

國立中山大學 112 學年度

碩士班暨碩士在職專班招生考試試題

科目名稱：科學英文【海保所碩士班甲組、乙組、海科系碩士班甲組、乙組、海生保聯招碩士班】

— 作答注意事項 —

考試時間：100 分鐘

- 考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。
- 答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，請衡酌作答(不得另攜帶紙張，亦不得使用應考證空白處作為計算紙使用)。
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- 違規者依本校招生考試試場規則及違規處理辦法處理。

國立中山大學 112 學年度碩士班暨碩士在職專班招生考試試題

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※本科目依簡章規定「不可以」使用計算機(問答申論題)

共 1 頁第 1 頁

英文翻譯成中文 (每題 20 分)

1. The oceans cover 70% of the earth's surface, having an average depth of about 3,700 m. We cannot drink seawater directly because 1 kg of seawater contains about 35 g of salt.
2. Plastic is a very stable man-made product. The sources of plastic waste in the oceans are very diverse, including riverine inputs, as well as fishing and aquaculture activities.

中文翻譯成英文 (每題 20 分)

3. 台灣東部表水的水溫大概 25 °C，而 pH 值大概 8.05。
4. 二氧化碳除了是一種溫室氣體外，它也是一種酸性氣體。

改寫句子 (每題 10 分)

Please rewrite the sentences below to change each of them from an active voice sentence into passive voice.

5. We collected water samples using the research vessel NOR3 on 25th November 2022.
6. The director of this institute is inviting the principal to join tonight's dinner party.

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碩士班暨碩士在職專班招生考試試題

科目名稱：普通生物學【海保所碩士班甲組、乙組、海科系碩士班甲組、海生保聯招碩士班】

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國立中山大學 112 學年度碩士班暨碩士在職專班招生考試試題

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※本科目依簡章規定「不可以」使用計算機(混合題)

共 8 頁第 1 頁

I. Single choice (50 %, 2 % each, only ONE correct answer)

1. In analyzing the number of difference bases in a DNA sample, which result would be consistent with the base-pairing rules?
 - A). $A + T = G + T$
 - B). $A + G = C + T$
 - C). $G = T$
 - D). $A = C$
 - E). $A = G$
2. Which of the following descriptions of the coral reefs is wrong?
 - A). One of the most diverse ecosystems on earth
 - B). Corals are small-sized marine invertebrates living in compact colonies of many identical units
 - C). There are no coral reefs in Peng-Hu Islands (澎湖)
 - D). Increase in water temperature can cause coral bleaching
 - E). Some corals rely on symbiotic algae to provide additional energy.
3. What type of migration does coho salmon (*Oncorhynchus kisutch*) have?
 - A). Anadromous
 - B). Catadromous
 - C). Amphidromous
 - D). All of the above
 - E). None of the above
4. What type of migration does Japanese eel (*Anguilla japonica*) have?
 - A). Anadromous
 - B). Catadromous
 - C). Amphidromous
 - D). All of the above
 - E). None of the above
5. Why is ATP an important molecule in metabolism?
 - A). Its terminal phosphate bond has higher energy than the other two.
 - B). It is one of the four building blocks for DNA synthesis.
 - C). It provides energy coupling between exergonic and endergonic reactions.
 - D). Its hydrolysis provides an input of free energy for exergonic reactions.
 - E). Its terminal phosphate group contains a strong covalent bond that, when hydrolyzed, releases free energy.

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共 8 頁第 2 頁

6. Which of the following is true about imprinting?
 - A). It is a type of learning that does not involve innate behavior.
 - B). It causes behaviors that last for only a short time.
 - C). It occurs only in birds
 - D). It happens to many adult animals, but not to their young.
 - E). It may be triggered by visual or chemical stimuli.

