

External assessment 2023

Multiple choice question book

# Earth & Environmental Science

## Paper 1

### General instruction

- Work in this book will not be marked.

## **Section 1**

### **Instruction**

- Respond to these questions in the question and response book.
- 

### **QUESTION 1**

Sluicing separates metallic resources based on

- (A) solubility.
- (B) melting point.
- (C) specific gravity.
- (D) hydrophobic properties.

### **QUESTION 2**

Where is the most likely location for gold-bearing quartz reefs?

- (A) a sedimentary sequence with an organic-rich source rock
- (B) fractures and joints surrounding a massive granite body
- (C) joint planes in an exhalative massive sulphide complex
- (D) an alluvial deposit in an igneous granite complex

### **QUESTION 3**

The operational time of a mineral sands quarry is limited because mineral sands

- (A) are replenished within a human lifespan.
- (B) have a greater deposition rate than extraction rate.
- (C) are formed from source rock through slow geological processes.
- (D) are formed from the decomposition of plants and animals from millions of years ago.

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**QUESTION 4**

Carbon sequestration is an example of which ecosystem service?

- (A) cultural
- (B) regulating
- (C) supporting
- (D) provisioning

**QUESTION 5**

A mature tropical cyclone formed off the west coast of Australia and was given a female name starting with J. A short time later, another tropical cyclone formed off the east coast of Australia.

The correct name for this cyclone would be

- (A) a female name beginning with K.
- (B) a female name beginning with J.
- (C) a male name beginning with K.
- (D) a male name beginning with J.

**QUESTION 6**

Urbanisation can increase the magnitude of floods by reducing

- (A) above-ground water storage capacity.
- (B) impermeable surface area.
- (C) evapotranspiration.
- (D) run-off.

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**QUESTIONS 7–8**

These questions refer to graphs about the association between particulate matter in the atmosphere and relative humidity at an Australian mine site for two seasons.

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**QUESTION 7**

Determine when a PM<sub>2.5</sub> concentration of 50 µg/m<sup>3</sup> could be recorded.

- (A) winter: 60% relative humidity
- (B) winter: 90% relative humidity
- (C) summer: 60% relative humidity
- (D) summer: 90% relative humidity

