

# 國立中山大學 103 學年度碩士暨碩士專班招生考試試題

科目名稱：普通生物學【海洋科學系碩士班】

題號：458002

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單選題，每題 2.5 分。不可於試題紙上作答。

1. The genetic material that we inherit from parents is (a) DNA; (b) EDA; (c) RNA; (d) DHA.
2. Specific stretches of molecular that program the amino acid sequence of proteins are (a) carbohydrates; (b) EDA; (c) genes; (d) RNA.
3. DNA consists of two polynucleotide strands called (a) twins; (b) double helix; (c) nucleic acid; (d) lipids.
4. Which of the following organelles is not found in an animal cell? (a) ribosome; (b) cell wall; (c) lysosome; (d) mitochondrion.
5. Which of the following organelles is the cell's genetic control center? (a) golgi apparatus; (b) cytoskeleton; (c) nucleus; (d) chloroplast.
6. Which of the following organelles is not found in an animal cell (a) ribosome; (b) cell wall; (c) lysosome; (d) mitochondrion.
7. The cells of a horse are on average \_\_\_\_ those of a mouse. (a) smaller than; (b) bigger than; (c) of the same small size of; (d) all of avobe.
8. Which of the following sentences is not true? (a) energy conversion in cells governed by laws of thermodynamics; (b) cellular environment affects enzyme activity; (c) passive transport is diffusion across a membrane; (d) osmosis is the active transport of water.
9. Which of the following definitions of terms is not correct? (a) photosynthesis: using light to make food; (b) light reaction: reactions that convert light energy to chemical energy and produce  $O_2$  as a waste product; (c) C4 plants: their Calvin cycle uses  $CO_2$  directly from the air; (d) autotrophs: making their own food without eating other organisms/organic molecules.
10. Which of the following organisms can regenerate an arm? (a) sea star; (b) sea cucumber; (c) sea urchin; (d) seal.
11. The reproductive process that involves the union of a sperm and an egg is called (a) asexual reproduction; (b) sexual reproduction; (c) regeneration; (d) cell division.
12. binary fission is a way to reproduce of (a) plant cells; (b) prokaryotes; (c) animal cells; (d) eukaryotes.
13. Which of the following phases is not a step of cell division? (a) metaphase; (b) anaphase; (c) betaphase; (d) prophase.
14. Which of the following sentences is not true? (a) gametes have a single set of chromosomes; (b) a typical body cell is called a somatic cell; (c) in mitosis, the nucleus divides into two genetically identical daughter nuclei; (d) meiosis occurs in all cells of our body.
15. Which of the following sentences is not true? (a) traits found most commonly in nature is called the wild type; (b) offspring of parental generation is called  $F_2$  generation; (c) alleles are alternative forms of genes; (d) a single gene may affect many phenotypic characteristics.
16. Polymerase chain reaction (PCR) is a modern technique to (a) multiply DNA; (b) save a life; (c) multiply cells; (d) save water.
17. Which of the following sentences is not true? (a) evolutionary adaptations are inherited characteristics that enhance an organism's ability to survive and reproduce in a particular environment; (b) fossils are imprints or remnants of organisms that lived in the past; (c) Mendel is the first scientist to propose the concept of evolution; (d) biogeography is the geographical

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distribution of species.

