

# 國立成功大學

## 113學年度碩士班招生考試試題

編 號： 53

系 所： 地球科學系

科 目： 科學英文

日 期： 0202

節 次： 第 1 節

備 註： 不可使用計算機

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

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

Find a proper/correct description or term corresponding to the question.

1. What is thermohaline circulation?
  - a. It is a wind-driven circulation.
  - b. It starts from the North Pacific Ocean.
  - c. It is driven by global density gradients caused by temperature and salinity differences.
  - d. It is a big-scale circulation in surface oceans.
2. Which one is the longest subdivision of geological time?
  - a. Period
  - b. Era
  - c. Epoch
  - d. Eon
3. There are several kinds of seismic waves. Please pick up a **WRONG** description of seismic waves.
  - a. Body waves can transmit either compressional motion (S waves) or shear motion (P waves).
  - b. Surface waves are vibrations that are trapped near Earth's surface.
  - c. Love waves and Rayleigh waves are two types of surface waves.
  - d. Body waves are analogous to light or sound waves in clear air.
4. Would you please choose a correct chronological order of epochs in Cenozoic era?
  - a. Pliocene → Oligocene → Miocene → Eocene → Paleocene → Pleistocene
  - b. Paleocene → Eocene → Oligocene → Miocene → Pliocene → Pleistocene
  - c. Pliocene → Pleistocene → Paleocene → Oligocene → Miocene → Eocene
  - d. Pleistocene → Paleocene → Oligocene → Miocene → Eocene → Pliocene
5. Following are the terms about fold-thrust belt. Please choose a **CORRECT** description.
  - a. Backarc is the region that lies behind the volcanic arc along a divergent plate boundary.
  - b. Fault-bend fold is a fold that forms in response to movement over bends in a fault surface.
  - c. Forearc is the region to the trench side of the volcanic arc of a divergent plate boundary.
  - d. Tear fault is a nearly horizontally dipping fault in a thrust sheet that is parallel or subparallel to the regional transport direction.
6. There are several types of igneous intrusions. Please choose a **CORRECT** description.
  - a. Sills commonly occurs in folded country rock at shallow crustal levels.
  - b. Laccoliths are mushroom-shaped intrusions that range in diameter from 1 to 8 m.
  - c. Most of lopoliths are found in significantly folded regions.
  - d. Batholiths are commonly composed of silica-rich igneous rocks and range in outcrop area from 100 to several thousand square kilometers.
7. What is plankton?
  - a. Tiny plants and animals that float in the ocean.

- b. Tiny grains involved in plant reproduction.  
c. Thin soil formed in arid climates.  
d. A thin layer of rotten rock created by chemical weathering.
8. Due to climate change, the oceans are turning more \_\_\_\_, Surface waters absorb \_\_\_\_ produced by the burning of fossil fuels.  
a. Chaotic, oxygen  
b. Dramatic, nitrogen  
c. Acidic, carbon dioxide  
d. Aromatic, carbon dioxide
9. Environmental crime can be fought. For example, Brazil has dramatically reduced tree-cutting in the Amazon with better \_\_\_\_, and east Africa has stepped up its \_\_\_\_ busts.  
a. Movement, crazy  
b. Enforcement, ivory  
c. Catchment, lovely  
d. Enhancement, irony
10. This week a massive quake off the coast of Chile killed six and forced hundreds of thousands to \_\_\_\_ in fear of a tsunami. Scientists have long dreamed of ways to predict and even protect regions from such \_\_\_\_.  
a. Create, destination.  
b. Generate, distinction.  
c. Regulate, determination.  
d. Evacuate, devastation.

(B.) Comprehension (10%)

The following paragraph is one part of an observation about ice concentration and sea ice extent in a special issue on the new Arctic Ocean (Meier, W.N., and J. Stroeve. 2022. An updated assessment of the changing Arctic sea ice cover. *Oceanography* 35: 10–19).

Please carefully read this paragraph then answer the questions.

