



LW3 Hot Deserts

AQA 8035 · Calculator allowed · about 65 minutes

Total Marks

Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

1 This question is about the characteristics of hot desert environments.

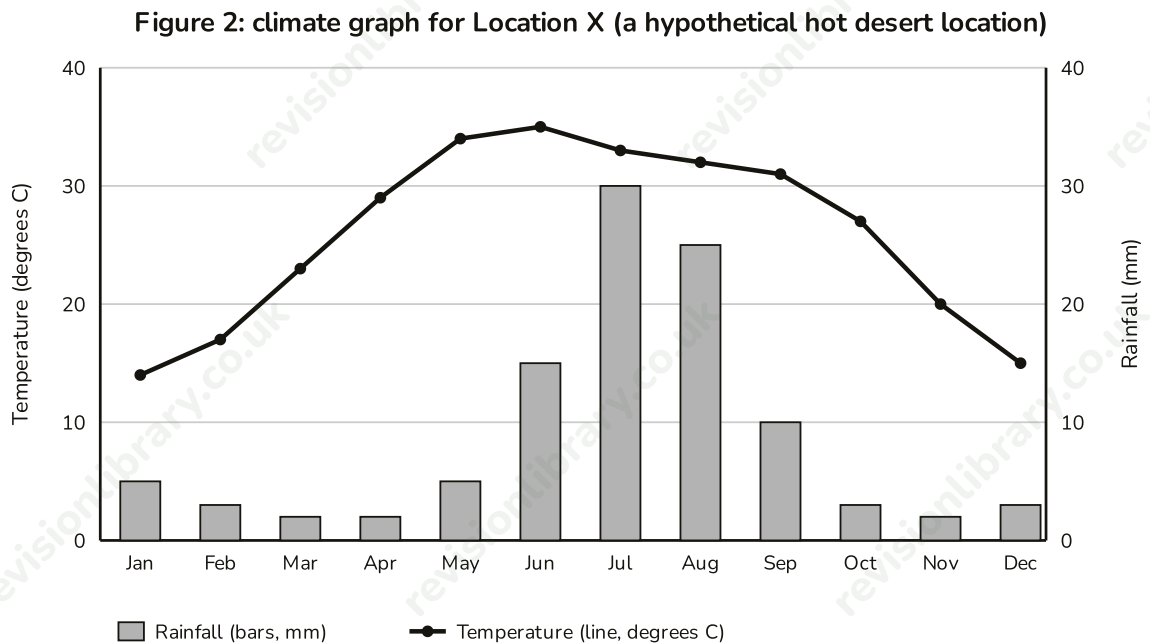
(a) State the approximate annual rainfall total that defines a hot desert climate. **(1)**

(b) State one other characteristic of the climate of a hot desert. **(1)**

(c) Name one hot desert location in the world. **(1)**

(Total for Question 1 is 3 marks)

- 2 Figure 2 shows a climate graph for Location X, a hypothetical hot desert location.



- (a) Using Figure 2, calculate the total annual rainfall at Location X. (2)

- (b) Using Figure 2, state which month is the hottest, and give its mean temperature. (1)

- (c) Using Figure 2, calculate the range in mean monthly temperature over the year. (2)

(Total for Question 2 is 5 marks)

- 3 Describe TWO ways that plants are adapted to survive in a hot desert environment.

(Total for Question 3 is 4 marks)

4 Describe ONE way that animals are adapted to survive in a hot desert environment.

(Total for Question 4 is 3 marks)

5 Hot desert environments can provide opportunities for economic development.

(a) Describe one opportunity for mineral extraction or energy generation in hot desert areas. (2)

(b) Describe one opportunity for farming in hot desert areas. (2)

(c) Describe one opportunity for tourism in hot desert areas. (2)

(Total for Question 5 is 6 marks)

6 Explain TWO challenges of developing hot desert environments.

(Total for Question 6 is 4 marks)

- 7 Using a named hot desert you have studied, describe TWO opportunities for economic development. (For example, you could refer to the Thar Desert, which lies across parts of north-west India and south-east Pakistan.)