18. Homologous structures are features of (a) different structures but functionally similar because of common ancestry; (b) different functions but structurally similar because of common ancestry; (c) different structures but functionally similar because of different ancestry;; (d) different functions but structurally similar because of different ancestry.
19. Which of the following sentences is not true? (a) reproduction is the central theme of natural selection; (b) a population is a group of individuals of different species living in the same place at the same time; (c) gene flow is the gain or loss of alleles from a population by the movement of individuals or gametes; (d) bottleneck effect and founder effect are two situations to cause genetic drift.
20. Which of the following reproductive barriers is not postzygotic? (a) hybrid inviability; (b) habitat isolation; (c) hybrid sterility; (d) hybrid breakdown.
21. Which of the following terms is not related to speciation? (a) adaptive; (b) gradualist model; (c) ATP; (d) punctuated equilibrium.
22. Which of the following sentences is not true? (a) the actual ages of rocks and fossils mark geological time; (b) phylogenetic trees symbolize evolutionary history; (c) systematists classify organism by phylogeny; (d) continents never move.
23. Which of the following sentences about scientific names is not true? (a) composed of two parts, the genus to which the species belongs; the second part identifies the species within the genus; (b) also called Latin name; (c) a binominal system created by Darwin; (d) must be in Italic type when written.
24. Species adapted to desert conditions probably didn't arise there. Their success in living there could be due to (a) convergent evolution; (b) exaptation; (c) phylogeny; (d) paedomorphosis.
25. Two plants of the same order must be in the same (a) genus; (b) class; (c) family; (d) country.
26. Seeds are originated from (a) fruit; (b) spore; (c) ovules; (d) roots.
27. Most animals are (a) vertebrates; (b) invertebrates; (c) mammals; (d) rodents.
28. Most animals are (a) radial symmetrical; (b) square; (c) triangular; (d) bilaterally symmetrical.
29. Most animals are (a) segmented; (b) hairy; (c) thin; (d) scaled.
30. Which of the following sentences is not true? (a) arthropods are the most numerous and widespread of all animals; (b) echinoderms have spiny skin, an endoskeleton; (c) arthropods have endoskeleton; (d) insects are the most diverse group of animals.
31. Which of the following is not true about the Chordata? (a) none has gill structures; (b) have a notochord; (c) have a dorsal, hollow nerve cord; (d) tunicate is member of the Chordata.
32. Which of the following is not true about vertebrates? (a) most vertebrates have hinged jaws; (b) amphibians were the first land vertebrates; (c) fishes are jawed vertebrates with gills and paired fins; (d) none undergoes metamorphosis.
33. Which of the following sentences is not true? (a) birds share many features with their reptilian ancestors; (b) mammals evolved from reptiles; (c) all fishes share the same ancestors; (d) koala is also a member of mammals.
34. Which of the following sentences is not true? (a) cardiovascular system is not involved in gas transportation; (b) several; tissues arranged to form an organ; (c) muscle tissue function in

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movement; (d) body is a cooperative of organ systems.

35. Food processing occurs in four stages. Which one of the following is not included? (a) ingestion; (b) digestion; (c) feeding; (d) absorption; (e) elimination.
36. Which of the following sentences is not true? (a) muscle tissue function in movement; (b) several tissues arranged to form an organ; (c) cardiovascular system is not involved in gas exchange; (d) body is a cooperative of organ systems.
37. In animals, heat is gained or lost in four ways. Which one of the following is not included? (a) conduction; (b) convection; (c) green house effect; (d) radiation; (e) evaporation cooling.
38. Which of the following is not a learning type? (a) innate behavior; (b) habituation; (c) association; (d) imitation.
39. Which of the following sentences is not true? (a) sexual and asexual reproduction are both common among animals; (b) meiosis involves in both sperm and ova formation; (c) fertilization results in a zygote; (d) among vertebrates, sex is determined right after fertilization.
40. Which one of the following is greenhouse gas? (a)  $H_2O$ ; (b)  $CO_2$ ; (c)  $CH_4$ ; (d)  $N_2O$ ; (e) all of above.

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科目名稱：科學英文【海科系碩士班乙組、丙組】

題號：458001

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## A. Vocabulary: translate the following words into Chinese (10 points; 1 point each).

- (1) hypothesis, (2) distinguish, (3) implication, (4) variability, (5) summarize,  
(6) effectively, (7) comparable, (8) complicated, (9) spectrum, (10) homogeneous.

## B. Vocabulary: translate the following words into English according to the category specified in the parentheses (10 points, 1 point each).

- (1) 發展 (verb), (2) 分析 (verb), (3) 提議 (verb), (4) 合理的 (adjective), (5) 特徵 (noun)  
(6) 控制 (noun), (7) 基本的 (adjective), (8) 預期 (noun), (9) 缺點 (noun), (10) 隨機地 (adverb)

## C. Reading: Read the following report and answer the multiple-choice questions according to the text. For each question, there might be MORE THAN ONE correct or best answer (50 points; 2 point per choice).

### Arctic Shelf Methane Sounds Alarm

Peter Brewer (*Nature Geoscience* 7, 6–7, January 2014)

*Large quantities of methane lie trapped beneath the floor of the Arctic Ocean. Measurements in the southern Laptev Sea around the Lena River delta suggest that bubbles and storms facilitate the flux of some of this submarine methane to the atmosphere.*

Marine methane emissions are not normally considered a key climate concern, despite the strong warming potential of this greenhouse gas. Significant quantities of methane are produced in submarine sediments globally, but the vast majority is consumed by microbes at depth, rendering the net release to the atmosphere small. However, where methane bubbles escape from the sea floor on continental shelves, the impact of bubble dissolution is minimized, enhancing the efficiency of transfer to the surface. Writing in *Nature Geoscience*, Shakhova and colleagues present measurements to suggest that methane emissions from the East Siberian Arctic Shelf are on a par with those from Arctic tundra, and from the surface of the remainder of the entire world ocean.

