Learning Objectives and Study Questions for Chapter 19

1. Describe how the spread of grasses during the relatively cool, dry Neogene has impacted both large and small animals in open terrains (grasslands).

2. Describe how the formation of the Isthmus of Panama is thought to have affected the onset of the Pleistocene ice age, as well as the interchange of mammalian faunas between North and South America.

3. Briefly discuss why, if the Milankovitch theory is correct and ongoing astronomical cycles influence climate, Earth has not had glacial advances and retreats throughout its entire history.

4. Sketch the locations of the San Andreas Fault and the Basin and Range Province on a map of modern North America and briefly describe how many geologists think the origins of these two features are related.

5. Sketch the locations of the Columbia Plateau and Snake River Plain on a map of modern North America and briefly describe how many geologists think the origins of these two provinces are related.

6. Predict whether modern geologic structures observed in the Alps and Himalayas will likely be more similar to those of the Sierra Nevada or Appalachian mountains, and explain your prediction in terms of the tectonic settings of these ranges.

1. The spread of grasslands at the expense of forests during Neogene time led to adaptive radiations of _____.
   A. Compositae (weeds/herbs)
   B. snakes
   C. rats and mice
   D. songbirds
   E. all of these groups

2. The shift from C3 to C4 grasses 6-7 million years ago favored grazing mammals with _____.
   A. smaller hooves
   B. very tall molars
   C. better eyesight
   D. denser fur
   E. college degrees

3. Long-term global cooling, which set the stage for the Pleistocene “ice age”, appears to mostly be related to _____.
   A. lower solar output
   B. low atmospheric CO₂
   C. increased volcanism
   D. continent/ocean positions
   E. Milankovitch cycles

4. Short-term glacial advances and retreats are apparently driven primarily by _____.
   A. continental movement
   B. large volcanic eruptions
C. variations in solar energy output  
D. astronomical cycles (Milankovitch effect)  
E. ups and downs in the stock market  

5. Extension in the Basin and Range province is closely related to _____. 
   A. inception of the Yellowstone hotspot  
   B. the Nevadan Orogeny  
   C. renewed uplift of the Appalachians  
   D. volcanism in the High Cascades  
   E. development of the San Andreas fault  

6. The Columbia River Basalts and Snake River Plain are related to _____. 
   A. Basin and Range extension  
   B. Cascade subduction  
   C. Yellowstone hotspot  
   D. San Andreas fault  
   E. Neogene cooling  

7. The main part of the Tethys Seaway was closed when India collided with Eurasia to build the _____ .  
   A. Alps  
   B. Himalayas  
   C. Urals  
   D. Korean Peninsula  
   E. Japanese Islands