, but allow temperatures to be higher during the night**; C. The presence of clouds causes increased temperatures during the day and night; D. The presence of clouds causes decreased temperatures during the day and night.

18. Relative humidity may change if: A. The amount of water vapor in the air changes, only; B. The temperature of the air changes, only; C. The air pressure changes, only; **D. Either the** amount of water

To answer questions 19 - 22, use the following information:

- Adiabatic Lapse Rate for Dry (Unsaturated) Air: 10°C decrease in temperature for every 1000 m increase in elevation; 2°C decrease in dewpoint for every 1000 m increase in elevation.
- Adiabatic Lapse Rate for Moist (Saturated) Air: 5°C decrease in temperature for every 1000 m increase in elevation; 5°C decrease in dewpoint for every 1000 m increase in elevation.



The diagram above shows a mountain which acts as a barrier to winds blowing from west to east. On the west side, at sea level, the air's temperature is 25°C, and its dewpoint is 9°C.

19. Based on this information, at what elevation will a cloud begin to form? A. 1000 m; **B. 2000 m.**; C. 3000 m.; D. 4000 m

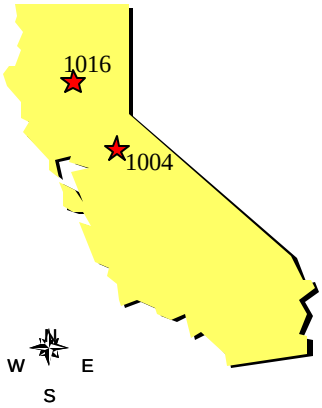
20. The precipitation that falls from the cloud that forms (at the level specified in question 19) will most likely be: **A. Rain**; B. Snow; C. Hail; D. Meatballs

21. If air continues to rise on the windward side, and sink on the leeward side of this mountain, what will the air temperature be at an elevation of 0 m. on the leeward side? A. 3°C; B.15°C; C. 25°C; **D. 35°C**

22. If these conditions are indicative of the a real location on Earth, where is this mountain most likely located? A. In Antarctica, at an latitude of 75° South; **B. In the United States, at a latitude of 35° North**; C. In South America, at a latitude of 10° South; D. In

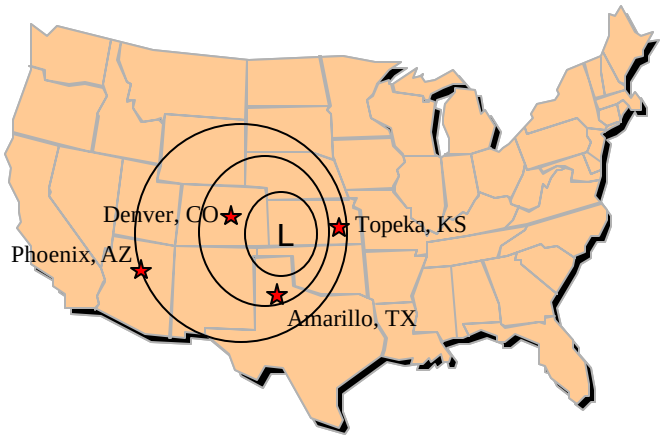
Questions 23 and 24 refer to the map below

The map to the right shows the state of California, and two air pressure readings obtained from weather stations in two cities: Redding, CA has reported an air pressure reading of 1016 millibars; Sacramento has reported an air pressure reading of 1004 millibars.



