

Option - Geoecology | Sample Answer

Describe and explain the main characteristics of one biome that you have studied. (2008 Q18)

The biome I have studied is the hot desert biome. Hot deserts can be found in the Sahara Desert in Africa and the Thar Desert in North West India.

Deserts tend to have a very wide diurnal range of up to 30. This is due to the high daytime temperature of up to 45 in summer, and rapid heat loss at night. The high daytime temperatures occur as there is no cloud cover, and the sun's rays are concentrated in a very small area. Rainfall in the desert can be as low as 1cm annually. Desert storms may occur. These are short downpours. However, in the desert, the evaporation rate is higher than the rainfall rate, causing drought. This has impacted the life cycles of plants. Ephemerals are fast-growing plants which can complete their life cycle in the weeks after a storm. They account for 40% of desert plants. The seeds of epherals can lay dormant for years but rainfall allows the seeds to germinate, flower and reproduce more seeds within 2-3 weeks e.g. creosote bush. Only 1/6 of desert rainfalls are heavy enough to support plant growth. There are three types of desert based on rainfall, extremely arid which has almost no rainfall each year, arid which has less than 250mm of precipitation annually, and semi-arid which has 250-500mm of rainfall annually.

High mountain ranges affect rainfall in the desert. The rain shadow effect results in a very dry desert. As the prevailing winds rise over mountains, the relief rain is triggered on areas of high ground. The land in the sheltered lee of the mountain gets much less rain as the air descends e.g. SouthWest USA desert. This has had an impact on the cactus which has had to adapt itself to the low rainfall conditions. The cactus is called a succulent as it stores water in its fleshy, sponge-like interior. It has grooves in its trunk which can expand to store water, In the grooves there are vertical channels which bring water directly to the roots. Water is also stored in the roots and underground bulbs. Cacti have thick, waxy leaves and dense hairs which prevents water loss. They are also thorny which prevents birds and insects biting in for water. Vegetation in the desert is sparse due to low water availability. Any vegetation that is there is well spread out to prevent resource competition.

The dominant soil in this biome is the aridisol. It is an alkaline soil which is found in dry, low rain areas. Coarse grained aridisols are found in low mountain slopes They are infertile and cannot hold moisture. This makes them unsuitable for vegetation growth as most plants require water for growth. They originate from exfoliated rocks due to high and low temperature which make rock contract and expand causing the rock split and separate.

Fine and sandy aridisols occur when fine materials are transported to lowlands by downpours and dry winds. They have a deep soil cover but are not suitable for plant growth. There is a lack of vegetation so there is no organic matter. This means there is no A horizon so the soils are a light grey colour. As there is no humus, micro-organisms activity is limited. Aridisols are nutrient rich so after short periods of heavy rainfall, rapid growth occurs. This encourages growth of plants but due to high vaporisation rates, the water disappears too soon. In aridisols, capillary action is active on the groundwater with dissolved minerals bringing them to the surface. The water evaporates quickly leaving a mineral layer which hinders plant growth. Salinization results in a salt pan forming. Salt is poisonous for plants so no growth can occur. Calcification is when a hardpan of calcite forms. Calcite is an impermeable substance, so plant roots cannot penetrate which inhibits growth. If plants have adapted to have a tap root system, their long root can penetrate the soil to reach the water table below e.g. Mesquite bush, where the single long root can be up to 50m long.