22nd International Geography Olympiad

Istanbul, Türkiye

11 – 17 August 2026

WRITTEN RESPONSE TEST

Question and Answer Booklet

Name: ..... Team: .....

Student number

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Do NOT open the Booklet before instructed to do so by a supervisor.

Instructions for Students

1. Fill in your name, team and iGeo student number on the front page of this "Question and Answer" Booklet.

2. Fill in your iGeo student number in the boxes at the top of each page of this Booklet.

3. This test consists of 6 sections.

4. The number of marks for each question is given in the margin at the beginning of the question.
   There is a maximum of **15 marks** assigned to each section.
   The maximum possible score for the WRT is **90 marks**.

5. Answer all questions in the spaces provided in this Booklet.
   All answers are to be written in English.
   Keep the left margin free for markers.
   Please write clearly, using **blue** or **black pen**. **DO NOT use pencil**.

6. Check the back of each page as questions are printed on both sides of the page.

7. There are blank pages which you can use as additional space for your notes.
   Please cross through any notes that are not part of your answers.
   If you use these pages for additional space for answers, you **MUST** label them clearly with the **Section** and **Question number** (e.g. A1).

8. Where appropriate, please write in full sentences or phrases, not single words.

9. Give only the required number of points in your answers.
   For example, if the question asks for 2 reasons or examples and you give more than 2, only the first 2 reasons will be marked.

10. The Resource Booklet contains Figures referred to in this Booklet.
    DO NOT write any of your answers in Resource Booklet.

11. You may use a simple calculator during the test. It must have be approved by the supervisors before the test begins.

12. Students not educated in English are allowed to use bilingual dictionaries during the test.
    Students must ensure that their bilingual dictionaries have been approved and do not contain unauthorized material such as study notes, maps, diagrams and named examples of places.

13. Time:
    180 minutes for students **not educated in English** (+10 minutes reading time),
    150 minutes for students **educated in English** (+10 minutes reading time).

Good luck!

Written Response Test
Contributions from: Brazil, Canada, China (Taipei), Croatia, Denmark, New Zealand, Singapore, Uzbekistan
Committee Convenor: Ivan Šulc (Croatia)
Director of Tests: Paul VanZant (Canada)

Student number: 22

Section A: Pluvial flooding in urban areas

Resource Booklet: Table A1 provides data on rainfall and discharge for two storm events in Dardenne Creek Basin, Missouri, USA in 1982 (pre-urbanisation) and 2003 (post-urbanisation).
Resource Booklet: Figure A1 shows the hydrological cycle.
Resource Booklet: Figure A2 shows individual elements that constitute a sponge city.
Resource Booklet: Figure A3 shows types of sustainable drainage systems.

5 m

1. For this question, refer to **Resource Booklet: Table A1**. The two data series compare storm events with 50 mm of rainfall over six hours **before** and **after urbanisation** of the basin.

   Draw a **hydrograph** that combines the precipitation and discharge data for both storm events into a **single diagram**. Label your diagram appropriately.

(The box is used for drawing a diagram)

2. For this question, refer to **Resource Booklet: Table A1** and the diagram in the previous question.

1 m

a) Calculate the **lag time** between peak rainfall and peak discharge for each of the two storm events (pre- and post-urbanisation).

Lag time in 1982: .....

Lag time in 2003: .....

0.5 m b) How many **hours earlier** does the lag time occur after urbanisation?

.....

0.5 m c) How many times larger is the **peak discharge** after urbanisation?

.....

(The box is used for calculations)

4 m 3. For this question, refer to **Resource Booklet: Table A1** and **Figure A1**.

Identify **two changes in the hydrological cycle** caused by urbanisation within the drainage basin. Explain these changes using specific evidence and describe how they have contributed to the discharge patterns shown in the hydrograph.

Change 1: .....

Explanation of change 1: .....

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Change 2: .....

Explanation of change 2: .....

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4. For this question, refer to **Resource Booklet: Figures A2** and **A3**.

2 m a) Explain **two potential solutions** related to the problems of discharge in urban areas following a heavy rainfall. Be sure to refer to the images provided.

Solution 1: .....

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Solution 2: .....

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2 m b) Evaluate how **effective** these solutions might be in the future, considering the impacts of climate change and more intense precipitation.

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You can use it for your notes, but please cross them through afterwards.
If you use it for answers, they **MUST** be clearly labelled with the Section and Question number.

Student number: 22

Section B: Agriculture and soil degradation

Resource Booklet: Figure B1 shows the share of degraded land worldwide in 2019, by country.
Resource Booklet: Figure B2 shows the share of the population experiencing moderate or severe food insecurity, by country.
Resource Booklet: Figure B3 shows the global environmental impacts of food and agriculture.