The presence of vast quantities of methane, frozen in both hydrate form and in the permafrost in the Arctic, is well documented. Concerns abound about the potential destabilization of the subsea fraction of this hydrate by future ocean warming.

Shakhova and colleagues investigated an extensive vent field that lies in the southern Laptev Sea on the East Siberian Arctic Shelf, just 50 meters below the ocean surface, between 1999 and 2012. Acoustic imaging revealed the presence of 27,000 bubble plumes of varying intensities. Using data on the density and intensity of these plumes, Shakhova et al. estimate that bubbles deliver around 290 mg of methane per m<sup>2</sup> per day to the overlying water column in this region — ten times more methane than previously thought.

Much of this bubble methane will dissolve in the water column, and thereby evade outgassing to the overlying atmosphere. However, Shakhova et al. also show that storm events — which occur on up to 70 days a year in this region — ventilate the water column down to the sea bed, and thereby greatly increase methane emissions to the atmosphere. Taking into account both bubble- and storm-induced methane fluxes, they estimate that the studied vents emit around 0.9 Tg of methane to the atmosphere each year, although the persistence of this venting is unknown. Scaling their findings up, they estimate that the East Siberian Arctic Shelf releases 17 Tg of methane annually, equivalent to estimated emissions

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from Arctic tundra, and from the entire world ocean.

Shakhova et al. attribute this methane release to the degradation of the subsea permafrost that underlies the East Siberian Arctic Shelf over a period of thousands of years. At the end of the last glaciation, coastal land previously exposed to frigid Arctic air would have been flooded with above-zero Arctic waters, as sea levels rose, and started to warm. To gauge the thermal state of the permafrost that underlies these vents, and so provide a preliminary test of this hypothesis, they measured the temperature of a 57-metre sediment core extracted from the sea floor. The temperatures of the sediments ranged from  $-1.8$  to  $0^{\circ}\text{C}$ , and they were entirely unfrozen as a result of the high salt content. Furthermore, Shakhova et al. simulated the distribution of taliks — patches of unfrozen ground — within the study area. Despite clear uncertainties in their spatial extent, the model distribution bore a close resemblance to the sites of gas venting detected in their acoustic survey.

The findings of Shakhova et al. arise from expeditionary science, not controlled experiments. As such, important questions remain. Their acoustic image of what is effectively a wall of gas rising up from the southern Laptev Sea is impressive. Whether such vent-rich regions can be found dotted across the greater East Siberian Arctic Shelf, as they assume in their estimates of methane emissions from the entire shelf, remains an open question. Given the intense interest in Arctic shelf hydrocarbon resources, expansive geophysical and geochemical surveys of the region are likely to be forthcoming, and will provide answers to such questions.

But perhaps the biggest unknown is whether the documented ebullition is a new phenomenon, or has been proceeding for several decades (or longer). Equally uncertain is the magnitude of future emissions. Shakhova et al. document a rise in seawater temperatures in the southern Laptev Sea of more than  $0.5^{\circ}\text{C}$  over the past 14 years; whether this influences the stability of the submarine permafrost remains to be seen.

Shakhova and colleagues show that the methane released from the venting of submarine permafrost in the southern Laptev Sea is escaping to the atmosphere through bubbles, and that storms accelerate this process through vigorous mixing of the water column. Storms are likely to cause increased disruption to the surface waters of the Arctic Ocean as sea ice is progressively lost. According to the findings of Shakhova et al., this rise in surface water disturbance is likely to exacerbate marine methane emissions in the Arctic. The focus of this paper is on the under-recognized impact of storms, which will be increasingly felt as sea ice recedes. In a disturbing coincidence, the authors dedicate their paper to the crew of the rescue ship that died trying to save them during a severe storm.

Questions:

- (1) Which of the following term(s) was/were used by Peter Brewer to describe the phenomenon of methane release into the ocean and atmosphere?  
(A) outgassing                      (B) accelerate                      (C) ebullition  
(D) disruption                      (E) emission
- (2) Which method(s) has/ have been used by Shakhova and colleagues?  
(A) geochemical analysis                      (B) acoustic imaging of gas bubbles  
(C) numerical simulation                      (D) geothermal measurements  
(E) expansive geophysical surveys of the entire East Siberian Arctic Shelf