A series of satellite-borne passive microwave sensors provides a consistent and nearly complete long-term record of sea ice concentration and extent since November 1978. Sea ice extent (sum of the area with at least 15% concentration) has been a workhorse in assessing the state of the ice cover because of the available long, consistent record. Several time series of extent have been produced from passive microwave brightness temperatures via various empirically derived sea ice concentration algorithms (e.g., Comiso, 1986; Spreen et al., 2008; Lavergne et al., 2019). Here, we use the extent record from the US National Snow and Ice Data Center (NSIDC) Sea Ice Index (Fetterer et al., 2017) derived from NASA Team algorithm concentration fields (Cavalieri et al., 1999); extent here is defined as the total area where concentration is

greater than 15%. The concentration product begins in November 1978 (Cavalieri et al., 1996), with the most recent data (for 2021 in this manuscript) augmented by near-real-time processing (Maslanik and Stroeve, 1999).

Sea ice concentration and extent are declining everywhere in the Arctic, with the most pronounced losses in summer occurring within the Beaufort, Chukchi, East Siberian, and Laptev Seas, and the largest ice losses in winter within the Barents Sea and the Sea of Okhotsk. Much of the concentration trend is due to complete loss of ice (i.e., decline in extent and retreat of the ice edge), but some areas within the ice pack are also trending toward lower concentration. This suggests a less compact ice pack that allows more solar absorption during summer and less resistance to wind and other dynamic forcing.

The sea ice extent trend in September, when the annual minimum occurs, is  $-12.7\%$  per decade, while winter trends are smaller but still statistically significant ( $p < 0.05$ ). Trends for 1979–2021 are negative and statistically significant for all months, with extents since 2005 consistently well below normal, particularly during spring and autumn (Figure 1d). The largest departures from average conditions recently have occurred in October, with the largest negative anomaly being the October 2020 extent that was 3.7 standard deviations below the 1981–2010 mean.

Q1: What kind of tool scientists used to study ice concentration and sea ice extent? (2 points)

Q2: Where do scientists obtain the sea ice extent record? (2 points)

Q3: Please tell me the regions where scientists observed the most losses of sea ice in summer and in winter? (4 points)

Q4: Which season has a relatively obvious sea ice loss trend? (2 points)

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

Please translate the following two paragraphs concisely and precisely into Chinese.

I. Global Warming Freezes Penguin Chicks (from 60s science, by Allie Wilkinson on Feb. 9<sup>th</sup>, 2014)  
Life isn't easy for a penguin chick. There's a lot to worry about: predators, having enough food, and now the changing climate. Researchers spent nearly thirty years tracking chicks at Punta Tombo, the world's largest colony of Magellanic penguins. They found that increased rainfall and extreme heat due to climate change are killing chicks. The study is in the journal PLoS ONE. [P. Dee Boersma and Ginger A. Rebstock, Climate Change Increases Reproductive Failure in Magellanic Penguins] Down-covered chicks are too big to receive parental protection from the elements but are not old enough to have grown protective waterproof feathers. So they get soaked to the skin during rainstorms and die of hypothermia. Their downy feathers do them a disservice during heat waves too, since they can't go for a swim to cool off until their waterproof feathers grow in. Chicks not getting enough food are even more susceptible to the elements, as they lack the fuel to maintain their body temperature. Storms during breeding season are already on the rise, and are

expected to keep increasing. So climate change will likely pose a challenge not only in Magellanic penguins, but other seabirds as well. It'll be sink or swim.

II. The Chi-Chi Taiwan Earthquake: Large Surface Displacements on an Inland Thrust Fault (from EOS Vol. 80, number 50, page 605 – 620.)

In the early morning (01:47 local time) of September 21, 1999, the largest earthquake of the century in Taiwan ( $M_w=7.6$ ,  $M_L=7.3$ ) struck the central island near the small town of Chi-Chi. The hypocenter was located by the Central Weather Bureau Seismological Center at 23.87°N, 120.75°E, with a depth of about 7 km. There were extensive surface ruptures for about 85 km along the Chelungpu fault with vertical thrust and left lateral strike-slip offsets. The maximum displacement of about 9.8 meters is among the largest fault movements ever measured for modern earthquakes. There was severe destruction in the towns of Chungliao, Nantou, Taichung, FengYuan, and Tungshi, with over 2300 fatalities and 8700 injuries. The Chi-Chi earthquake was recorded by a dense strong motion network in Taiwan [Liu et al., 1999], providing one of the best strong-motion data sets ever recorded for a destructive earthquake.

(D.) English Composition (30%)

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

- a. Ocean acidification
- b. Black hole
- c. COP28: Transitioning away from fossil fuels in energy systems.
- d. Blue carbon