1. For this question refer to **Resource Booklet: Figures B1** and **B2**.

2 m a) Outline two **natural processes** (besides climate change) that can cause soil degradation.

Natural process 1: .....

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Natural process 2: .....

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2 m b) Describe two specific **socio-economic activities or land-use changes** that may contribute to soil degradation.

Change 1: .....

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Change 2: .....

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2 m c) Suggest a practical **solution to mitigate** <u>one</u> of the human activities that you identified in the question 1b).

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2 m d) Discuss the possible **limitations** of the solution you suggested in the question 1c).

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2. For this question refer to **Resource Booklet: Figures B1** and **B2.**

Identify two **spatial patterns** related to land degradation and food security shown on the maps. Provide specific data from the sources in your answer. You should refer to specific regions and/or multiple countries, not just individual countries.

Pattern 1: .....

.....

Pattern 2: .....

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2 m

3. Explain two impacts of soil degradation on **food security**.

Impact 1: .....

.....

Impact 2: .....

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3 m

4. For this question refer to **Resource Booklet: Figures B1, B2** and **B3**.

Evaluate this statement: "***Food lies at the heart of the world's environmental issues*.**"** Use specific evidence from the data provided to support your answer.

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Section C: Natural resources

Resource Booklet: Figure C1 shows the average natural resource rent as a percentage of GDP and the average GDP per capita growth rate (1995–2019) worldwide, by country. **Resource Booklet: Figure C2** presents global bauxite mining, aluminium smelting and refining (2024) and information on lateritic bauxite deposits.

1. For this question, refer to **Resource Booklet**: **Figure C1**.

2 m a) Analyse the **relationship** between average natural resource rent as a percentage of GDP and average GDP per capita growth rate (1995-2019). Justify your arguments using **specific evidence**.

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0.5 m b) Identify the **concept/phenomenon** shown in Figure C1.

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2 m c) Explain two impacts of **high dependence on natural resources** on national economies.

Impact 1: .....

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Impact 2: .....

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2. For this question, refer to **Resource Booklet**: **Figure C2.**

2 m a) Identify **two** examples of **negative environmental impacts** associated with lateritic bauxite mining.

Impact 1: .....

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Impact 2: .....

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2 m b) Explain **two socio-economic impacts** associated with lateritic bauxite mining in **developing** countries.

Impact 1: .....

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Impact 2 .....

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3 m 3. For this question, refer to **Resource Booklet: Figure C2**.

Four to five kilograms of bauxite ore are required to produce one kilogram of aluminium, making it a **bulk-reducing industry**. However, many aluminium smelters and refineries are located in countries that are not major bauxite producers.

Outline **three reasons** why this may be the case.

Reason 1: .....

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Reason 2:.....

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Reason 3:.....

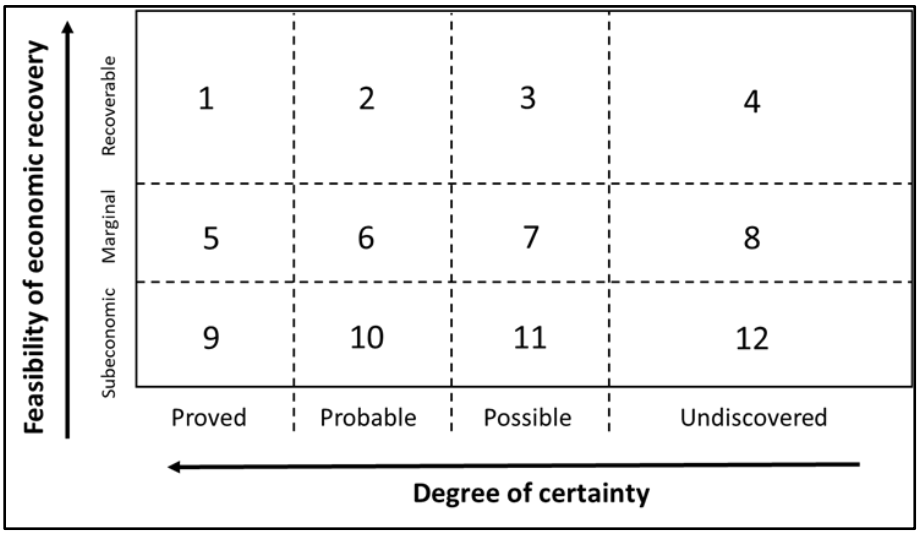
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0.5 m

4. The image below presents the **McKelvey Diagram**, which is used to illustrate the difference between resources and reserves based on geological certainty and economic feasibility.

   Complete the diagram by **shading relevant box(es)** to show the **'reserves'** category.