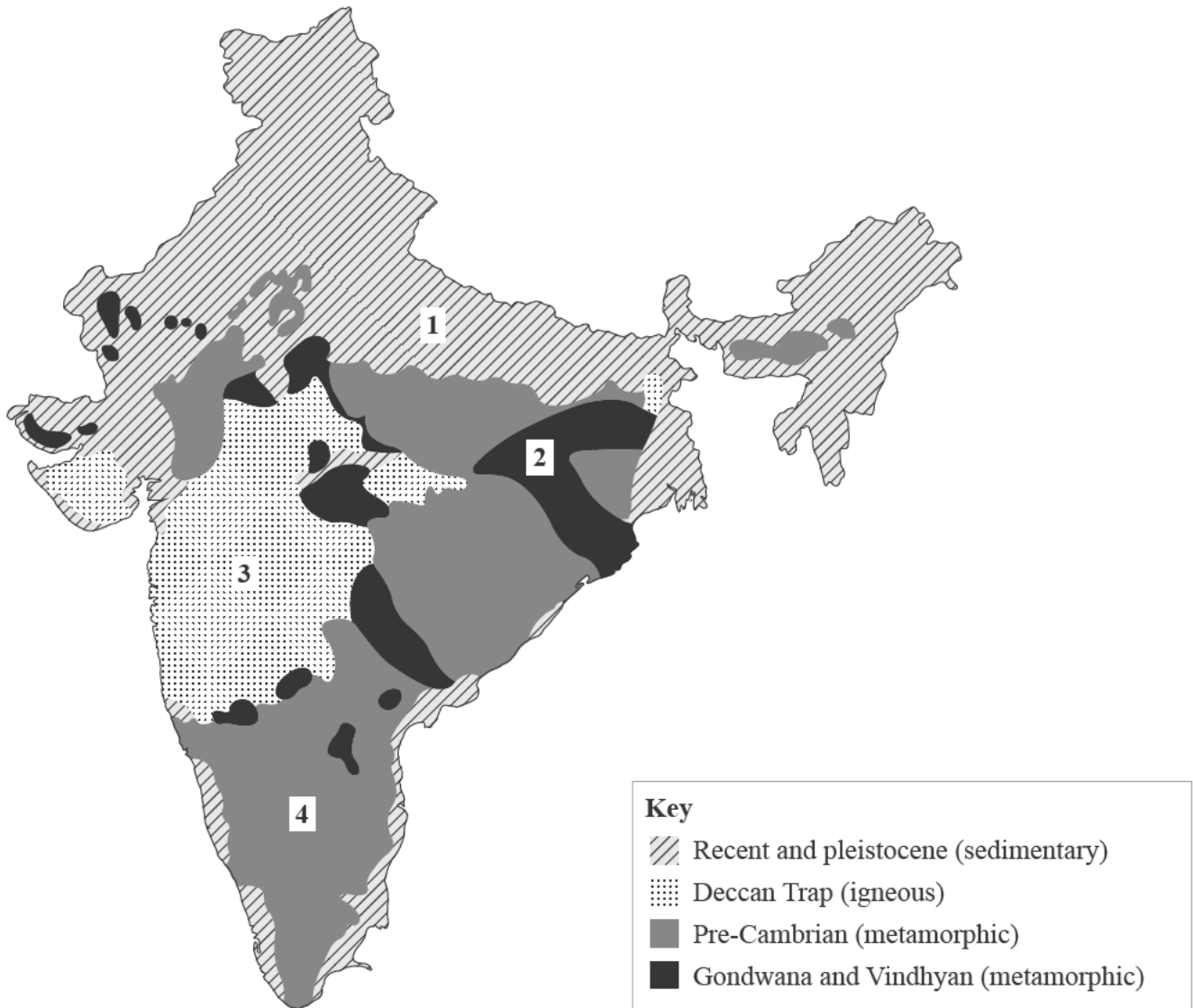
**QUESTION 8**

Which inference is supported by the graphs?

- (A) The ideal humidity level to reduce particulate matter is 80%.
- (B) Humidity has the most impact on particulate matter during summer.
- (C) Increased humidity results in a decrease in particulate matter concentration.
- (D) Higher concentrations of particulate matter are more resistant to changes in humidity.

QUESTION 9

A geological map of India is shown.



A viable location to explore for coal is

- (A) 1
- (B) 2
- (C) 3
- (D) 4

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**QUESTION 10**

Sea ice extent is the area of ice that covers the Arctic and Antarctic Ocean at a given time. The graph shows Arctic and Antarctic sea ice extent anomalies and trends for 1980–2017.

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The most likely reason for the difference between Antarctic and Arctic extent changes since 1980 is

- (A) significant glacial melting.
- (B) decreasing salinity of the Arctic Ocean.
- (C) the presence of a continental crust beneath Antarctica.
- (D) a greater increase in northern hemisphere atmospheric temperatures.

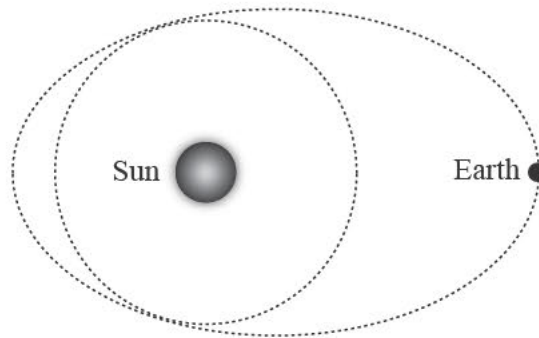
**QUESTION 11**

Flood events impact river systems by

- (A) redistributing sediment from upstream to downstream.
- (B) causing greater erosion on the inside of river bends.
- (C) permanently reducing upstream biodiversity.
- (D) reducing the quantity of debris downstream.

**QUESTION 12**

The diagram shows the Earth's elliptical orbit and a theoretical circular orbit.



The feature of the Earth's orbit that is illustrated is

- (A) eccentricity.
- (B) precession.
- (C) obliquity.
- (D) axial tilt.



**QUESTION 13**

A topographical map of an island is shown.



**Key**  
● Epicentre of recent earthquakes of magnitude 4 or greater

The location with the highest risk of a tsunami is

- (A) I.
- (B) II.
- (C) III.
- (D) IV.

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**QUESTION 14**

Algal blooms caused by nutrient run-off impact long-term water quality by decreasing

- (A) acidity.
- (B) turbidity.
- (C) light availability.
- (D) dissolved oxygen.

**QUESTION 15**

The best type of survey to identify underground petroleum is

- (A) seismic.
- (B) magnetic.
- (C) radioactive.
- (D) hyperspectral.

**QUESTION 16**

Geological and weather conditions for four locations are shown.

