

2125/02/S/O/26

- 1 (a) (i) Using Figure 1.1, state the hazard that the students think was the greatest risk. [1]

- **Traffic accidents**, which had the highest risk score of **15**. [1]

- (ii) Name the two different types of rating scale used in questions 2 and 3 of the questionnaire. [2]

- Scale for Question 2: **Frequency scale**. [1]
- Scale for Question 3: **Likert Scale**. [1]

- (iii) With reference to Figure 1.3, suggest one reason why the students put each group in charge of one street in Kreta Ayer for the interviews. [1]

- Assigning each group to a different street ensures that respondents from **different parts of Kreta Ayer are surveyed**, giving **better spatial coverage** of the neighbourhood and reducing the chance of several groups interviewing people in the same area. [1]

- (iv) Using Figure 1.4, suggest why they agreed with the hypothesis. [3]

The hypothesis was: *"Residents living in the Kreta Ayer neighbourhood can experience different elements of Chinese culture."*

- All the cultural elements recorded a **higher positive score for Chinese culture than the corresponding negative score for non-Chinese culture**, showing that Chinese cultural elements are strongly experienced in Kreta Ayer. [1]
- **Chinese restaurants had the strongest positive score of +99**, compared with only **-8 for non-Chinese restaurants**, suggesting that residents have considerable exposure to Chinese food and cuisine. [1]
- Other Chinese cultural elements also received high positive scores, such as **Chinese places of worship (+77)** and **shops selling Chinese products (+75)**, supporting the hypothesis that residents can experience a variety of Chinese cultural elements. [1]

- (v) Evaluate the reliability of the data collected for this investigation. [4]

Reliable:

- All respondents were asked the **same structured questionnaire**, making the data collection procedure consistent and allowing responses from the six streets to be compared reliably. [1]

- The six groups interviewed **15 people each**, giving a total sample of about **90 respondents** spread across different streets, which provides a reasonably large amount of data. [1]

Less reliable:

- Interviews were conducted only between **0900 hrs and 1300 hrs on a Wednesday**, so people who were at work or school may have been excluded. [1] Repeating the survey at a different time or on a weekend could produce different results.
- Each street had the same number of respondents even though streets may differ in the number and type of residents or visitors present. Thus, some streets or groups of people may be **over- or under-represented**, reducing the reliability of the overall findings. [1]

(b) (i) Using Figure 1.5, describe two ways this aim has been achieved. [2]

The aim is to create connections within a town.

- The **MRT and LRT networks connect different residential areas of Punggol**, allowing residents to travel between different parts of the town conveniently. [1]
- **Park connectors and cycling paths form continuous routes through the town**, providing residents with alternative connections between homes, green spaces and transport facilities. [1]

(ii) Explain how local communities can benefit from the environment that has been created in Figure 1.6. [3]

- The previously unused space beneath the rail tracks has been transformed into **walking and recreational areas**, allowing residents to exercise and participate in leisure activities in a sheltered environment. [1]
- The addition of **greenery and landscaped spaces** improves the attractiveness of the neighbourhood and can **provide shade** and a more comfortable environment for users. [1]
- Shared facilities and recreational areas provide places where residents can **meet and interact with one another**, strengthening social interaction and community ties. [1]

(iii) Suggest how people may acquire a sense of place in a location like the one shown in Figure 1.6. [2]

- People who use the area regularly for activities such as walking, playing or commuting may develop **familiarity and personal memories associated with the place**, creating emotional attachment. [1]
- Meeting neighbours and taking part in activities in the shared space can develop **social relationships and a sense of belonging to the local community**, strengthening their sense of place. [1]

(c) (i) Using Figure 1.7, describe the trends in the number of fire occurrences. [2]

- The total number of fire occurrences initially **increased from about 4200 in 2013 to a peak of about 4800 in 2014**, before **generally declining** over the rest of the period. [1]
- There was a particularly large decline after 2018, with the total falling to about **1800–1900 occurrences from 2020 to 2022**, where it remained relatively stable. [1]

(ii) Suggest two causes of fires in urban neighbourhoods. [2]

- **Unattended cooking or open flames** may ignite cooking oil, furniture or other combustible materials in homes. [1]
- **Electrical faults**, such as overloaded power sockets, damaged wiring or faulty appliances, may overheat and cause fires. [1]

(iii) Describe three problems that fires may cause for residents in urban areas. [3]

- Residents may suffer **burns, smoke inhalation, serious injuries or death**. [1]
- Homes and personal belongings may be **damaged or destroyed**, causing residents to be temporarily or permanently displaced. [1]
- Fires may cause **financial losses and disruption**, as residents may have to pay for repairs or alternative accommodation and may be unable to return home for some time. [1]

2 (a) (i) Identify the type of climate shown in Figure 2.1. [1]

