國立中山大學九十三學年度碩士班招生考試試題

科目：普通生物學(海生所)

I. Multiple choices (This section has 25 questions. Some of them have just one correct answer. Others have more than one correct answers. 2.5 points for each question) 請將答案寫在選擇題專用頁

1. The mitochondrion functions in ____. a) lipid storage; b) protein synthesis; c) photosynthesis; d) DNA replication; e) ATP synthesis.

2. Which of these cellular organelles have their own DNA? a) chloroplast; b) nucleus; c) mitochondrion; d) all of these.

3. Which of the following statements is/are true? a) endocytosis is the case when a molecule causes the cell membrane to bulge inward, forming a vesicle; b) phagocytosis is the type of endocytosis where an entire cell is engulfed; c) pinocytosis is when the external fluid is engulfed; d) Receptor-mediated endocytosis occurs when the material to be transported binds to certain specific molecules in the membrane.

4. a) Crossing-over; b)Synapsis; c)Linkage; d)Envelope between homologous chromosomes produces chromosomes with new associations of genes and alleles.

5. Under anaerobic conditions, pyruvic acid can be routed by the organism into one of three pathways: a) lactic acid fermentation; b) alcohol fermentation; c) cellular respiration; d) Kreb's cycle.

6. The first stable product of the Calvin Cycle is phosphoglycerate (PGA), which is a a) 4-C chemical; b) 3-C chemical; c) 6-C chemical; d) 5-C chemical.

7. Which of these materials is not a major component of the plasma membrane? a) phospholipids; b) glycoproteins; c) proteins; d) DNA.

8. The polysaccharide ___ is a major component of shrimp shell. a) chitin; b) peptidoglycan; c) cellulose; d) mannitol; e) cholesterol.

9. The Earth's early atmosphere apparently lacked ___. a) water vapor; b) carbon dioxide; c) oxygen; d) ammonia.

10. Autotrophic organisms obtain their food ____. a) from another creature; b) by photosynthesis; c) by chemical synthesis; d) by eating each other within their own species.

11. The monomer that makes up polysaccharides is ____. a) amino acids; b) glucose; c) fatty acids; d) nucleotides; e) glycerol.

12. The sequence of ___ bases determines the ___ structure of a protein. a) RNA, secondary; b) DNA, quaternary; c) DNA, primary; d) RNA, primary.

13. A diet high in _____ is considered unhealthy, since this type of material is largely found in animal tissues. a) cellulose; b) phytate; c) unsaturated fats; d) saturated fats.

14. Which of these is not a function of lipids? a) long term energy storage; b) structures in cells; c) hormones; d) enzymes; e) sex hormones.

15. Bacteria belong to the taxonomic kingdom ____. a) Plantae; b) Protista; c) Animalia; d) Fungi; e) Monera.

16. Which of these is NOT caused by a living organism? a) influenza; b) AIDS; c) mad-cow disease; d) SARS; e) all of these.

17. The purpose of a control in a scientific experiment is to ___. a) provide a basis of comparison between experimental and nonexperimental; b) indicate the dependent variable; c) indicate the independent variable; d) provide a baseline from which to graph the data.

18. Polygenic inheritance is a) as was the case with Mendel's pea plant traits; b) a continuous variation; c) governed by the cumulative effects of many genes; d) demonstrated in color in wheat kernels.

19. Which of these is correct? a) genome refers to all of the alleles possessed by an organism; b) chromatin is the uncoiled form of RNA; c) genes that are incorporated in a complex transposon are known as jumping genes since they can move about on the chromosome; d) transduction is the transfer of host DNA from one cell to another by a bacterium; e) reverse transcriptase of retrovirus makes a single-stranded viral DNA copy of the single-stranded viral RNA and the single stranded viral DNA is subsequently turned into a double-stranded DNA.

20. The proteins associated with DNA are collectively known as histones. They are a) synthesized in quantity during the M-phase of the cell cycle; b) responsible for folding and packaging of DNA into chromosome form; c) known to have 3 types; d) attracted to the positively charged DNA because they are short polypeptides that are negatively (acidic) charged.

21. Coding sequences that are expressed are a) introns; b) intervening sequences; c) accounted for 90% of human DNA; d) exons.