3 m

5. For this question, refer to **Resource Booklet: Figure C2** and the **McKelvey Diagram in the question 4**.

   Discuss **three potential ways** the reserves category could be expanded.

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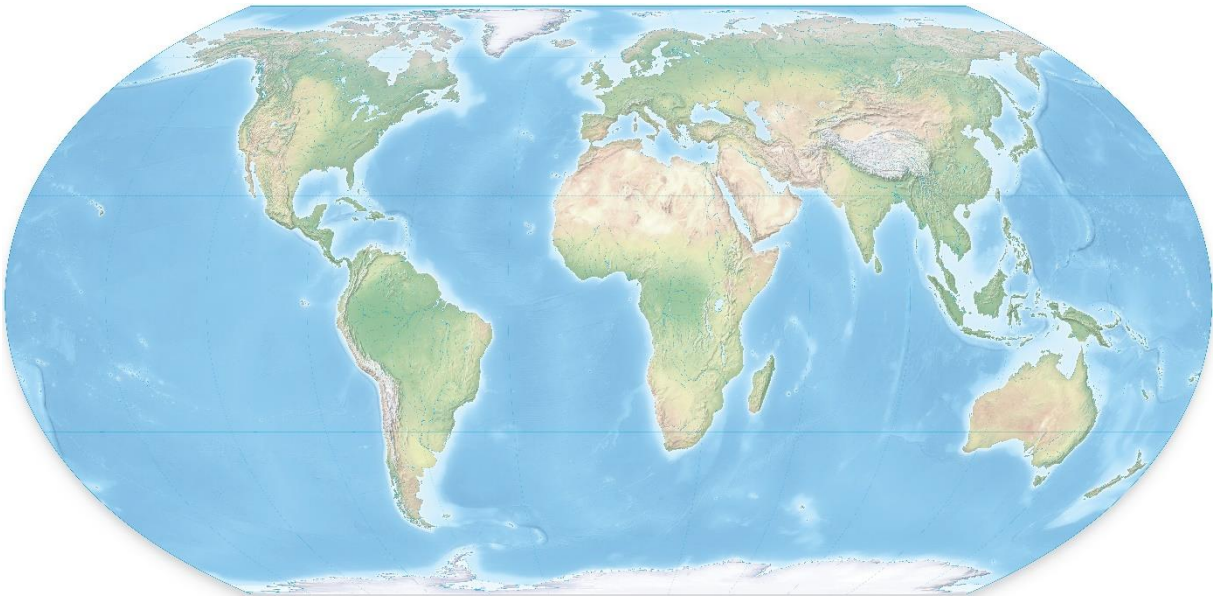
Section D: Arctic ice

Resource Booklet: Table D1 shows the average temperatures and precipitation for Camp Summit, Greenland (72.38°N, 38.45°W, elevation: 3216 m)
Resource Booklet: Figure D1 illustrates the transformation of snow into ice.
Resource Booklet: Figure D2 shows the decline of Arctic sea ice from 1979 to 2015, with projections to 2050 (maps are for September, when there is the least ice).
Resource Booklet: Table D2 shows the number of ships by type in the Arctic region from 2013 to 2024.

1. For this question, use the following **physical map** of the world.

1 m a) On the map provided, mark one the largest **ice sheets** using solid lines and name it.

2 m b) On the map provided, mark two areas with major **ice caps** using dotted lines and name each.



(https://en.wikipedia.org/wiki/World_map)

1 m 2. Describe **two differences** between ice sheets and ice caps.

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2 m

3. Identify and explain **two processes** by which ice sheets lose mass in the **ablation zone**.

Process 1: .....

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Process 2: .....

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4. For this question, refer to **Resource Booklet: Table D1** and **Figure D1**.

1 m

a) Calculate the **annual precipitation** in Camp Summit in **millimetres** and convert it into the **annual snowfall** in **centimetres**.

Annual precipitation (mm): .....

Annual snowfall (cm): .....

(The box is used for calculations)

2 m

b) Explain why the **depth of ice** at Camp Summit is not increasing despite high annual snowfall.

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5. For this question, refer to **Resource Booklet: Figure D2**.

1 m a) Estimate the **extent of Arctic sea ice** in September 2025 based on Figure D2. Draw the estimated extent of Arctic sea ice **on the map of the Arctic below**.

2 m b) Due to the smaller extent of sea ice, the Arctic is becoming an important sea transport route.

Draw two **Arctic shipping routes** on the map that could soon provide alternatives to major intercontinental maritime corridors, connecting key port regions in the Northern Hemisphere. Mark the routes in **different colours** and **annotate the regions** they connect.