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- (3) Which of the following material(s) is/are the research target(s) of Shakhova and colleagues?
- (A) vent field (B) marine sediment  
(C) sea ice (D) submarine permafrost  
(E) taliks
- (4) Which of the following statement(s) about the number is/are true?
- (A) The vents that Shakhova et al. studied emit 0.9 Tg methane to the atmosphere each year.  
(B) The global ocean emits about 17 Tg methane to the atmosphere each year.  
(C) The water in the sediment from the East Siberian Arctic Shelf did not freeze at the temperature of  $-1.8$  to  $0$  °C because of the high pressure.  
(D) Arctic tundra emits 17 Tg methane to the atmosphere each year.  
(E) Before the work of Shakhova et al., marine methane release from the southern Laptev Sea is already a well-known phenomenon, with a reported bubbling flux of 290 mg of methane per  $m^2$  per day.
- (5) What is/are the criticism(s) of the work of Shakhova et al.?
- (A) Their acoustic image of what is effectively a wall of gas rising up from the southern Laptev Sea is problematic.  
(B) It is unclear whether such vent-rich regions distribute evenly across the greater East Siberian Arctic Shelf.  
(C) The rise in seawater temperatures that they documented was too little compared to other published studies.  
(D) Venting of methane might not be a continuous process.  
(E) They killed the crew of the rescue ship.

## D. Writing

**“Young people (below age 30) would benefit from the program of working holiday in a foreign country.”**

Write a response to discuss whether you agree or disagree with the statement and explain your reasoning for the position you take. Try to organize your argument into points if you have more than one reason. You are encouraged to use examples to support your argument. The text should have at least 200 words. (30 points)

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科目名稱：科學英文閱讀測驗【海科系碩士班甲組】  
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題號：458005  
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I. Multiple choice (80%): Read the main texts and answer the following questions.  
Only one answer to each question. Write your answer in the Answering Sheet.

## A. Shark (from Wikipedia)

...Since then, sharks have diversified into over 470 species. They range in size from the small dwarf lanternshark (*Etmopterus perryi*), a deep sea species of only 17 centimetres (6.7 in) in length, to the whale shark (*Rhincodon typus*), the largest fish in the world, which reaches approximately 12 metres (39 ft). Sharks are found in all seas and are common to depths of 2,000 metres (6,600 ft). They generally do not live in freshwater although there are a few known exceptions, such as the bull shark and the river shark, which can survive in both seawater and freshwater.<sup>[2]</sup> They breathe through five to seven gill slits. Sharks have a covering of dermal denticles that protects their skin from damage and parasites in addition to improving their fluid dynamics. They have several sets of replaceable teeth.<sup>[3]</sup>

Well-known species such as the great white shark, tiger shark, blue shark, mako shark, and the hammerhead shark are apex predators—organisms at the top of their underwater food chain.

Many shark populations are threatened by human activities.

Evidence for the existence of sharks dates from the Ordovician period, 450-420 million years ago, before land vertebrates existed and before many plants had colonized the continents.<sup>[1]</sup> Only scales have been recovered from the first sharks and not all paleontologists agree that these are from true sharks, suspecting that these scales are actually those of thelodont agnathans.<sup>[8]</sup> The oldest generally accepted shark scales are from about 420 million years ago, in the Silurian period.<sup>[8]</sup> The first sharks looked very different from modern sharks.<sup>[9]</sup> The majority of modern sharks can be traced back to around 100 million years ago.<sup>[10]</sup> Most fossils are of teeth, often in large numbers. Partial skeletons and even complete fossilized remains have been discovered. Estimates suggest that sharks grow tens of thousands of teeth over a lifetime, which explains the abundant fossils. The teeth consist of easily fossilized calcium phosphate, an apatite. When a shark dies, the decomposing skeleton breaks up, scattering the apatite prisms. Preservation requires rapid burial in bottom sediments.

1. Sharks eat a. vegetables b. macroalgae c. small microorganisms d. fishes
2. Which statement about sharks is wrong? a. Some sharks could enter rivers b. Some sharks could reach very large size, e.g., 2000 meters in length c. There are hundreds of species of sharks d. Sharks are fishes
3. What particular parts of a shark are most likely to remain as fossils? a. thelodont b. teeth c. apatite d. Ordovician e. Silurian
4. It is obvious that a. Ordovician predates Silurian b. sharks occurred earlier than agnathans c. paleontologists are specialists on fishes d. Sharks 420 millions ago looked just like modern sharks
5. Which statement is correct? a. Sharks threaten human ever since Silurian period b. Large sharks appeared when there were large trees along river banks c. Modern sharks could live for as long as 100 million years d. Shark skeleton, except teeth, is not made of apatite

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## B. The trophic fingerprint of marine fisheries (from Nature (2010) 468:431-435)

Biodiversity indicators provide a vital window on the state of the planet, guiding policy development and management. The most widely adopted marine indicator is mean trophic level (MTL) from catches, intended to detect shifts from high-trophic-level predators to low-trophic-level invertebrates and plankton-feeders. This indicator underpins reported trends in

