



GEO.PH19 Hot Desert Characteristics, Adaptations and Opportunities for Development

AQA 8035 · Calculators not allowed · about 50 minutes

Total Marks

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Name: _____ Date: ____ / ____ / ____

Answer ALL questions. Show all your working.

- 1** Define a 'hot desert' environment, naming the typical climate and vegetation context for deserts such as the Sahara or the Thar Desert.

(Total for Question 1 is 1 mark)

- 2** State a typical annual rainfall range (in millimetres) for hot deserts such as the Sahara or the Thar Desert.

(Total for Question 2 is 1 mark)

- 3** Describe the typical daily temperature range in a hot desert environment such as the Sahara or Thar Desert and explain why daily extremes occur.

(Total for Question 3 is 2 marks)

- 4** Give TWO physical features of hot desert soils, for example in areas of the Thar Desert or the Sahara.

(Total for Question 4 is 2 marks)

- 5 Figure 1: A simplified labelled diagram of a barrel cactus from a hot desert such as parts of the Sonoran or Sahara edge is shown here in words: Label A = thick fleshy stem, Label B = spines, Label C = shallow wide roots. Using the diagram context, explain the function of each labelled feature for survival in a hot desert environment.

(Total for Question 5 is 3 marks)

- 6 Figure 2: A simple labelled diagram of a dromedary camel features: Label A = hump, Label B = long eyelashes and closable nostrils, Label C = wide, padded feet. Explain how each labelled feature helps the camel survive in hot desert conditions like the Thar Desert.

(Total for Question 6 is 3 marks)

- 7 Give ONE behavioural adaptation of a desert animal, for example in the Sahara or Thar Desert, and explain how this adaptation reduces exposure to extreme heat.

(Total for Question 7 is 2 marks)

- 8 A small research station in a dry part of the Thar Desert recorded annual rainfall in two adjacent years: Year 1 = 220 mm, Year 2 = 55 mm. Calculate the percentage decrease in annual rainfall from Year 1 to Year 2, to one decimal place.

(Total for Question 8 is 2 marks)

- 9** Table 1: Vegetation cover measured at four distances from an oasis edge in a hot desert area (percentage ground cover).

Distance from oasis edge (m): 0, 50, 200, 1000

Vegetation cover (%): 65, 40, 10, 1

Using the table, describe the pattern shown by vegetation cover with distance from the oasis edge.

(Total for Question 9 is 3 marks)

- 10** Figure 3: Development opportunities in a hot desert region are listed here as stimulus for this question: large areas of flat, sunlit land suitable for solar farms; visible surface mineral deposits and small open-pit mines; an established tourist route with dunes and cultural sites; an irrigated belt of farmland near a permanent river or aquifer. Describe the opportunities for development shown in Figure 3, using the list above.

(Total for Question 10 is 4 marks)

- 11** Explain TWO benefits of developing large-scale solar farms in a hot desert region such as parts of the Sahara or Thar Desert.

(Total for Question 11 is 4 marks)

- 12** Give TWO challenges that developers face when trying to develop infrastructure or agriculture in a hot desert such as the Thar Desert.

(Total for Question 12 is 2 marks)

- 13** Explain the challenges of developing a hot desert environment such as the Thar Desert. In your answer, develop a clear explanation with supporting detail.

Explain the challenges of developing a hot desert environment such as the Thar Desert.

(Total for Question 13 is 6 marks)

- 14** You plan a simple fieldwork transect to measure soil moisture across a 500 metre transect from an oasis edge into the surrounding desert in the Thar Desert. Suggest a suitable method, including how you would sample and what equipment you would use.

(Total for Question 14 is 3 marks)

- 15** Explain ONE way that tourism can both help and challenge development in a hot desert area such as parts of the Sahara or the Thar Desert.

(Total for Question 15 is 3 marks)

Mark scheme · GEO.PH19 Hot Desert Characteristics, Adaptations and Opportunities for Development

Question 1

- **B1** a region with very low and unreliable rainfall and sparse, specialised vegetation (xerophytes), often very hot by day, oe
- **Answer: A region with very low and unreliable rainfall and sparse specialised vegetation, often with very hot daytime temperatures.**

Question 2

- **B1** about 0 to 250 mm per year, oe
- **Answer: About 0 to 250 mm per year.**

Question 3

- **B1** daytime temperatures can be very high (often above 40 degrees C) and nights very low (often near or below 0 degrees C), oe
- **B1** linked explanation, e.g. the low humidity and lack of cloud allow strong daytime heating and rapid cooling at night, oe
- **Answer: Daytime temperatures are often very high, above 40 degrees C, while nights can be near or below 0 degrees C. The low humidity and lack of cloud mean strong daytime heating and rapid night cooling.**

Question 4

- **B1** sandy or rocky soil texture, oe
- **B1** low organic matter and low fertility, oe
- **Answer: Sandy or rocky texture; low organic matter and low fertility.**

Question 5

- **B1 A:** thick fleshy stem stores water for long dry periods, oe
- **B1 B:** spines reduce water loss by shading the stem and deter herbivores, oe
- **B1 C:** shallow, wide roots quickly absorb surface rainfall before it evaporates, oe
- **Answer: A stores water in a fleshy stem; B spines shade the stem and deter animals, reducing water loss; C shallow, wide roots absorb surface rainfall quickly before it evaporates.**