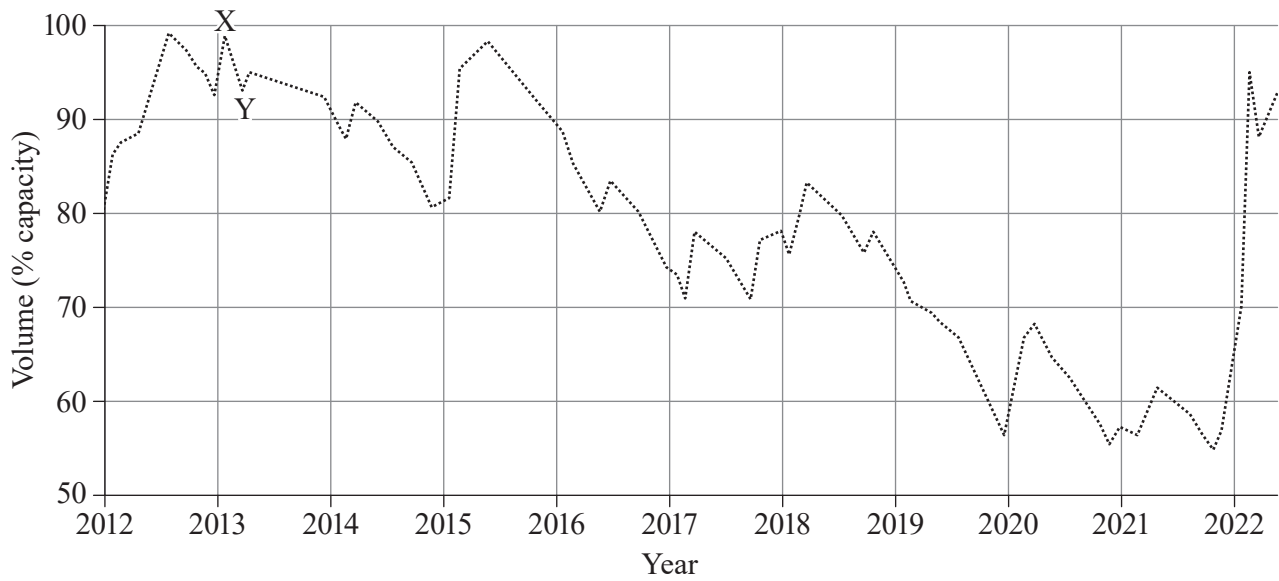
Location	Tectonic activity	Distance from coast (km)	Average wind speed (km/h)	Average annual sunshine (hours)	Average annual rainfall (mm)	Elevation above sea level (m)
1	Moderate	5000	16.5	4136	1549	1750
2	Moderate	30	22.9	1835	1653	23
3	High	7	9.8	988	910	554
4	Low	15 000	13.4	1322	2030	176

Compared to locations 1, 3 and 4, location 2 is the most suitable location for which form of renewable energy?

- (A) solar
- (B) wind
- (C) geothermal
- (D) hydroelectric

**QUESTION 17**

The graph shows the volume of water in a local dam as a proportion of its capacity.



The locality experienced a flooding event in 2013. The change in dam capacity between X and Y can be explained by

- (A) an overflow of the dam wall causing catastrophic dam failure.
- (B) a release of environmental flow water from the dam.
- (C) a secondary flooding event.
- (D) further significant rainfall.

**QUESTION 18**

Elevation data for four volcanoes is shown.

	Elevation above mean (m)			
Date	Volcano 1	Volcano 2	Volcano 3	Volcano 4
Dec 2021	2.8	3.8	4.1	1.8
Jan 2022	1.8	4.2	4.0	2.3
Mar 2022	3.1	4.6	3.7	2.6
Jun 2022	3.2	4.8	3.5	2.6
Sep 2022	3.0	4.7	3.5	2.5
Dec 2022	2.7	4.5	3.3	2.4
Jan 2023	3.4	4.3	3.1	2.4
Mar 2023	3.2	4.1	3.2	2.9
Jun 2023	2.6	4.1	3.0	3.2

Which volcano is most likely to erupt in the near future?