3 m

6. For this question, refer to **Resource Booklet: Table D2** and **the map in question 4.**

In areas where sea ice disappears completely or is present only in winter, more opportunities for economic activities emerge. Outline three such **economic activities** other than sea transport.

Activity 1: .....

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Activity 2: .....

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Activity 3: .....

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Section E: Coral reefs and tourism management

A bay on a tropical island is a popular diving destination because of its diverse coral reefs. However, the increasing number of tourists, combined with environmental changes, has gradually led to the deterioration and bleaching of the corals. The Covid-19 pandemic, which affected the world between 2020 and 2021, caused a sharp decline in tourist numbers to the island. During this period, local accommodation operators renovated and built new facilities, hoping to provide a better travel experience in the future. After the pandemic, tourist numbers returned to pre-pandemic levels and are even expected to surpass the previous peak.

Resource Booklet: Figure E1 represents an aerial image of the bay on a tropical island in South East Asia.
Resource Booklet: Figure E2 provides various images of the bay on the same tropical island as in Figure E1.
Resource Booklet: Figure E3 shows a sea turtle swimming in a healthy coral reef and a sea turtle and a snorkel diver swimming in a compromised coral reef.
Resource Booklet: Figure E4 shows the sea surface temperature and monthly rainfall in the bay.
Resource Booklet: Figure E5 provides data on the number of visitors to the tropical bay from 2017 to 2025, the percentage of healthy and compromised coral colonies recorded in the bay during different periods, and substrate characterisation of the bay in different periods.

1. For this question, refer to **Resource Booklet: Figures E1 and E2**.

1 m a) Name the **type of the coral reef** shown in the photos.

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1 m b) Describe **how** this type of coral reef is **formed**.

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2 m

c) Draw a **sketch** of the reef type defined in (a) and label the basic elements on the sketch.

(The box is used for drawing a sketch)

2 m

2. For this question, refer to **Resource Booklet: Figures E1 and E2**.

Identify the **physical features** and **land uses** around the bay and label them in the boxes next to the aerial image.



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2 m

3. For this question, refer to **Resource Booklet: Figures E3** and **E4**.

Some believe that “a short break in tourism could reverse the long-term disturbances to coral reef ecosystems caused by natural and anthropogenic stressors”.

With the help of the information provided, state whether you **agree or disagree** with the statement. **Justify** your reasons using **specific evidence**.

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4. For this question, refer to **Resource Booklet: Figures E4 and E5.**

Explain one possible **cause of coral degradation** in each of the following periods.

Pre-Covid period (2016-2019): .....

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Covid period (2020-2021): .....

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Post-Covid period (2022-2024): .....

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4 m

5. Outline **two management strategies** for ecotourism that would help maintain the integrity of the coral reef ecosystem and socio-economic development in the bay.

Strategy 1:.....

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Strategy 2:.....

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Section F: Data centres and AI infrastructure

Artificial intelligence, cloud computing, social media, streaming platforms, and online services depend on large data centres. Although digital technologies may seem "weightless", they require extensive physical infrastructure, including buildings, power supplies, cooling systems, fibre-optic networks, and land. The rapid growth of AI has increased demand for data centre capacity worldwide.

Resource Booklet: Figure F1 shows AI data centres in the world in June 2025.
Resource Booklet; Figure F2 presents land use in the Grange Castle Business Park, Dublin, Ireland in 2012 and 2025
Resource Booklet: Figure F3 displays infrastructure related to AI: (A) Google data centre in the Netherlands; (B) Solar farm in the USA; (C) Amazon Web Services data centre in the USA; (D) Cooling infrastructure for a data centre in Denmark.
Resource Booklet: Figure F4 shows global electricity consumption by data centres (TWh).

2 m 1. For this question, refer to **Resource Booklet: Figure F1**.

Analyse and describe the **spatial distribution** of data centres in the world.

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3 m 2. For this question, refer to **Resource Booklet: Figure F2**.

Explain three major **land use changes** that have occurred between 2012 and 2025.

Change 1:.....

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Change 2:.....

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Change 3:.....

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3 m

3. For this question, refer to **Resource Booklet: Figures F3** and **F4**.

Describe **three location factors** that explain why major data centre clusters are concentrated in specific regions.

Factor 1: .....

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Factor 2: .....

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Factor 3: .....

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4 m

4. A multinational technology company plans to build a new AI data centre in a rural area near a medium-sized city. Explain **two** potential **benefits** and **two** potential **disadvantages** for the local community.

Benefit 1:.....

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Benefit 2:.....

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Disadvantage 1: .....

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Disadvantage 2: .....

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3 m

5. Discuss how the expansion of AI data centres might be a new generator of **global spatial inequality**. Use at least three arguments. You must include both supporting arguments and counterarguments to get full marks.

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Student number: 22

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