Question 6

- **B1 A:** hump stores fat that can be metabolised for energy and water, oe
- **B1 B:** long eyelashes and closable nostrils protect eyes and reduce sand entering the nose, allowing survival during sandstorms, oe
- **B1 C:** wide, padded feet prevent sinking into sand and aid walking on soft desert surfaces, oe
- **Answer: A hump stores fat that can be used for energy and water; B eyelashes and closable nostrils protect against sand and reduce water loss; C wide, padded feet stop the camel sinking and help walking on sand.**

Question 7

- **B1** behavioural adaptation named, e.g. being nocturnal, oe
- **B1** linked explanation, e.g. active at night to avoid daytime heat, reducing water loss and overheating, oe
- **Answer: Nocturnal behaviour, active at night to avoid high daytime temperatures, which reduces overheating and water loss.**

Question 8

- **M1** $(220 - 55) / 220 \times 100$ or $165 / 220 \times 100$ seen, oe
- **A1** 75.0% cao
- **Answer: 75.0%.**

Question 9

- **B1** vegetation cover decreases as distance from the oasis increases, oe
- **B1** supported with data, e.g. 65% at 0 m, 40% at 50 m, 10% at 200 m and 1% at 1000 m, oe
- **B1** this suggests plants are concentrated near the water source and thin out rapidly with distance, oe

Question 10

- **B1** solar energy potential from large, flat, sunlit areas, oe
- **B1** mineral extraction from visible surface deposits and small mines, oe
- **B1** tourism based on dunes and cultural sites, generating income and jobs, oe
- **B1** commercial farming where irrigation is possible near a river or aquifer, oe
- **Answer: Opportunities include solar energy on large flat sunlit land; mineral extraction from surface deposits and small mines; tourism based on dunes and cultural sites providing jobs and income; and commercial irrigated farming where water sources exist.**

Question 11

- **B1** benefit 1 named, e.g. renewable electricity generation using abundant sunlight, oe
- **B1** linked detail, e.g. generates low-carbon energy that can reduce fossil fuel use and be exported or used locally, oe
- **B1** benefit 2 named, e.g. job creation and new infrastructure, oe
- **B1** linked detail, e.g. construction and maintenance create local employment and can lead to improved roads and power grids, oe
- **Answer: Solar farms provide renewable electricity from abundant sunlight, cutting reliance on fossil fuels and allowing local use or export; they also create jobs during construction and maintenance and can bring infrastructure improvements such as roads and grid connections.**

Question 12

- **B1** extreme heat causing problems for workers, machinery and materials, oe
- **B1** water scarcity making irrigation and human settlements difficult, oe
- **Answer: Extreme heat that affects workers and machinery; and water scarcity that limits irrigation and supply for settlements.**

Question 13

- **Level 3** (5-6): Detailed explanation of multiple challenges with clear, linked detail and examples, showing how each challenge constrains development, and a coherent overall account.
- **Level 2** (3-4): Clear explanation of at least two challenges with some linked detail or an example, showing how they affect development.
- **Level 1** (1-2): One or two simple statements about challenges with limited explanation or detail.
- **Indicative content:**
 - Extreme heat increases costs and risk for construction, reduces worker productivity, and can damage materials and equipment, making building and maintaining infrastructure harder.
 - Water scarcity limits irrigation for agriculture and increases the cost of supplying drinking water, requiring expensive pipelines, wells or desalination which raise development costs.
 - Inaccessibility and vast distances raise transport costs for materials and finished goods, making commercial farming or industry less profitable.
 - Temperature extremes and sand movement (dunes, sandstorms) damage roads, solar panels and buildings and increase maintenance costs.
 - Environmental limits, such as fragile soils and limited native vegetation, make landscapes more vulnerable to disturbance and increase restoration costs.
 - Examples could include the need to drill deep wells or import water, the expense of constructing roads over shifting sands, or providing cooling and maintenance for solar infrastructure.

Question 14

- **M1** method named, e.g. measure soil moisture at regular intervals (e.g. every 50 m) along the 500 m transect, oe
- **A1** equipment named, e.g. use a soil moisture meter or gravimetric sampling with labelled bags and a trowel, oe
- **B1** sampling justification or quality control, e.g. systematic sampling at set intervals and repeat measurements at each point to improve reliability, oe
- **Answer: Measure soil moisture at regular intervals (for example every 50 m) along the 500 m transect, using a soil moisture meter or by collecting samples with a trowel for gravimetric drying; take repeat readings at each point to improve reliability.**

Question 15

- **B1** help point, e.g. tourism creates income and jobs in hotels, guiding and transport, oe
- **B1** linked challenge, e.g. tourism can be seasonal and put pressure on scarce water supplies and local infrastructure, oe
- **B1** linked development effect or balance, e.g. income may benefit some but increase inequality or cause environmental damage, oe
- **Answer: Tourism creates income and jobs in hotels, guiding and transport, helping the local economy; however it is often seasonal and can put pressure on scarce water and infrastructure, and may cause environmental damage or unequal benefits.**