(Total for Question 7 is 5 marks)

- 8 Using the same hot desert named in your answer to Question 7, explain TWO challenges of developing this area.

(Total for Question 8 is 5 marks)

- 9 Explain TWO causes of desertification (land in dry areas becoming more desert-like).

(Total for Question 9 is 4 marks)

- 10 Explain TWO strategies that can be used to reduce the risk of desertification.

(Total for Question 10 is 4 marks)

- 11** Give TWO reasons why some hot desert areas, such as the Thar Desert, can support a relatively large population, despite the harsh climate.

(Total for Question 11 is 3 marks)

- 12** Explain why hot deserts typically have a large daily (diurnal) temperature range.

(Total for Question 12 is 4 marks)

- 13** Describe the global distribution (location) of hot deserts.

(Total for Question 13 is 3 marks)

- 14** A hot desert region has an area of 200,000 square kilometres and a population of 4,000,000 people. (These figures are illustrative, not the exact statistics for any single named place.)

- (a) Calculate the population density of this region, in people per square kilometre. (2)

(Total for Question 14 is 2 marks)

15 Use the case study of the Thar Desert (or another named hot desert you have studied) to answer this question.

'The challenges of developing hot desert environments are greater than the opportunities.'
Assess the extent to which you agree with this statement.

(Total for Question 15 is 8 marks)

Mark scheme · LW3 Hot Deserts

Question 1

- (a) **B1** less than 250 mm of rain per year, oe
- (a) **Answer: Less than 250 mm of rain per year.**
- (b) **B1** any one of: very high daytime temperatures (often above 40 degrees C in summer); a large daily (diurnal) temperature range; low and unreliable rainfall; clear skies with little cloud cover, oe
- (b) **Answer: For example, very high daytime temperatures, often above 40 degrees C in summer.**
- (c) **B1** any correctly named hot desert, e.g. the Sahara Desert, the Thar Desert, the Sonoran Desert, the Atacama Desert
- (c) **Answer: For example, the Sahara Desert.**

Question 2

- (a) **M1** adds all 12 monthly values, oe
- (a) **A1** 105 mm cao
- (a) **Answer: 105 mm.**
- (b) **B1** Jun, 35 degrees C
- (b) **Answer: Jun, 35 degrees C.**
- (c) **M1** 35 - 14, oe
- (c) **A1** 21 degrees C cao
- (c) **Answer: 21 degrees C.**

Question 3

- **B1** adaptation 1 named, e.g. long roots that grow deep or spread wide, oe
- **B1** linked to function, e.g. to reach underground water or collect water quickly after rare rainfall, oe
- **B1** adaptation 2 named, e.g. small, waxy or spine-like leaves, oe
- **B1** linked to function, e.g. this reduces the surface area for water loss through transpiration, oe
- **Answer: For example: long roots that reach deep underground water; and small, waxy or spine-like leaves, which reduce water loss through transpiration.**

Question 4

- **B1** adaptation named, e.g. being nocturnal (active at night) / having large ears (e.g. a fennec fox) / being able to store fat and go without water for long periods (e.g. a camel), oe
- **B1** linked detail, e.g. large ears have a big surface area, which helps the animal lose excess body heat, oe
- **B1** further linked detail or a second correct point, oe
- **Answer: For example, many desert animals are nocturnal, staying in burrows during the extreme daytime heat and only becoming active at night when it is cooler.**