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human impacts, declining when predators collapse ("fishing down marine food webs") and when low-trophic-level fisheries expand ("fishing through marine food webs"). The assumption is that catch MTL measures changes in ecosystem MTL and biodiversity. Here we combine model predictions with global assessments of MTL from catches, trawl surveys and fisheries stock assessments and find that catch MTL does not reliably predict changes in marine ecosystems. Instead, catch MTL trends often diverge from ecosystem MTL trends obtained from surveys and assessments. In contrast to previous findings of rapid declines in catch MTL, we observe recent increases in catch, survey and assessment MTL. However, catches from most trophic levels are rising, which can intensify fishery collapses even when MTL trends are stable or increasing. To detect fishing impacts on marine biodiversity, we recommend greater efforts to measure true abundance trends for marine species, especially those most vulnerable to fishing.

6. Trophic level is most related to a. the length b. the kind of food consumed c. the weight d. the phylum of the organism.
7. The author is a. in favor of b. against the use of MTL as an index of ecosystem change.
8. This abstract appeared in a. New York Times b. Nature c. Fisheries Science d. Wikipedia
9. MTL is supposed to indicate a. pollution level of fishes b. habitat destruction of marine environment c. fishing impacts d. effects of invasive species.
10. MTL is obvious a. qualitative b. quantitative

## C. Corals Chemically Cue Mutualistic Fishes to Remove Competing Seaweeds (from Science 2012, 338:804-807)

Corals in the genus *Acropora* generate much of the structural complexity upon which coral reefs depend, but they are susceptible to damage from toxic seaweeds. *Acropora nasuta* minimizes this damage by chemically cuing symbiotic goby fishes (*Gobidon histrio* or *Paragobidon enchinocephalus*) to remove the toxic seaweed *Chlorodesmis fastigiata*. Within minutes of seaweed contact, or contact from only seaweed chemical extract, the coral releases an odor that recruits gobies to trim the seaweed and dramatically reduce coral damage that would otherwise occur. In turn, chemically defended gobies become more toxic after consumption of this noxious alga. Mutualistic gobies and corals appear to represent a marine parallel to terrestrial ant-plants, in that the host provides shelter and food in return for protection from natural enemies.

11. This study is most likely to appear in a chapter of a. Fish taxonomy b. Coral taxonomy c. Ichthyology d. Symbiosis e. Natural products
12. The fish gain in this relationship due to a. ingestion of food as energy source b. corals provide shelter c. ingestion of algae as toxin source d. corals build reefs e. the chemical released by the fish is nutritious.
13. It is implied that in a reef without the goby fishes, a. the corals will no longer release the cue b. the corals may suffer more from the toxic algae c. the corals will attract shrimps rather than gobies d. there won't be any toxic seaweeds
14. The toxic algae harm the corals a. by been ingested b. by contact c. through the fish d. blocking sun light
15. *nasuta* is a a. coral genus b. coral species c. fish genus d. fish species e. seaweed genus

## D. Chemoattraction to Dimethylsulfoniopropionate Throughout the Marine Microbial Food Web (Science 2010, 329:342-345)

Phytoplankton-produced dimethylsulfoniopropionate (DMSP) provides underwater and atmospheric foraging cues for several species of marine invertebrates, fish, birds, and

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mammals. However, its role in the chemical ecology of marine planktonic microbes is largely unknown, and there is evidence for contradictory functions. By using microfluidics and image analysis of swimming behavior, we observed attraction toward microscale pulses of DMSP and related compounds among several motile strains of phytoplankton, heterotrophic bacteria, and bacterivore and herbivore microzooplankton. Because microbial DMSP cycling is the main natural source of cloud-forming sulfur aerosols, our results highlight how adaptations to microscale chemical seascapes shape planktonic food webs, while potentially influencing climate at the global scale.

16. DMSP is a. a bacteria b. a phytoplankton c. a chemical d. a process e. a predator
17. DMSP is NOT known in a. water b. phytoplankton c. air d. lava
18. Motile strains of several microbes could a. see b. metabolize c. detect d. absorb DMSP
19. How does DMSP play a role in global climate? Through a. acid rain b. predator avoidance c. green house effect d. cloud
20. The research technique mentioned most likely involves a. HPLC b. SEM c. Microscope d. Gene sequencing e. Histology

## II. Translation (20%)

Choose one of the 4 sections (A, B, C, D) above and translate into Chinese. Write your answer on the Answering Sheet.

