

Chapter 8

1. a. Outside of the polar regions, what single environmental factor is most important in determining the distribution of forests?

Answer

Mean average rainfall

1. b. Explain the distribution of temperate grasslands in Figure 8.19.

Answer

Grasslands are generally found in the centre of continents or away from moist coastal air, that is in the drier regions.

1. c. What sequence of ecosystems (based on the types described here) would you expect to find as you ascended an alpine valley?

Answer

The alps are largely within the temperate region (they border the Mediterranean ecosystems only on their most southerly fringes) and so the valley bottoms are broadleaved forest. With increasing altitude, we find the same sequence as if we were progressing north – with interruptions for agriculture, such as pasture. A natural sequence would thus follow with conifer forest, a tundra like moorland in flatter areas bordering the ice fields.

2. The hurricane season in North America lasts from June 1 to November 30. Suggest why hurricanes and intense storms are a feature of the Gulf of Mexico.

Answer

The Gulf of Mexico represents a relatively enclosed body of water sitting on the Tropic of Cancer. Surrounded on three sides by land, water is retained within a crucible where it can be heated by the sun during the summer of the northern hemisphere. High rates of evaporation from the sea surface, and the high pressure created by the warming of the air above mean large amounts of energy are added to the atmosphere over a relatively confined area. When it meets cold air arriving from the North vortices are formed from which this energy and water can be released.

3. For each of the following biomes what factor determines a seasonal change in biological activity?

- Tundra
- Temperate forest
- Arctic polar region
- Savanna
- S E Asian tropical forest

Answer

Parts of the tundra and the arctic polar region undergo summer thaws, so here the main factor is temperature, as it is in temperate forests. The dry season of the savanna is

responsible for the seasonal migration of the large herbivores and it also causes some forests in S E Asia to shed their leaves.

4. Living and fossil marsupials are only found in America, Antarctica and Australia. The oldest fossils are found in America. Suggest the pattern of dispersal of these mammals, and account for their absence from the other land masses once connected to Antarctica 65 million years ago.

Answer

The earliest marsupials originated in Central and North America and probably dispersed via Antarctica to Australia. However, this must have happened after the other major landmasses connected to Antarctica (principally, Africa, India and Madagascar) had separated and moved northwards. This separation occurred around 140 million years ago, a long time before the first marsupials appeared.

5. Why should a persistent thawing of the permafrost lead to greater methane releases from this biome?

Answer

Prolonged thawing would allow a waterlogged, organically rich soil to become biologically active for longer. A waterlogged soil lacks oxygen, so the principal means of decomposition will be anaerobic (and bacterial) and that means that methane (CH₄) is generated in relatively large proportions. Methane is a more powerful greenhouse gas than carbon dioxide.

6. List the ways in which the abiotic ecology of the river Amazon may change if the Amazon basin dries and experiences a higher frequency of forest fires.

Answer

Worth noting that the Amazon catchment is a massive landscape feature and what applies in some parts will not apply elsewhere.

- Lower rainfall implies less runoff, but this may become more seasonal, perhaps with more floods and periods of low flow
- Landslips increase in upland areas with less forest cover to retain soils
- Higher sediment loads
- Changes in water chemistry with greater sediment load
- Greater turbidity, possibly lower oxygen levels
- Greater sedimentation in lowland areas

This is not an exhaustive list. Speculate on how each of these may change the interactions within the river community.

7. Consider Figure 8.32. Suggest the main reason why turnover is so much faster in oceanic planktonic communities compared to terrestrial ecosystems.

Answer

Terrestrial plants, especially trees, have to invest in structural tissues to support their photosynthetic surfaces. This means that a significant part of their fixed carbon is held in such support tissues. Phytoplankton make no such investment and complete their life cycle in a short period.