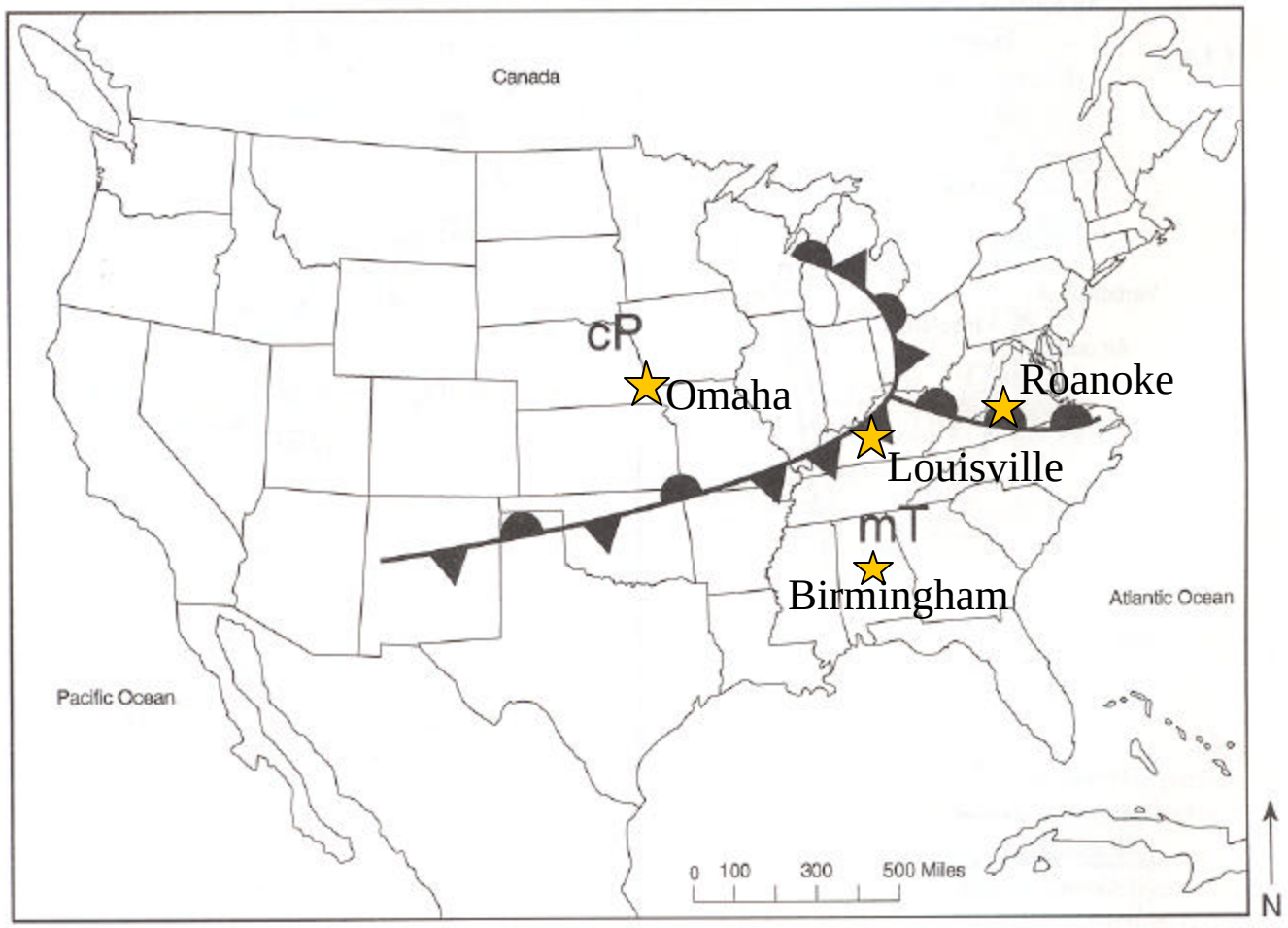
23. What type of surface winds would probably result from these conditions?
A. A southeast wind; **B. A northwest wind**; C. A southwest wind; D. A northeast wind.

24. Which if the following statements about probable local weather conditions in the two cities is most likely accurate?
A. Sacramento and Redding are both experiencing cloudy skies; B. Sacramento and Redding are both experiencing clear skies; C. Redding is experiencing cloudy skies, while Sacramento is experiencing clear skies; **D. Redding is experiencing clear skies, while Sacramento is experiencing cloudy skies.**



25. Which city is most likely experiencing the highest wind speeds? A. Phoenix, B. Denver, C. Amarillo, **D. Topeka**

Questions 26 - 30 refer to the weather map shown below.