7. Which of the following statements is representative of the second law of thermodynamics?
 - A). Cells require a constant input of energy to maintain their high level of organizations.
 - B). Every energy transformation by a cell decreases the entropy of the universe.
 - C). Heat represents a form of energy that can be used by most organisms to do work
 - D). Without an input of energy, organisms would tend toward decreasing entropy
 - E). Conversion of energy from one form to another is always accompanied by some gain of free energy.

8. After surgical removal of an infected gallbladder, a person must be especially careful to restrict dietary intake of
 - A). Mineral.
 - B). Fat.
 - C). Carbohydrate.
 - D). Water.
 - E). All of the above.

9. Which of the following defines a genome?
 - A). Representation of a complete set of a cell's polypeptides.
 - B). The complete set of an organism's polypeptides.
 - C). The complete set of a species' polypeptides.
 - D). A karyotype.
 - E). The complete set of an organism's genes.

10. Which of the following is a true statement about sexual vs. asexual reproduction?
 - A). Asexual reproduction, but not sexual reproduction, is characteristic of plants and fungi.
 - B). In asexual reproduction, offspring are produced by fertilization without meiosis.
 - C). In sexual reproduction, individuals transmit 50% of their genes to each of their offspring.
 - D). Sexual reproduction requires that parents be diploid.
 - E). Asexual reproduction produces only haploid offspring.

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共 8 頁第 3 頁

11. Which of the following lists of organisms is ranked in correct order from lowest to highest percent in production efficiency?
 - A). Fish, insects, mammals.
 - B). Insets, fish, mammals.
 - C). Mammals, insects, fish.
 - D). Insects, mammals, fish.
 - E). Mammals, fish, insects.

12. Which term most precisely describes the cellular process of breaking down large molecules into smaller ones?
 - A). Catalysis.
 - B). Metabolism.
 - C). Anabolism.
 - D). Catabolism.
 - E). Dehydration.

13. Which term most precisely describes the cellular process by which the body changes food and drink into energy?
 - A). Catalysis.
 - B). Metabolism.
 - C). Anabolism.
 - D). Dehydration.
 - E). Catabolism.

14. Which of the following is not a polymer?
 - A). Glucose.
 - B). Starch.
 - C). Cellulose.
 - D). Chitin.
 - E). DNA.

15. Analysis of jawbones from the skeletal remains of a vertebrate animal reveal its dietary patterns owing to
 - A). The size of the mouth opening.
 - B). Whether the mouth is the most anterior structure.
 - C). The prevalence of specific kinds of teeth.
 - D). The evidence of food molecules still present.
 - E). The position of muscle attachment sites.

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共 8 頁第 4 頁

16. Some bacteria are metabolically active in hot springs because
- A). They are able to maintain a lower internal temperature.
 - B). High temperature make catalysis unnecessary.
 - C). Their enzymes have high optimal temperatures.
 - D). Their enzymes are completely insensitive to temperature.
 - E). All of the above.
17. After drinking alcoholic beverages, increased urine excretion is the result of
- A). Inhibited secretion of antidiuretic hormone (ADH).
 - B). Increased reabsorption of water in the proximal tubule.
 - C). The osmoregulator cells of the brain increasing their activity.
 - D). Increased blood pressure.
 - E). Increased aldosterone production.
18. An oocyte released from a human ovary enters the oviduct as a result of
- A). The force of the follicular ejection directing the oocyte into the oviduct.
 - B). Movement of the oocyte through the pulsating uterus into the oviduct.
 - C). The wavelike beating of cilia lining the oviduct.
 - D). The beating action of the flagellum on the oocyte.
 - E). Peristaltic contraction of ovarian muscles.
19. Nitrifying bacteria participate in the nitrogen cycle mainly by
- A). Converting nitrogen gas to ammonia.
 - B). Releasing ammonium from organic compounds, thus returning it to the soil.
 - C). Incorporating nitrogen into amino acids and organic compounds.
 - D). Converting ammonium to nitrate, which plants absorb.
 - E). Converting ammonia to nitrogen gas, which returns to the atmosphere.
20. Unlike most bony fishes, sharks maintain body fluids that are isoosmotic to seawater, so they are considered by many to be osmoconformers. Nonetheless, these sharks osmoregulate at least partially by
- A). Using their gills and kidneys to rid themselves of sea salts.
 - B). Tolerating high urea concentrations that balance internal salt concentrations to seawater osmolarity.
 - C). Monitoring dehydration at the cellular level with special gated aquaporins.
 - D). Synthesizing trimethylamine oxide, a chemical that binds and precipitates salts inside cells.
 - E). Possessing a special adaptation that allows their cells to operate at an extraordinarily high salt concentration.