22. 'Whereas prokaryotes have one type of RNA polymerase for all types of RNA, eukaryotes have a separate RNA polymerase for each type of RNA'. The above statement is a) false, because the reverse is true; b) false, because prokaryotes have no RNA polymerase; c) false, this is the case in DNA polymerase, not RNA polymerase; d) correct.

23. Which of the description about leukocytes is false: a) Neutrophils enter the tissue fluid by squeezing through capillary walls and phagocytozing foreign substances; b) Macrophages release white blood cell growth factors that cause a population increase for white blood cells; c) Lymphocytes fight infection; d) T-cells attack cells containing viruses; e) B-cells produce antihistamine to prevent inflammation.

24. Cholecystokinin (CCK) a) is released from intestinal epithelium in response to food proteins; b) causes the release of bile from the gall bladder; c) causes the release of lipase from the large intestine; d) stimulates secretion of gastrin.

25. Natural selection depicts a) that because not all organisms are equally well adapted to their environment, some will survive and reproduce better than others; b) that all organisms tend to reproduce beyond their environment's capacity to support them; c) the concept of survival of the fittest; d) the mechanism that explains how evolution occurred.

II. Use the correct or the most suitable glossary provided to fill the blank in the following questions. 2.5 points for each blank.

請將答案寫在答案欄，每行一題

Glossary: Darwin; bursae; carrying capacity; cones; antibody; circadian; gene exclusion; neurotransmitter; active transport; ATP; cyclic AMP; pheromones; genetic drift; Linnaeus; reflex; osmoconformers; exclusion; translation; RNA polymerase; DNA polymerse; phospholipids; peptidoglycan; succession; competition; cartilage; osteoporosis; hormones; NADPH; resource; speciation; seasonal; osmosis; Wallace; cytokine; transcription; transformation; shark; Dark reaction

26. The Law of the Minimum states that population growth is limited by the ( ) in the shortest supply.

27. Competitive ( ) occurs between two species when competition is so intense that one species completely eliminates the second species from an area.

28. Binomial nomenclature is a system of taxonomy developed by ( ) in the early eighteenth century.

29. The frequency of alleles can change from generation to generation as a result of chance alone in a small gene pool. This phenomenon is known as ( ).

30. ( ) are chemical signals that travel between organisms rather than between cells within an organism.

31. Many hormones, such as ACTH-cortisol, TSH, and GH show ( ) rhythms that show cyclic changes on a daily (or even a few hours) basis.

32. Nonsteroid hormones do not enter the cell but bind to plasma membrane receptors, generating a second chemical signal inside the target cell. ( ) have been identified to work as one of the second messengers.

33. Resting potential of a neuron results from differences between sodium and potassium positively charged ions and negatively charged ions in the cytoplasm. This imbalance is maintained by the ( ) of ions to reset the membrane known as the sodium potassium pump.

34. Norepinephrine is a ( ). It is active for only a short time, inactivated by enzymes and is taken back into the axon and recycled.

35. In the eye, two types of photoreceptor cells are clustered on the retina. Rods detect differences in light intensity while ( ) detect color.

36. ( ) is the process of converting the mRNA codon sequences into an amino acid sequence.

37. ( ) opens the part of the DNA to be transcribed.

38. ( ) are aligned tail to tail so the nonpolar areas form a hydrophobic region between the hydrophilic heads on the inner and outer surfaces of cell membrane.

39. Community ( ) is the sequential replacement of species by immigration of new species and local extinction of older ones following a disturbance that creates unoccupied habitats for colonization.

40. ( ) are marine organisms that have no system of osmoregulation and must change the composition of their body fluids as the composition of the water changes.

