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Hot desert ecosystems

Living conditions in hot deserts

Hot desert biomes are found in North America, South and Central America, Africa, the Middle East, South Asia and Australasia. They are found around and within tropical regions, mostly around the Tropic of Cancer and Tropic of Capricorn. These biomes are characterised by:

- hot seasons for most of the year
- average annual rainfall below 250 millimetres
- extreme daily variation in temperature from up to 50 °C during the day to below 0 °C at night
- clear skies all day and night
- coarse sandy soils with good drainage, little sub-surface water but low in nutrients and organic matter.

To survive in these conditions requires special adaptations for plants and animals. Yet the hot desert ecosystem is much richer than at first sight.

B Adapting to desert life



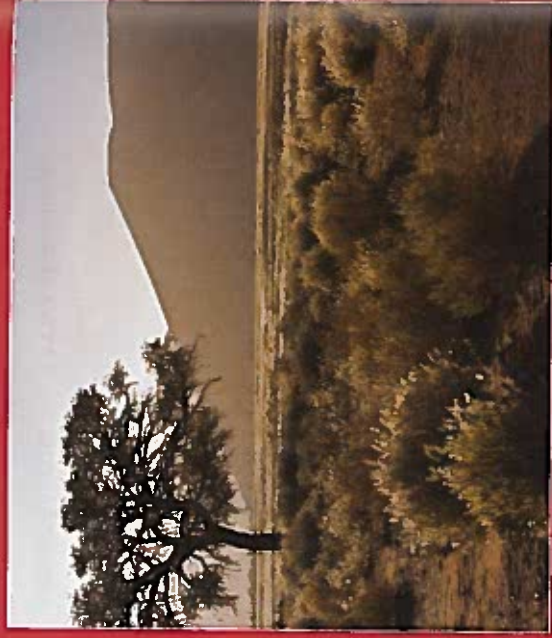
The Saguaro cactus is the state flower of Arizona, USA. The blossoms open during desert nights and close in the day. It has a tall, thick stem with smooth waxy skin and 20 mm spines. The stem can expand to store water.



Camels are called 'ships of the desert' because they can cross the desert better than any other animal. They have bushy eyebrows and two pairs of eyelashes to keep sand out of their eyes. They only have two toes and thick padded feet so they can walk easily across sand. The hump stores fat reserves that can be used as food as the animals travel. If the hump shrinks the camel's reserves are low.

Beginnings ...	endings
Plants are low-growing ...	... to avoid water loss by strong winds.
Some animals can store food and water for days ...	... to prevent water loss by evapotranspiration.
Animals are often small ...	... to reach underground water supplies.
Plants store water in thick stems ...	... to use in dry periods.
Small animals can hide in burrows or under stones ...	... to reach the maximum area for water and to find any surface moisture.
Some rodents are nocturnal ...	... so there is less water loss from a small surface area.
Plants have roots that travel horizontally ...	... so they can avoid intense daytime heat.
Insects and reptiles have waterproof skins ...	... so they can hunt in cooler nights.
Plants have long roots ...	... so they can retain water in their bodies.
Plants have small, thick leaves or needles ...	... so they can travel far without the need for daily supplies.

A Living conditions are harsh



Makkah (21°N 40°E), Saudi Arabia; Altitude: 277 metre

	J	F	M	A	M	J	J	A	S	O	N	D
Temperature (°C)	24	24	27	31	34	36	36	36	35	32	28	25
Rainfall (mm)	21	1	6	12	1	0	1	6	5	14	22	21

Average annual rainfall = 110 millimetres

Temperatures are average (mean) for each month

Average daily temperature: Max 43 °C Min 18 °C

Average relative humidity: 46%

Alice Springs (24°S 134°E), Australia; Altitude: 545 metres

	J	F	M	A	M	J	J	A	S	O	N	D
Temperature (°C)	28	28	25	20	15	13	12	15	18	23	26	28
Rainfall (mm)	38	37	30	13	14	12	12	8	7	18	22	32