- **Tropical climate**. [1]

(ii) Using Figure 2.1, describe the pattern of temperature and rainfall. [3]

Temperature

- Temperatures remain **high throughout the year at about 27–29°C**,
- giving a very **small annual temperature range** of only about **2°C**. [1]

Rainfall

- Rainfall is **high throughout the year**, with every month receiving approximately **500 mm or more** of rainfall. [1]
- Rainfall is highest around **May and June at about 650 mm**, while the relatively drier months such as February and December receive about **500–520 mm**. [1]

(iii) Explain the formation of convectional rainfall. [4]

- Strong solar radiation **heats the land surface**, which in turn **heats the air above it**. [1]
- The heated air **expands**, becomes **less dense** and **rises rapidly through convection**. [1]
- As the air rises, it expands and cools. When it reaches its dew point, water vapour **condenses to form large clouds such as cumulonimbus clouds**. [1]
- Continued condensation causes water droplets to grow larger and heavier until they fall as **heavy convectional rainfall**, often accompanied by thunderstorms. [1]

(b) (i) Describe what a drought is. [2]

- A drought is a **prolonged period of abnormally low or below-average rainfall**. [1]
- This causes a **shortage of available water**, such as reduced soil moisture, river flow and water supplies. [1]

(ii) Using Figure 2.2, describe the distribution of areas declaring a drought emergency in 2022–2023. [3]

- Drought emergencies were **widely distributed across several continents**, rather than being concentrated in only one part of the world. [1]
- Extensive areas declaring drought emergencies were found across **North America, Europe and large parts of Asia**. [1]
- Smaller and more scattered areas were also found in **Africa and South America**, while some regions such as much of Oceania had relatively few or no areas shown as declaring a drought emergency. [1]

(iii) Using Figure 2.2, compare the areas declaring a drought emergency with the areas with occurrences of wildfires in 2022–2023. [3]

- There is some **spatial overlap between drought emergencies and wildfires**, such as in parts of western North America, Europe and Asia. [1]
- However, not every drought-emergency area experienced a wildfire; there are **large drought-affected areas with few or no wildfire symbols**. [1]
- Some wildfires also occurred **outside areas shown as declaring drought emergencies**, showing that drought is associated with wildfire risk but is not the only factor affecting where wildfires occur. [1]

(iv) Explain how droughts affect provisioning ecosystem services. [3]

- Drought reduces water stored in rivers, reservoirs and groundwater, causing a decline in the ecosystem's provision of **fresh water for drinking, irrigation and other uses**. [1]
- Reduced rainfall and soil moisture can cause crops to wilt or fail, reducing the provisioning of **food from agricultural ecosystems**. [1]
- Vegetation and forests may become stressed or die during prolonged droughts, reducing the supply of **timber, fuelwood and other plant-based resources** provided by ecosystems. [1]

(c) "The use of clean energy sources is the best mitigation strategy for reducing a country's greenhouse gas emissions."
To what extent do you agree with this statement? Explain your answer.

[6]

Agree: Clean energy can be highly effective

- The use of clean energy sources such as **solar, wind and hydroelectric power** can greatly reduce greenhouse gas emissions because electricity is generated without burning large quantities of fossil fuels.
- This directly reduces emissions of carbon dioxide from power generation and allows other activities, such as transport, to become less carbon-intensive when they shift towards electricity.
- Therefore, in countries where electricity production depends heavily on coal, oil or natural gas, replacing these fuels with clean energy can result in a **large reduction in national greenhouse gas emissions**.

Counterpoint: Other mitigation strategies are also important

- However, clean energy alone may not be the best strategy for every country because its effectiveness depends on factors such as **cost, technology, infrastructure and the availability of renewable energy resources**.
- Improving energy efficiency in buildings, transport and industries can also reduce greenhouse gas emissions because **less energy is needed to provide the same service**, reducing the amount of fossil fuel that has to be burned.
- Protecting forests and increasing vegetation can also strengthen **carbon sinks**, which remove carbon dioxide from the atmosphere. Measures to reduce transport emissions and energy consumption are therefore needed alongside cleaner electricity generation.

Conclusion

- I agree **to a large extent** that clean energy is one of the most important mitigation strategies because it can reduce emissions at source on a large scale, especially in countries with carbon-intensive electricity systems.
- However, its effectiveness depends on the country's physical and economic circumstances. Hence, the most effective approach is an **integrated**

mitigation strategy, where clean energy is combined with energy efficiency, reduced fossil-fuel consumption and protection of carbon sinks.

