

國立成功大學
114學年度碩士班招生考試試題

編 號： 50

系 所： 地球科學系

科 目： 科學英文

日 期： 0211

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。

(A.) Multiple Choice Questions (20%, 2 points for each question)

1. Holiday deals are designed to be _____. A consumer psychologist explains how to avoid overconsumption and shop sustainably.
(a) resistible, (b) flexible, (c) flammable, (d) irresistible.
2. A study of births in New Jersey reveals a troubling _____ between unscheduled C-sections for Black people.
(a) similarity, (b) disparity, (c) equality, (d) efficiency.
3. We cover a 3.26-billion-year-old meteorite impact, the spread of bird flu and a scurvy case study that serves as a _____ tale in this week's news roundup.
(a) cautionary, (b) favorable, (c) cautious, (d) comprehensive
4. Plate tectonics is the unifying theory of how the solid earth works, and how the tectonic cycle _____ with other components of the Earth system.
(a) communicates, (b) implements, (c) launches, (d) interacts
5. A volcano which is composed of lava flows and pyroclastic material and which is steep-sided and very tall is known as:
(a) syncline, (b) anticline, (c) composite cone, (d) none of these.
6. Biosphere describes the earth realm where life occurs What describes the entire solid earth realm and is composed of mineral matter?
(a) hydrosphere, (b) lithosphere, (c) atmosphere, (d) aerosphere.
7. While many different gases are found in the atmosphere, a number do NOT contribute significantly to solar heating of the atmosphere. Which TWO of the following gases do NOT absorb much heat?
(a) carbon dioxide and methane, (b) nitrogen and oxygen, (c) water vapor and Ar, (d) oxygen and hydrogen.
8. Which of the following minerals is noted for its one perfect cleavage?
(a) calcite, (b) muscovite, (c) quartz, (d) pyrite.
9. Which of the following pairs contains one igneous and one sedimentary rock?
(a) granite and limestone, (b) sandstone and quartzite, (c) shale and marble, (d) obsidian and gneiss.
10. Galena is a primary ore of which of the following metals?
(a) zinc, (b) tungsten, (c) silver, (d) lead

(B.) Comprehension (10%)

Read the following few paragraphs then answer the questions. These paragraphs are copied from Landrum and DuVivier 2024 from News & views, Nature.

Sea ice mediates the heat exchanged between the ocean and the atmosphere (Fig. 1). In the summer, this ice reflects most of the radiation from the Sun, preventing it from reaching and warming the surface of the ocean. During the dark, cold winter months, sea ice insulates the ocean from the colder atmosphere above it, reducing heat loss from the ocean. But sea ice also has a key role in enabling the ocean to draw excess heat from the atmosphere — and this mechanism is particularly relevant for the Southern Ocean.

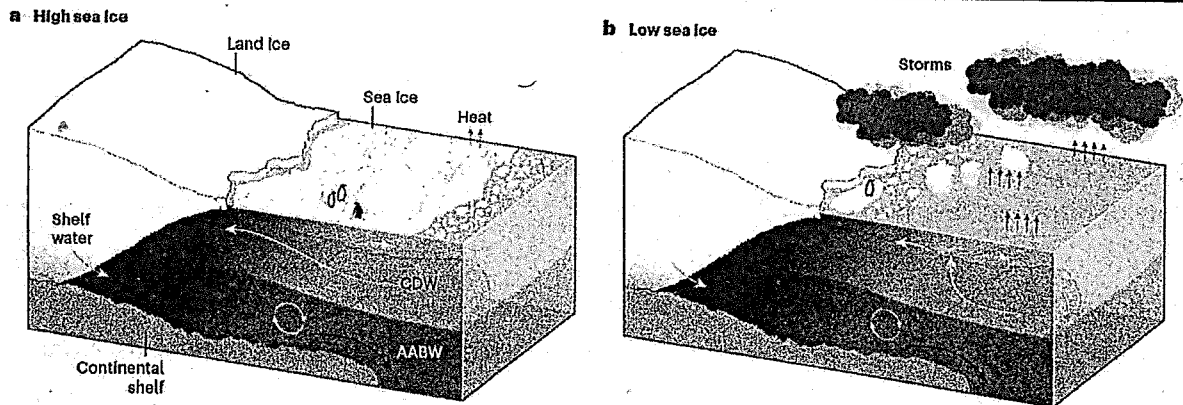


Figure 1. The effects of Antarctic sea ice. **a**, Antarctic sea ice insulates the Southern Ocean, preventing it from losing too much heat to the atmosphere, and it mediates ocean-circulation processes that draw heat from the atmosphere. The formation of sea ice makes water sink and flow off the continental shelf, mixing with a layer called circumpolar deep water (CDW) to become Antarctic bottom water (AABW). **b**, When ice is scarce, ecosystems are affected, there is increased heat loss to the atmosphere (upward arrows), and the properties of the CDW are affected. This, in turn, fuels storms and has an impact on the amount of carbon that can be absorbed by the ocean.