Average annual rainfall = 243 millimetres

Temperatures are average (mean) for each month

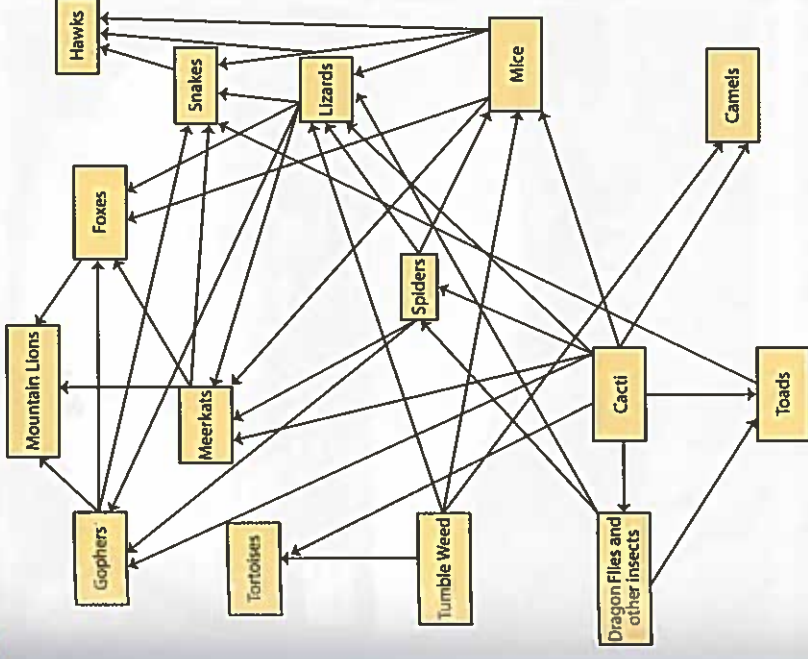
Average daily temperature: Max 36 °C Min 4 °C

Average relative humidity: 19%

TASK 1: Study Source A

- a Describe the scene in the photo.
- b Use an atlas to describe the location of Makkah and Alice Springs.
- c Look at the climate data. Explain how both meet the criteria for being classified as having a hot desert climate.
- d Describe the similarities and differences between the two sets of climate data. Explain the difference in temperature distribution.
- e Suggest any difficulties facing plants, animals and people who need to survive in these environments. Refer to the photo and climate data.

C A hot desert food web



TASK 2: Study Source B

- a Match the Beginnings ... and ... endings in two different tables: one for plants and one for animals.
- b Draw an annotated sketch showing your design for a plant or animal that would survive the conditions found in a hot desert.

TASK 3: Study Source C

a Name one example of each of the following:

- a producer
- a primary consumer
- a secondary consumer
- a tertiary consumer.

b Draw one food chain that involves four trophic levels from producer to tertiary consumer.

c Imagine all the snakes are taken out of this food web. Describe any benefits or problems that this change to food chains might cause for some plants and animals.

TASK 4: Study Source D

- a Describe changes that will affect plants and animals in hot desert ecosystems. Explain your choices.
- b Suggest advantages and disadvantages of any of these changes for hot desert ecosystems and for people who live and work in them.

D Desert ecosystems face changes

Less rainfall and more drought will increase desertification and extend desert areas. People may have to migrate into more crowded areas.

Increased winds will blow more sand grains onto agricultural land. Food supplies will suffer.

Diverting rivers for irrigation or HEP reservoirs will reduce water flow through desert areas. People may migrate into towns for water supplies.

Increased development of settlements and roads as countries develop their economies will change the nomadic way of life.



Many scientists think that hot deserts are ideal places to develop solar energy, as they receive intense sunlight and have plenty of space to build solar farms.

Tourists are looking for exciting desert activities such as camel trekking, off-road dune bugging, and stargazing. Local people earn good money as guides, camel owners or buggy drivers.

Modern mines excavate below the water table and pump out water, making it lower. Abandoned mines leave copper, lead and nitrate to pollute drinking water and affect irrigation as well as plants and animals. Each mine causes dust, noise and damage. Roads and oil and gas pipelines also affect the desert ecosystem.

People have lived and worked in hot deserts for thousands of years. Nomads have moved their herds of sheep, goats and camels to find water or settle in semi-permanent oases, where the water table reaches the surface. Camel trains have trekked across the Sahara Desert carrying gold, ivory and other goods to the south and, in previous centuries, returned with slaves. Where a river is close by, some irrigation has allowed people to carry out subsistence farming and settle in villages and market towns.