3 (a) (i) Using Figure 3.1, describe the distribution of volcanic activity in 2023. [2]

- Volcanic activity is mainly concentrated in **long, narrow belts around the margins of the Pacific Ocean**, including the western coasts of North and South America and areas around Japan, the Philippines and Indonesia. [1]
- Smaller areas of volcanic activity are also found elsewhere, such as around **East Africa and parts of the Mediterranean region**, so volcanic activity is **unevenly distributed globally**. [1]

(ii) Most volcanic activity occurs in areas of plate movement. Explain how slab-pull force results in plate movement. [2]

- At a **subduction zone**, a denser oceanic plate **sinks into the mantle under the force of gravity**. [1]
- As the descending slab sinks, it **pulls the rest of the tectonic plate behind it into the mantle**, causing the plate to move. [1]

(b) (i) Explain how volcanoes are formed at convergent plate boundaries. [4]

- At a convergent plate boundary, two plates move towards one another and the **denser oceanic plate is subducted beneath the less dense plate**. [1]
- As the oceanic plate descends into the mantle, conditions associated with subduction cause **partial melting and the formation of magma**. [1]
- The magma is less dense than the surrounding rocks and therefore **rises through cracks and weaknesses in the crust**. [1]
- The magma erupts at the Earth's surface as lava, ash and other volcanic material. Repeated eruptions cause these materials to **accumulate and form a volcano**. [1]

(ii) Explain how mid-ocean ridges are formed at divergent plate boundaries. [2]

- At a divergent plate boundary, two oceanic plates **move apart**, creating a gap in the crust through which magma rises from the mantle. [1]
- The magma cools and solidifies to form **new oceanic crust**, and repeated formation of new crust builds up an elevated underwater feature known as a **mid-ocean ridge**. [1]

(c) (i) Using Figure 3.2, state three hazards caused by the eruption of Cumbre Vieja. [3]

- **Lava flows**. [1]
- **Volcanic ash / ash clouds**. [1]
- **Volcanic gases**. [1]

(ii) Describe how the eruption of Cumbre Vieja has negatively affected the local area shown in Figure 3.2. [4]

- Large lava flows have **covered extensive areas of land**, making the affected land unusable. [1]
- Lava has spread through areas containing **farmland and cultivated fields**, destroying crops and reducing agricultural production and farmers' livelihoods. [1]
- Buildings and settlements close to the lava flows are threatened or may be **damaged or destroyed**, causing residents to be evacuated or displaced. [1]
- The large ash and gas plume can **reduce air quality and visibility**, creating health hazards and disrupting daily activities and transport in the surrounding area. [1]

(iii) Suggest two ways in which volcanic eruptions like the one in Figure 3.2 may benefit people. [2]

- Volcanic ash and lava eventually weather to form **fertile soils**, which can **support productive agriculture**. [1]
- Volcanic landscapes and eruptions can **attract tourists**, providing **income and employment for local businesses** such as hotels, restaurants and tour operators. [1]

(d) "The time of shaking is the most important factor determining the extent of damage caused by an earthquake."

To what extent do you agree with this statement? Explain your answer.

[6]

Agree: Time of occurrence can strongly influence the extent of damage

- The time at which an earthquake occurs can affect the number of people exposed to danger. If an earthquake occurs **at night**, many people may be asleep in their homes and may have less time to react or evacuate, increasing the risk of injury or death.
- If an earthquake occurs during **peak hours**, many people may be travelling, working or attending school. This means roads, offices, schools and public transport may be crowded, increasing the number of people exposed to collapsing buildings, falling debris or damaged infrastructure.
- The time of occurrence can also affect the **speed of emergency response**. For example, damaged roads during busy periods may delay emergency vehicles and rescue operations.
- Therefore, the time of shaking can significantly influence the extent of damage because it affects **how many people are exposed and how effectively they can respond**.

Counterpoint: Other factors may be more important

- However, the **magnitude of the earthquake** may have a greater influence because a higher-magnitude earthquake releases more energy and produces stronger ground shaking, which can damage buildings and infrastructure over a wider area.
- The **quality of buildings and level of preparedness** are also important. In places where buildings are earthquake-resistant and residents practise emergency drills, fewer buildings may collapse and fewer people may be injured even if an earthquake occurs at a busy time.
- In contrast, an earthquake of similar magnitude may cause far greater damage in a densely populated area where buildings are poorly constructed and emergency services are limited.
- Hence, the extent of damage depends not only on the time of occurrence but also on the **severity of the hazard and the vulnerability of the community**.

Conclusion

- I agree **to a small extent** that the time of shaking is the most important factor. Although the time of occurrence affects the number of people exposed and their ability to respond, I consider **building quality and preparedness more significant** because these directly influence whether structures collapse and whether people can protect themselves.
- Using the geographical concept of **vulnerability**, an earthquake occurring at a busy time does not necessarily result in severe damage if the community is well prepared and buildings are designed to withstand earthquakes. Therefore, the interaction between the **hazard and the community's vulnerability** is more important than the time of occurrence alone.