The Southern Ocean is smaller than the Pacific, Atlantic and Indian oceans, and yet it is a major mitigator of global climate change — over the past century, it has taken up around 83% of the heat that oceans absorb from the atmosphere and about 43% of the carbon dioxide. The Southern Ocean's ability to take up so much heat and carbon is directly related to the formation of sea ice and to ocean circulation. As sea ice forms in the Southern Ocean, the shelf waters (meaning the shallow waters on the continental shelf) become saltier, because salt is expelled from ocean water when it freezes. The cold, salt-laden ocean water sinks and flows off the continental shelf, then mixes with a layer, known as circumpolar deep water (CDW), to become the densest ocean water in the world — the Antarctic bottom water (AABW).

Current understanding about the state of Earth's oceans suggests that Antarctic sea ice has a dominant role in determining the characteristics of the CDW. The CDW, in turn, influences the volume and density of the AABW. It also mediates the melting of ice sheets that flow from the Antarctic continent into the ocean — particularly the Thwaites and Pine Island glaciers, which skirt the Southern Ocean and have been dubbed the Doomsday Glaciers because their melting could trigger a catastrophic sea-level rise.

The highly saline shelf water that mixes with CDW to become AABW absorbs CO₂ at the surface and then carries it down as it flows to the ocean bottom. This water circulates in the abyss until it eventually resurfaces, typically around 1,000 years later. The amount of carbon that the Southern Ocean can take up is influenced by the volume of AABW formed, as well as the time it remains at great depths before resurfacing. These factors also determine how long the ocean will take to adjust to ever-increasing carbon emissions and related atmospheric heating.

Q1: What's the major function of sea ice? (2p)

Q2: Why does the Southern Ocean play an important role in mitigating global climate change? (2p)

Q3: What's the relationship between CDW and AABW? (3p)

Q4: What are the factors controlling the amount of carbon that the Southern Ocean can take up? (3p)

(C.) Translation (40%, 20 points for each section)

Please translate the following paragraphs concisely into Chinese.

1. Bacteria Got an Early Fix on Nitrogen (By Lee Billings, Scientific American Potcast, 2015/02/24)

Oxygen and water are crucial to most life on Earth, but what about nitrogen? It's in every molecule of DNA in your body, and in all your proteins—you literally can't live without it. But most of Earth's nitrogen exists as an inert atmospheric gas that organisms can't use. Lightning strikes can convert some nitrogen into a bioavailable form. But most of the biosphere's usable nitrogen is the result of bacteria employing an enzyme called nitrogenase to pull nitrogen out of the air. Based on genetic evidence, scientists have thought that nitrogenase first evolved around 2 billion years ago. Before that, life on Earth might have been confined to the oceans and been limited by the crucial substance's inaccessibility. But researchers now have evidence for the existence of nitrogenase in bacteria going back some 3.2 billion years. The researchers base their argument on the ratios of light to heavy nitrogen isotopes in ancient rocks from Australia. Their finding indicates that the biosphere more than three billion years ago was much more complex than previously appreciated and perhaps had already colonized land. An earlier arrival for nitrogenase also may mean that the enzyme evolves more easily than was previously believed. Which could increase the odds that, sooner or later, astrobiologists will find signs of another robust biosphere on some world far away.

2. Track Cosmic Rays with Smartphone App (By Clara Moskowitz, Scientific American Potcast, 2014/10/16)

Thousands of energetic particles called cosmic rays fly right through our bodies every second without us ever noticing. Now scientists want your help to track this radiation from space in a massive citizen science project—by using your smartphone. Physicists don't know for sure where cosmic rays come from, but they suspect supernovae and powerful black holes are involved. Although we're bombarded with the particles, the very highest energy cosmic rays are rare. Studying them has therefore been difficult. But it turns out that smartphone cameras are actually good at detecting them. When these especially energetic rays hit Earth's atmosphere they create a shower of other charged particles. These particles hit a camera's sensor, resulting in one bright pixel against a dark background. If enough phones in the same area see particles, scientists can recreate the cosmic ray's path through space. You can take part in the project through an app called CRAYFIS (for Cosmic Rays Found in Smartphones). CRAYFIS only operates when a phone is plugged into a power source and not otherwise being used, so it will not drain your battery. Between Candy Crush and Facebook sessions, your phone can help unravel the mysteries of the universe.

(D.) English Composition (30%)

Please choose **ONE** of the following topics and write down a short essay.

1. Global warming from fossil fuels
2. Biodiversity loss
3. Plastic Pollution