26. What is the total number of different kinds of weather fronts shown on this weather map? A. 1; B. 2; C. 3; **D. 4**

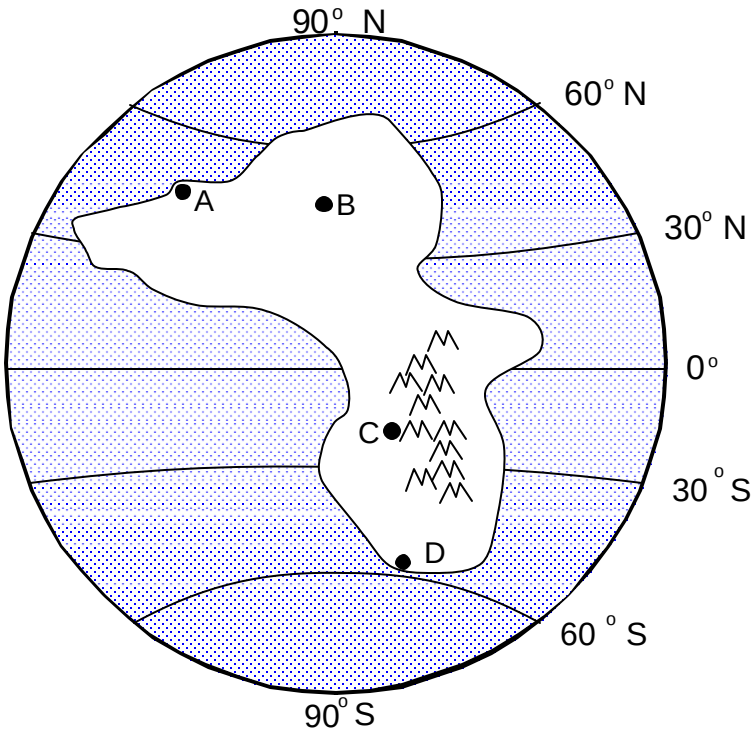
27. Which city is most likely the coolest and driest? **A. Omaha**; B. Birmingham; C. Louisville; D. Roanoke

28. Which city is most likely receiving heavy showers? A. Omaha; B. Birmingham; **C. Louisville;** D. Roanoke

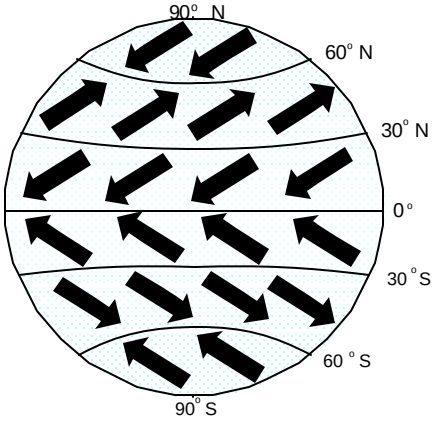
29. Which city is most likely receiving light rain or drizzle? A. Omaha; B. Birmingham; C. Louisville; **D. Roanoke**

30. Over which city would we most likely find thick "cumuloform" clouds? A. Omaha; B. Birmingham; **C. Louisville**; D. Roanoke

Questions 31-33 refer to the map below, left showing four locations, labeled A, B, C, and D, on an imaginary continent called "Messinaland." Planetary wind belts are shown below, right. Answer questions 31 - 33 based on these diagrams.

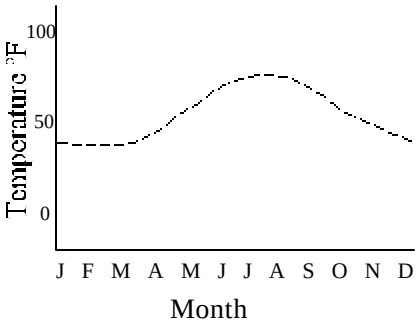


Messinaland

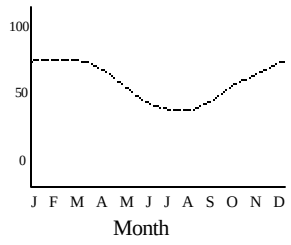


Planetary Wind Belts

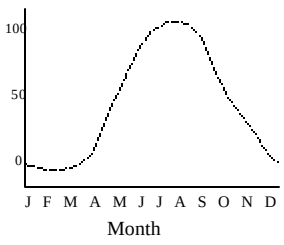
Use the graph below to answer question 31.



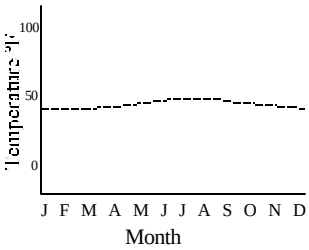
31. If the graph to the right shows the average high temperature for location "A" during a year, which graph most likely shows the average high temperature for location B?



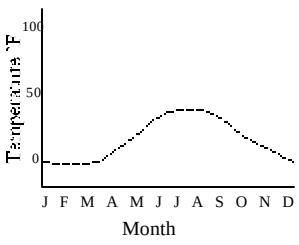
A



B



C



D

32. Which location probably has the driest climate? A, B, **C**, D

33. Which location lies closest to a known zone of convergence and low pressure? A, B, C, **D**