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共 8 頁第 5 頁

21. The principle of competitive exclusion states that
 - A). Competition in a population promotes survival of the best-adapted.
 - B). Two species cannot coexist in the same habitat.
 - C). Competition between two species always causes extinction or emigration of one species.
 - D). Two species that have exactly the same niche cannot coexist in a community.
 - E). Two species will stop reproducing until one species leaves the habitat.

22. The absorption of fats differs from that of carbohydrates in that
 - A). Most absorbed fat first enters the lymphatic system, whereas carbohydrates directly enter the blood.
 - B). Fat absorption occurs in the stomach, whereas carbohydrates are absorbed from the small intestine.
 - C). Fats, but not carbohydrates, are digested by bacteria before absorption.
 - D). Processing of fats does not require any digestive enzymes, whereas the processing of carbohydrates does.
 - E). Carbohydrates need to be emulsified before they can be digested, whereas fats do not.

23. A human who has no access to fresh water but is forced to drink seawater instead
 - A). will thrive under such conditions, as long as he has lived at the ocean most of his life.
 - B). will excrete more water molecules than taken in, because of the high load of ion ingestion.
 - C). will develop structural changes in the kidneys to accommodate the salt overload.
 - D). will find that drinking saltwater satiates his thirst.
 - E). will risk becoming overhydrated within 12 hours.

24. After ingestion by humans, the first category of macromolecules to be chemically digested by enzymes in the mouth is
 - A). Protein.
 - B). Carbohydrate.
 - C). Cholesterol and other lipids.
 - D). Minerals.
 - E). Nucleic acids.

25. Certain nutrients are considered “essential” in the diets of some animals because
 - A). The nutrients are subunits of important polymers.
 - B). Only certain foods contain them.
 - C). Only those animals use those nutrients.
 - D). These animals are not able to synthesize these nutrients.
 - E). The nutrients are necessary coenzymes.

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共 8 頁第 6 頁

II. Complete the table (40 %, 2 % each). Draw the table in your answer paper, and fill in your answers.

26. In ecology, r/K selection theory relates to the selection of combinations of traits in an organism that trade-off between quantity and quality. Please complete the following table regarding the r- and K-strategy using comparative descriptors (high vs low, short vs long, early vs late..., etc., except for the example organism (20 %, 1 % each):

Type	r-selection	K-selection
Example organism		
Overall mortality		
Number of offspring		
Quality of offspring		
Degree of Parental care		
Reproductive Maturity		
Population growth rate		
Independence at birth		
Generation time		
Competition potential in crowded niches		

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27. There are four possible types of vaccines developed against the COVID-19 pandemic: inactivated virus, viral vector (i.e., Adenovirus), mRNA, and protein subunit. Please give a summary about the mechanism by a few sentences and a name of an approved vaccine for each type (20 %, 2.5 % each cell):

Type of vaccine	Mechanisms	Vaccine name
Inactivated whole virus		
Viral vector		
mRNA		
Protein-subunit		

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III. Short answer question (10%)

28. The 2022 Nobel Prize in Physiology or Medicine was awarded to the Swedish geneticist Svante Pääbo for his research in the field of genomes of extinct hominins and human evolution. Please give two examples of his research with a few summarizing sentences (10 %, 5 % each).