Question 5

- (a) **B1** opportunity named, e.g. mineral extraction (such as gypsum, limestone or metal ores) OR renewable energy generation (solar or wind power), oe
- (a) **B1** linked detail, e.g. hot deserts often have clear skies and intense, reliable sunshine, which is ideal for large-scale solar power generation, oe
- **(a) Answer: For example, hot deserts have clear skies and intense sunshine, making them well suited to large-scale solar power generation.**
- (b) **B1** farming can take place where water is brought in through irrigation, e.g. using a canal or borehole, oe
- (b) **B1** this can allow crops to be grown that would not otherwise survive the dry climate, supporting local food supply and income, oe
- **(b) Answer: Irrigation, for example using a canal to bring in water, can allow crops to be grown in areas that would otherwise be too dry to farm.**
- (c) **B1** tourists are attracted to the distinctive desert landscape, e.g. sand dunes, rock formations or wildlife, oe
- (c) **B1** tourism can create jobs and income for local people, e.g. as guides, or through hotels and desert safaris, oe
- **(c) Answer: The distinctive desert landscape (such as sand dunes) attracts tourists, creating jobs and income for local people, for example as guides or in hotels.**

Question 6

- **B1** challenge 1, e.g. extreme temperatures make it difficult and dangerous for people to work outdoors, oe
- **B1** challenge 2, e.g. water supply is limited and unreliable, restricting where people can live and farm, oe
- **B1** challenge 3, e.g. inaccessibility, since deserts are often remote with few roads, making transport of goods, workers and equipment difficult and costly, oe
- **B1** any further valid, distinct challenge, e.g. shifting sand can bury roads, railways and infrastructure, oe
- **Answer: For example: extreme temperatures make outdoor work difficult; and a limited, unreliable water supply restricts where people can live and farm.**

Question 7

- **B1** names a valid hot desert location, e.g. the Thar Desert, India/Pakistan
- **B1** opportunity 1, e.g. mineral extraction, such as gypsum, limestone and feldspar mined in the Thar Desert region, oe
- **B1** opportunity 2, e.g. farming has expanded in parts of the Thar Desert because irrigation canals, such as the Indira Gandhi Canal, bring in water from elsewhere, oe
- **B1** opportunity 3, e.g. the region has strong potential for solar and wind energy, and wind farms have been developed around Jaisalmer, oe
- **B1** opportunity 4, e.g. tourism, with visitors attracted to Jaisalmer's desert landscape, forts and cultural festivals, oe
- **Answer: For example, in the Thar Desert (India/Pakistan): irrigation from canals such as the Indira Gandhi Canal has expanded farming; and wind and solar energy have been developed around Jaisalmer.**

Question 8

- **B1** names the same location consistently
- **B1** challenge 1, e.g. summer temperatures in the Thar Desert can rise above 45 degrees C, making outdoor work and farming difficult, oe
- **B1** challenge 2, e.g. water supply is limited outside areas served by canals, restricting settlement and farming, oe
- **B1** challenge 3, e.g. remoteness and a lack of infrastructure make some parts of the desert hard to access, raising the cost of development, oe
- **B1** challenge 4, e.g. overgrazing and the removal of vegetation for fuel can worsen soil erosion and desertification, oe
- **Answer: For example, in the Thar Desert: extreme summer temperatures (above 45 degrees C) make outdoor work difficult; and areas away from irrigation canals have very limited water supply, restricting where people can live and farm.**

Question 9

- **B1** cause 1, e.g. climate change can reduce and make rainfall more unreliable in already dry areas, oe
- **B1** linked detail, e.g. leaving less water available for plants, which die back and expose bare soil, oe
- **B1** cause 2, e.g. a growing population can lead to overgrazing by livestock and removal of trees for fuel wood, oe
- **B1** linked detail, e.g. this removes the vegetation that holds the soil together, so it is eroded by wind and occasional heavy rain, oe
- **Answer: For example: climate change reduces and makes rainfall less reliable, killing vegetation and exposing bare soil; and a growing population leads to overgrazing and fuel-wood collection, which removes vegetation and exposes soil to erosion.**

Question 10

- **B1** strategy 1, e.g. planting trees and shrubs (shelter belts) along the desert edge, oe
- **B1** linked detail, e.g. their roots bind the soil together and they reduce wind speed at ground level, slowing erosion, oe
- **B1** strategy 2, e.g. using appropriate, water-efficient technology such as drip irrigation, oe
- **B1** linked detail, e.g. this delivers water directly to plant roots with little waste, allowing farming without over-using scarce water supplies, oe
- **Answer: For example: planting shelter belts of trees, whose roots bind the soil and which reduce wind speed, slowing erosion; and using drip irrigation, which delivers water efficiently to crops without wasting scarce supplies.**