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科目名稱：化學【海科系碩士班乙組選考】

題號：458003

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注意：化學反應式須先行平衡，計算題請寫出計算過程

一、解釋下列名詞：(30%)

- (1) Aerobic oxidation
- (2) Planck's constant
- (3) Boyle's Law
- (4) Ester
- (5) Concentration equilibrium constant
- (6) Hydrogen bond
- (7) Common ion effect
- (8) Fractionation crystallization
- (9) Dynamic equilibrium
- (10) Biochemical oxygen demand

二、(10%)  $\text{PbCl}_2$  的  $K_{sp}$  值在  $25^\circ\text{C}$  時是  $1.6 \times 10^{-5}$ ，在  $80^\circ\text{C}$  時是  $3.3 \times 10^{-3}$ ，若將 1.00 mL 在  $80^\circ\text{C}$  為飽和狀態的  $\text{PbCl}_2$  溶液降溫到  $25^\circ\text{C}$ ，上述溶液降溫後可產生多少質量的沉澱？假設肉眼可辨識沉澱物的最低量為 1 mg，降溫後產生的沉澱物肉眼可見否？(詳列計算過程，否則扣分)。(原子量 Pb: 207.2; Cl: 35.5)

三、(10%) 某不純氫氧化鉀樣品含有 92.25% 的氫氧化鉀、2.25% 的碳酸鉀、和 5.50% 的水(質量比)。將此成分的固體樣品 1.250 g 置入 25.00 mL 的 1.840 M 鹽酸中反應，多餘的鹽酸以 1.050 M 的氫氧化鉀中和後，將此溶液加熱蒸乾，說明蒸乾後所得固體是甚麼(化學式)，並計算所得固體質量多少？(原子量 H: 1; O: 16; K: 39; C: 12; Cl: 35.5)

四、(10%) 海水平均鹽度接近 35，古典上定義是 1 公斤海水中含有 35 克的鹽類，其中有幾個元素的離子濃度佔了海水鹽度的絕大部分，氯占了 18.980 克、鈉 10.556 克、鉀 0.380 克、鈣 0.400 克、鎂 1.272 克、硫酸根 2.649 克、碳酸氫根 0.140 克，化學物質在溶液中的濃度會因為探討問題不同需要使用不同濃度單位，若海水平均密度  $1.025 \text{ g/cm}^3$ ，請以重量百分比、重量莫耳濃度(molality)、及體積莫耳濃度(molarity)分別表示上列七種物質中的“陰離子”在海水的平均濃度。(原子量 Cl: 35.5; Na: 23; K: 39; Ca: 40; Mg: 24.3; S: 32; O: 16; H: 1; C: 12)

五、(10%) 說明化學分析上為了確認分析數據的品質，所需要的品保(quality assurance)和品管(quality control)的原則及分析時須採取的措施。

六、(10%) 說明並比較光譜儀及質譜儀做為化學分析的偵測器所使用的原理。

七、(10%) 化學分析有時因為樣品本身的異質性，必須使用用於取樣與分析之定量物理分離方法，例如使用過濾技術可以將固態樣品由液態基質中分離出來。說出分別如何(使用甚麼技術)適合由固態、液態、氣態基質中分離出固態、液態、氣態的需求樣品？

八、(10%) 說明定量分析上“靈敏度”與“偵測極限”有何不同？

# 國立中山大學 103 學年度碩士暨碩士專班招生考試試題

科目名稱：普通地質學【海科系碩士班乙組選考】

題號：458007

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）

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## 一、 單選題

1. 下列哪一種不是常見的造岩礦物？(a)矽酸鹽類 (b)碳酸鹽類 (c)硫酸鹽類 (d)磷酸鹽類 (e)硝酸鹽類 (2%)
2. 下列哪些是海底主要的地形特徵？ A. 中洋脊 B. 海溝 C. 海底火山 D. 深海平原 E. 深海隕石坑 (a)ABCD (b)ACD (c)ACDE (d)ABCDE (e)ABC (2%)
3. 承上題，哪種地形特徵佔有的百分比最大？ (a)中洋脊 (b)海溝 (c)海底火山 (d)深海平原 (e)深海隕石坑 (2%)
4. 大陸邊緣(continental margin)不包含哪種地形？(a)大陸棚 (b)大陸坡 (c)大陸隆堆 (d) 海底峽谷 (e)海底火山 (2%)
5. 台灣西部平原的形成年代大約是？(a)最近十萬年 (b)最近一萬年 (c)最近一千年 (d)最近兩萬年 (e)最近一百萬年 (2%)

