Answer Key

Answers to Study Questions

1. With the structure of global air circulation, air currents sink through the atmosphere around the 30° North and South Latitudes. As the air descends, the weight of the overlying air compresses the descending air, causing it to warm up. As the temperature of the descending air increases, its capacity to hold water vapour also increases. Hence, the land surface around the 30° North and South latitudes is characterized by high evaporation rates. However, very little of this evaporating water falls back to Earth at these latitudes as rain. As a result, such regions are characterized by low rainfall and high evaporation rates, which promote desert conditions.

2. A rain shadow zone develops when moist air is forced upwards as it blows over a mountainous landscape. As the air rises, it cools, and the moisture in the air condenses and falls as rain on the windward side of the mountain range. When the air emerges on the other side of the mountain range, it will be dry, giving rise to an environment characterized by low rainfall. This dry zone is called a *rain shadow zone*.

3. Polar deserts develop close to the pole regions when global air currents descend, causing evaporation but no precipitation. Such conditions give rise to cold and dry conditions termed *polar deserts*.

4. In desert environments, the characteristic dry climate rarely allows for enough water to sustain rivers that flow year-round. Though water runs over the surface following storms, such streams are only ephemeral. For this reason, most deserts lack through-flowing streams.

5. Flash floods in deserts can rapidly incise narrow ravines with vertical walls that dry quickly when the floods subside. The floors of such canyons are often mantled with gravel and are called *arroyos* (or dry washes).

6. The term *mesa* describes a wide, flat-topped, elevated landform (or hill) with a cap of resistant rock. Such a structure is usually formed when a plateau is eroded, leaving behind the more resistant remnants. A *butte* is formed by similar processes but is narrower than a mesa.

7. Alluvial fans form when sediment eroded from mountains by flash floods is deposited at the base of the mountain. With increasing deposition at the base of the mountain, several alluvial fans can merge to form a larger structure called a *bajada*.

8. The continued erosion of a mountain structure can eventually reduce it to a landform with a lower altitude and a gentler gradient called a *pediment*. Pediments are often covered by a thin layer of gravel deposits produced by the weathering of the mountain.

9. A flat face on a ventifact is produced by the action of wind-transported sand grains blasting against the exposed face of a rock or boulder from a particular direction. Hence, three flat faces on a ventifact would indicate a varying wind direction: that is, wind has originated from at least three directions.

10. The process of *deflation* entails the removal of lighter (fine-grained) particles from a landscape by wind, leaving behind the heaver and coarser-grained fractions. Deflation can lead to a significant reduction of the landscape.

11. A blowout develops on a land surface when the localized removal of sediment (erosion) by wind leads to the formation of a hollow depression.

12. *Cross-bedding* structures are inclined sedimentary structures that form when sediment deposited on the slip face of a dune slides over as the slope of the face becomes too steep. The sediments that slide over settle lower down the slip face, forming an inclined secondary bed. Continued deposition and slippage results in repetitive inclined bedding that characterizes depositional sequences in dunes.

13. *Wind ripples* are repetitive, small-scale ridges that occur on dune surfaces. They are believed to be the products of sediment transportation by saltation up the dune surface.

14. Barchans are structurally similar to parabolic dunes in that both dune types are curved or crescent-shaped. However the horns of a barchan dune point in the downwind direction, and the slip face is on the inside slope. Parabolic dunes, on the other hand, have horns that point upwind, and the slip face is on the outside slope.

15. Longitudinal (or seif) dunes occur as regularly-spaced symmetrical ridges aligned parallel to the wind direction. Longitudinal dunes form some of the largest dune structures. Such dunes can reach lengths of up to 120 km and heights of more than 200 m.