- (A) 1
- (B) 2
- (C) 3
- (D) 4

**QUESTION 19**

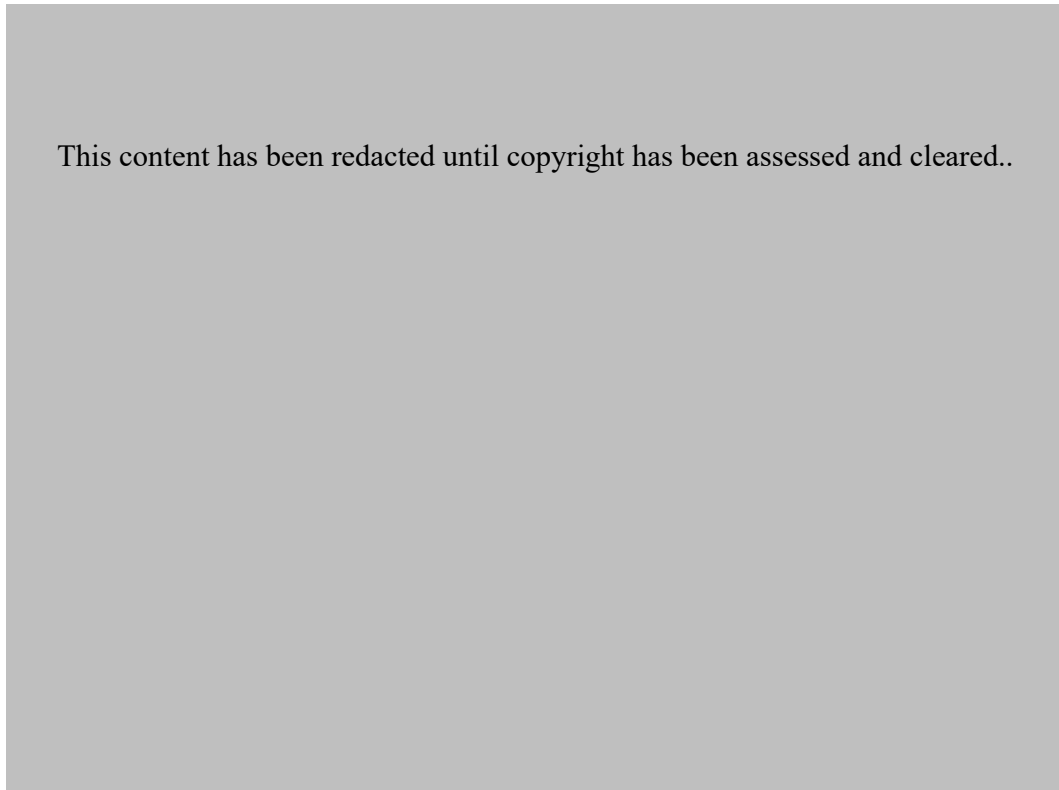
The best tests to monitor soil structure are

- (A) moisture and organic carbon.
- (B) volume and erosion pattern.
- (C) particle size and air space.
- (D) pH and salinity.

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**QUESTION 20**

The graph shows spawning stock biomass and fishing pressure for North Sea cod between 1963 and 2002.



The maximum sustainable yield measured by fishing pressure is

- (A) 1.15
- (B) 0.95
- (C) 0.75
- (D) 0.55

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## References

### Question 7–8

Adapted from Chen, S et. al. 2019, ‘Figure 3 : Relative humidity and PM10 and PM2.5 concentrations (a) November, 2018 (b) 6-9 June, 2018’ in *A big data analysis of PM2.5 and PM10 from low cost air quality sensors near traffic areas*, Aerosol and Air Quality Research, vol. 19, issue 8, pp. 1721–1733, <https://doi.org/10.4209/aaqr.2019.06.0328>

### Question 9

Adapted from Nichalp 2012, ‘India geology map’, Wikimedia Commons, <https://commons.wikimedia.org/wiki/File:India-geology-map.png>, CC BY 3.0.

### Question 10

Adapted from Fetterer, F et. al. 2017, ‘Arctic and Antarctic standardized anomaly and trend, Nov. 1978-Dec. 2018’, National Snow and Ice Data Center, <https://nsidc.org/sites/nsidc.org/files/images/cryosphere/sotc/arctic-antarctic-anomaly-trend-1978-2017.png>

### Question 13

Adapted from Braziunas, T & Jones, G, ‘Blake Island topographical map’, [https://commons.wvc.edu/rdawes/GEOL101/Labs/GEOL101\\_Lab1\\_TopoMaps.htm](https://commons.wvc.edu/rdawes/GEOL101/Labs/GEOL101_Lab1_TopoMaps.htm)

### Question 17

Adapted from Seqwater 2023, ‘Historical dam storage data’, *Historical dam levels*, <https://www.seqwater.com.au/historic-dam-levels>

### Question 20

Adapted from Eionet (European Environment Information and Observation Network) 2012, ‘Spawning stock biomass and fishing pressure for North Sea cod 1963-2002’, European Environment Agency, <https://www.eea.europa.eu/data-and-maps/figures/spawning-stock-biomass-and-fishing-pressure-for-north-sea-cod-1963-2002>



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