## 二、 複選題

6. 下列哪些原因可能會造成地震的發生？(a)火山爆發 (b)隕石撞擊 (c)人為開發 (d)地殼變形 (e)天體運動 (2%)
7. 變質岩的形成與那些營力作用有關？(a)熱力 (b)潮汐 (c)壓力 (d)熱液作用 (e)風化作用 (2%)
8. 下列哪些岩石屬於火成岩類中的深成岩？(a)流紋岩 (b)花崗岩 (c)正長岩 (d)玄武岩 (e)橄欖岩 (2%)
9. 台灣在那些地方有著名的惡地地形存在？(a)屏東墾丁 (b)臺北陽明山 (c)臺東利吉 (d)高雄田寮 (e)苗栗三義 (2%)
10. 影響風化作用速度的因素有哪些？(a)降雨與氣溫 (b)坡度的大小 (c)母岩的岩性 (d)地表的植被 (e)人為的開發活動 (2%)

## 三、 名詞解釋

1. unconformity (2%)
2. epicenter (2%)
3. fossil (2%)
4. bioturbation (2%)
5. sedimentation (2%)
6. turbidite (2%)
7. trench (2%)
8. transform fault (2%)
9. syncline (2%)
10. transgression (2%)

## 四、 簡答題

1. 請簡述礦物的生成可以有哪些方式？(10%)
2. 台灣本島的火成岩主要分布在那些地方？其空間分布的模式跟台灣附近的板塊構造運動有何關聯？(10%)
3. 請詳述大陸地殼與海洋地殼的差異？(10%)
4. 何謂 Bouma Sequence？請分別敘述其各層的差異及成因。(10%)
5. 造成海嘯發生的可能原因為何？(10%)
6. 天然氣水合物(gas hydrate)被視為新一代的能源，台灣目前也正積極開發天然氣水合物，請就你的觀點分別論述開發天然氣水合物的優點與缺點為何？(10%)

# 國立中山大學 103 學年度碩士暨碩士專班招生考試試題

科目名稱：海洋學【海洋科學系碩士班】

題號：458006

※本科目依簡章規定「不可以」使用計算機

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選擇題(複選)3 題，每題 4 分。

1. 下列有關科氏力的敘述，何者正確？  
(a)科氏力不作功 (b) 科氏力改變流速的方向(c) 科氏力改變流速(d)科氏力造成北半球的河流流向右岸比較陡峭，左岸比較平緩(e) 科氏力造成北半球的火車行駛方向左邊磨損比較厲害
2. 仔細觀察浪逐漸接近岸邊，將可看見浪會有那些變化？ (a)波長變大 (b)波速變小 (c)波高變大 (d)以上皆是，(e)以上皆不是。
3. 一個月中潮差最大的時間，此時月相為何？  
(a)上弦月 (b)下弦月 (c)滿月 (d)新月。

選擇題(單選)9 題，每題 2 分。

4. 若一颱風位於距離花蓮港東方 600 公里之太平洋海面上，颱風產生的波浪分別有週期 14、12 及 10 秒的成分，請問這三類波浪何者先抵達花蓮？  
(a) 10 秒 (b) 12 秒 (c) 14 秒 (d) 約同時抵達
5. 聖嬰現象是那一個海洋的水溫發生異常所造成？ (a)太平洋 (b)大西洋 (c)印度洋 (d) 北冰洋(e)以上皆非。
6. 海濱泳客陷入離岸流(rip current)時應該先如何?(a) 游向海岸(b)游離開海岸 (c)沿平行岸方向游 (d)以上皆是 (e) 以上皆非
7. 根據理論計算，地表平均溫度應為 $-23^{\circ}\text{C}$ ，但實際卻為 $15^{\circ}\text{C}$ ，主要原因為何？ (a)臭氧層吸收紫外線之故(b)溫室效應所致(c)火山噴發釋熱的貢獻(d)人類活動所造成的結果。
8. 海洋衛星影像上若是看到數十公里長的線條，此現象最可能是(a)海嘯 (b)颱風波浪 (c)潮汐 (d)內波 (e) 洋流
9. 下列各港口中潮差最大的是 (a) 蘇澳港 (b)基隆港 (c) 花蓮港 (d) 高雄港 (e) 台中港。
10. 下列何者是颱風形成的條件之一？  
(a) 在溫暖開闊的大陸上 (b) 在緯度 5 度以內 (c) 海水溫度至少在  $26^{\circ}\text{C}$  以上 (d) 赤道海面有強烈高氣壓存在
11. 鹽度高低與下列何者有相同變化的趨勢？(a)蒸發量(b)降雨量(c)降雨量-蒸發量(d)蒸發量-降雨量(e) 以上皆非。
12. 南亞海嘯在麻六甲海峽傳遞速度遠小於印度洋的原因是(a) 海水比較淺 (b) 海底摩擦比較大 (c) 海峽比較窄 (d) 海藻與紅樹林的阻力。