Question 11

- **B1** reason 1, e.g. irrigation canals bring in water from wetter regions, allowing farming and settlement, oe
- **B1** reason 2, e.g. mineral resources and energy projects create jobs, attracting people to live and work there, oe
- **B1** reason 3, e.g. some desert areas have long-established trade routes or cities that developed before the modern period and have simply continued to grow, oe
- **Answer: For example: irrigation canals bring in water for farming and settlement; and mineral, energy and tourism industries create jobs that attract people to live in the area.**

Question 12

- **B1** skies are usually clear, with little cloud cover, oe
- **B1** during the day, this allows intense solar radiation to heat the ground quickly, causing very high daytime temperatures, oe
- **B1** there is little vegetation or moisture in the air to retain heat, oe
- **B1** so at night, heat escapes (radiates) rapidly back into the atmosphere, causing temperatures to fall sharply, oe
- **Answer: Clear skies let intense sunshine heat the ground rapidly by day, but with little vegetation or moisture to retain that heat, it escapes rapidly at night, so temperatures fall sharply, giving a large daily range.**

Question 13

- **B1** most hot deserts are found roughly 15 to 30 degrees north and south of the equator, oe
- **B1** they are linked to belts of descending, high-pressure air, which brings clear skies and very little rainfall, oe
- **B1** named example(s) of location, e.g. the Sahara Desert (North Africa), the Thar Desert (India/Pakistan), the Sonoran Desert (south-west USA/Mexico), oe
- **Answer: Hot deserts are found mainly in bands roughly 15 to 30 degrees north and south of the equator, where descending high-pressure air gives clear skies and very low rainfall, for example the Sahara and Thar deserts.**

Question 14

- (a) **M1** 4,000,000 / 200,000, oe
- (a) **A1** 20 people per square kilometre cao
- (a) **Answer: 20 people per square kilometre.**

Question 15

- **Level 4** (7-8): A detailed, well-balanced assessment that uses accurate, detailed reference to a named hot desert; weighs specific opportunities against specific challenges and reaches a clear, justified conclusion about the extent of agreement.
- **Level 3** (5-6): A clear assessment that uses accurate reference to a named hot desert; both opportunities and challenges are considered, and a conclusion is reached, though the weighing of one against the other may be less developed.
- **Level 2** (3-4): Some relevant opportunities and/or challenges are described, with limited or generalised use of a named example; a simple conclusion is given with little justification.
- **Level 1** (1-2): One or two isolated relevant points about hot desert development are made, with little or no use of a named example.
- **Level 0** (0): No relevant content.
- **Indicative content:**
 - Opportunities in the Thar Desert include: mineral extraction (gypsum, limestone, feldspar); expanded farming enabled by canal irrigation (e.g. the Indira Gandhi Canal); solar and wind energy potential, including wind farms around Jaisalmer; and tourism based on the desert landscape and culture.
 - Challenges in the Thar Desert include: extreme summer temperatures (above 45 degrees C); limited and unreliable water supply outside irrigated areas; remoteness and poor infrastructure raising development costs; and the risk of soil erosion and desertification from overgrazing.
 - Agrees with the statement: without continued investment in water supply and infrastructure, the physical challenges (heat, water scarcity, access) limit how much of the opportunity can actually be realised, especially for the poorest rural communities.
 - Disagrees with the statement: large-scale schemes (irrigation canals, wind and solar energy, tourism) show that with sufficient investment, the opportunities can be developed successfully and support a growing population.
 - A balanced answer recognises that the balance may differ between areas within the same desert (e.g. irrigated land near a canal versus remote areas far from infrastructure).
 - A well-supported conclusion should state a clear judgement on the extent of agreement, backed by specific evidence from the named case study.