

國立成功大學

115學年度碩士班招生考試試題

編 號：44

系 所：地球科學系

科 目：科學英文

日 期：0204

節 次：第 1 節

注 意：1. 不可使用計算機
2. 請於答案卷(卡)作答，於
試題上作答，不予計分。

Multiple Choice Questions (30%, only one answer for each question)

1. Which seismic wave type is primarily responsible for the most destructive ground motion during earthquakes, particularly creating a rolling, elliptical motion?
 - A. P-waves
 - B. S-waves
 - C. Love waves
 - D. Rayleigh waves
2. Which process is primarily responsible for the long-term regulation of atmospheric CO₂ on geological timescales?
 - A. Volcanic degassing
 - B. Silicate weathering feedback
 - C. Photosynthesis
 - D. Oceanic outgassing
3. What mechanism primarily drives thermohaline circulation in the global ocean?
 - A. Wind stress
 - B. Coriolis force
 - C. Density differences due to temperature and salinity
 - D. Tidal forcing
4. Bowen's Reaction Series explains the:
 - A. Fractional crystallization of magma
 - B. Formation of sedimentary basins
 - C. Rate of radioactive decay
 - D. Metamorphic facies transitions
5. The Mohorovičić discontinuity represents the boundary between the:
 - A. Lithosphere and asthenosphere
 - B. Crust and mantle
 - C. Upper mantle and lower mantle
 - D. Outer core and inner core
6. The $\delta^{18}\text{O}$ value in marine carbonate fossils is primarily used as a proxy for:
 - A. Atmospheric CO₂ concentration
 - B. Ocean salinity only
 - C. Past ocean temperature and ice volume
 - D. Biological productivity
7. What primarily distinguishes an active continental margin from a passive continental margin?
 - A. Thickness of continental crust
 - B. Presence of deep-sea trenches and volcanism
 - C. Width of the continental shelf
 - D. Rate of sediment accumulation
8. Which greenhouse gas contributes the most to Earth's natural greenhouse effect?
 - A. Carbon dioxide

- B. Methane
 - C. Nitrous oxide
 - D. Water vapor
9. What process changes sediment into sedimentary rock?
- A. Erosion
 - B. Evaporation
 - C. Compaction and cementation
 - D. Melting
10. Which layer of the atmosphere contains the ozone layer?
- A. Troposphere
 - B. Stratosphere
 - C. Mesosphere
 - D. Thermosphere

Comprehension (20%)

→Please read the two paragraphs on seafloor spreading, then answer the following five questions.

Seafloor spreading is the process by which new oceanic crust is formed at mid-ocean ridges when tectonic plates move away from each other. As the plates separate, magma from the Earth's mantle rises through cracks in the crust. When this magma reaches the ocean floor, it cools and solidifies, creating new oceanic crust. Over time, continuous magma flow causes additional crust to form, pushing the older crust farther away from the ridge. As the older crust moves outward, it cools, becomes denser, and eventually sinks back into the mantle at deep-ocean trenches through a process called subduction.

Several types of evidence support the theory of seafloor spreading. One key piece of evidence is the age of ocean floor rocks, which are always youngest near mid-ocean ridges and become progressively older with increasing distance from the ridge. Another important evidence is the pattern of magnetic stripes found on the ocean floor. These stripes form because iron minerals in cooling magma align with Earth's magnetic field, which reverses periodically over time. The symmetrical pattern of normal and reversed magnetism on both sides of mid-ocean ridges provides strong proof that new crust is continuously created and spreads outward. Seafloor spreading helped scientists understand plate tectonics by explaining how tectonic plates move and carry continents, offering a clear explanation for continental drift and the ongoing changes to Earth's surface.

1. Explain what seafloor spreading is and how it occurs at mid-ocean ridges. (3p)
2. Describe the process by which new oceanic crust is formed and what happens to older crust over time. (3p)
3. Discuss the evidence scientists use to support the theory of seafloor spreading. (6p)
4. Explain how magnetic stripes on the ocean floor form and why they are important. (4p)
5. Explain how seafloor spreading helped scientists understand plate tectonics and the movement of continents. (4p)

Translation (30%)

Please translate the following two short paragraphs concisely into Chinese.

I. Germany's Journey to a Plastic-Free Future (15p)

Germany has emerged as a global leader in the fight against plastic pollution through comprehensive policies and strong multi-stakeholder collaboration. The country tops the Plastics Management Index with a score of 87 out of 100, reflecting stringent laws on plastic waste, effective waste management, and incentives for responsible business practices. Germany's waste collection and recycling infrastructure is particularly robust, with exceptionally high recycling rates for materials like PET bottles. Central to its strategy are circular economy principles that emphasize product longevity, reuse, and recycling, as well as efforts to reduce dependence on single-use plastics through bans and substitution with sustainable alternatives. National initiatives such as a strategic five-point plan and active engagement with international commitments further reinforce Germany's leadership in tackling plastic pollution. While the country still faces challenges—such as downcycling and the need for more accurate data—its commitment to policy innovation and stakeholder engagement positions it at the forefront of sustainable plastic management. Germany also hosts a growing number of organizations working toward a plastic-free future, contributing to broader environmental sustainability efforts.

II. What is blue carbon? (15p)

Blue carbon refers to the carbon captured, stored, and sequestered by coastal and marine ecosystems, particularly mangroves, seagrass meadows, and salt marshes. Through photosynthesis, these ecosystems absorb carbon dioxide from the atmosphere and store it not only in their living biomass but also, more importantly, in the waterlogged soils and sediments beneath them, where carbon can remain locked away for hundreds to thousands of years. Despite covering a relatively small area globally, blue carbon ecosystems are among the most efficient natural carbon sinks on Earth. Beyond their role in climate change mitigation, they provide essential co-benefits such as protecting coastlines from erosion and storms, supporting rich biodiversity, improving water quality, and sustaining fisheries and coastal livelihoods.

English Composition (20%)

Please choose one topic (see below), then prepare a short paragraph about 150 words to convey the information or knowledge you can share on the topic.

1. Carbon Dioxide Removal (CDR)
2. Sustainable Development Goals (SDGs)
3. Extreme weather and natural hazards (consider using Taiwan as an example).