背面有題

國立中山大學 103 學年度碩士暨碩士專班招生考試試題

科目名稱：海洋學【海洋科學系碩士班】

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13. 潮汐 (15%)

圖 1 為某地區之潮位紀錄(單位為 m)，橫軸為日期，請描述其潮差、週期、大潮、小潮等特性。

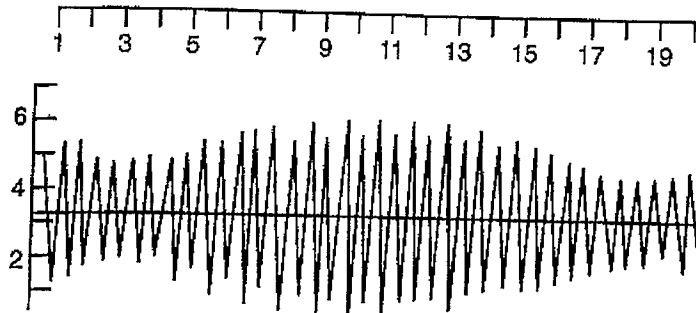


圖 1

14. 雲林海域環境觀測樁季節性波高與風速之關係如圖 2。何以同測站同樣風速下的波高不同？ (15%)

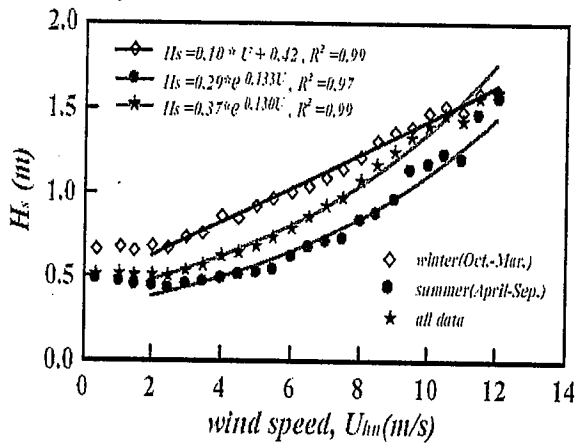


圖 2

15. 假若電影「明天過後」中的氣候災難會發生；請敘述圖 3 中的海洋環流可能有怎樣的改變？ (20%)

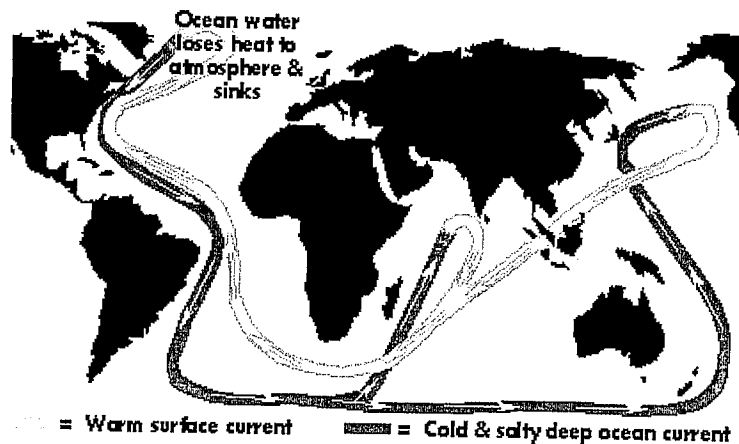


圖 3

背面有題

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16. 試說明大陸地殼與海洋地殼之主要差異。(10%)

17. 台灣首座海洋國家公園，位於台灣西南方海域，圖4是海洋國家公園的衛星影像圖。請由圖4判斷此國家公園屬於哪一種珊瑚礁地形？(10%)

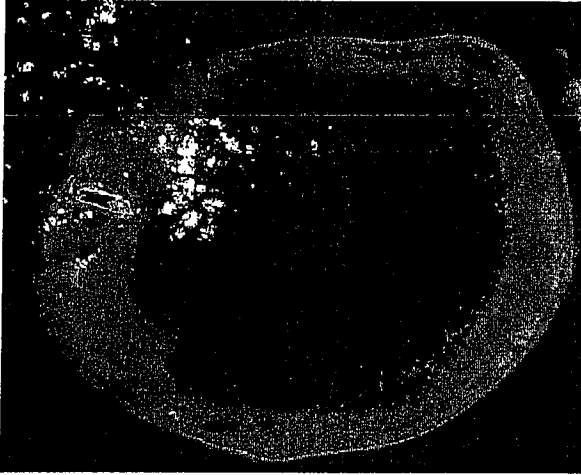


圖 4