國立中山大學九十三學年度碩士班招生考試試題

科目：水產生物學 (選考) 【海洋生物研究所碩士班】

甲. 解釋名詞 (請任選六題作答,回答超過六題者以排前面者算分) (30分)

A. El Nino-Southern Oscillation
B. Food conversion rate
C. Condition factor
D. Codend
E. Brine shrimp
F. Population
G. Primary producer
H. Purse seine

乙. 問答計算題

1. 葉綠素在海洋表面的分布狀況因不同的地理位置而有很大的差異，請列出這些差異發生的地區及造成分布差異原因。(10%)

2. 請說明橈腳類(Copepoda)的生態特性和它們在海洋生產上的重要性 (10%)

3. 假設某魚群自出生起平均每年自然死亡率 25%,現在池中放養初生魚苗若干尾。假設均無生殖及漁獲行為，二年半（30 個月）後清池得到魚數為 1000 尾。請問原放養之魚苗數應為多少？
(不必確實算出答案，但須以算式寫出各推算步驟) (15%)

4. 請以台灣漁業為例，在下面各類水產生物中各舉出一種，就你所知列出其俗名,中文及拉丁文學名、及有關內容(主要包括其生態特性及分布狀況等)。 (35%)
藻類
腔腸動物
棘皮動物
軟體動物
甲殼類動物
軟骨魚類
硬骨魚類

(A) 解釋名詞 (每題 3 分)

1. allele
2. coronary
3. folic acid
4. interneuron
5. spatial summation
6. vasopressin
7. saltatory conduction
8. macrophage
9. glucagons
10. luteal phase

(B) 問答題 (每題 7 分)

1. Describe the ways of controlling protein activity.
2. What factors determine the magnitude of the solute flux through a mediated-transport system?
3. Describe the differences between action potential and graded potential.
4. Describe the mechanism of long-term potentiation.
5. What are the reasons that account for the muscle fatigue?
6. During exercise, the alveolar ventilation may increase dramatically. Why?
7. What factors regulate the extracellular calcium concentration?
8. Describe the functions of the hormone leptin.
9. What mechanisms control the events of parturition in human?
10. Describe the functions of MHC protein.

國立中山大學九十三學年度碩士班招生考試試題

科目：普通植物學 (選考) 【海洋生物研究所碩士班】

一、單選題：每題 3 分

1. 何者是植物的特徵：(1) cell wall 細胞壁 (2) nuclear 細胞核 (3) mitochondria 粒腺體 (4) membrane 膜
2. 屬低等植物的藻類具有：(1) xylem 導管 (2) chloroplast 葉綠體 (3) root 根 (4) flower 花
3. 營養鹽是植物的重要生長因子：(1) 吸收過程可經主動運輸 (2) 可經胞飲作用 (3) 與光合作用無關 (4) N 及 P 屬於微量元素
4. 植物生長：(1) 與細胞壁伸長擴大有關 (2) 與環境因子無關 (3) 不受光週期影響
5. 何者是植物生態學研究的單位：(1) community (2) root (3) DNA (4) area

二、問答題：

1. 高等植物構造及其功能
   a. 畫出植物細胞構造並說明各構造之功能 (15%)
   b. 畫出單子葉及雙子葉植物氣孔之構造並說明各構造之功能 (10%)
2. 光合作用
   a. 圖示光反應之電子傳遞鏈 (10%)
   b. 請問 DCMU 殺草劑與光合作用之關係 (5%)
   c. 比較 C3 及 C4 植物之差異 (15%)
3. 植物荷爾蒙與逆境之關係 (10%)
4. 請以某一植物 (低等植物的藻類或高等植物) 說明光、營養鹽等因子與植物由幼生至成體發育之關係 (20%)

Part A. Multiple-choice questions (Questions 1 to 10; three points for each question):
Direction: Each of the questions or incomplete statements is followed by five suggested answers or completions. Select the ONE that is BEST in each case.

1. Of the following, which statement does NOT closely relate to a biological community?
   (a) Founder-controlled community
   (b) Dominance-controlled community
   (c) Succession
   (d) Temporal patterns in community composition
   (e) Population carrying capacity (K)
2. Shannon-Weaver index is for estimating
   (a) assimilation efficiency
   (b) population growth rate
   (c) life expectancy
   (d) species diversity
   (e) community stability
3. What is NOT true for a top-down controlled food web?
   (a) The biomass abundance of lower trophic levels depends on the effects of consumers from higher trophic levels.
   (b) The species number of lower trophic levels depends on the effects of consumers from higher trophic levels.
   (c) The structure of lower trophic levels depends on the effect of consumers from higher trophic levels.
   (d) Populations within a trophic level are affected predominately by competition for resource.
   (e) Herbivore numbers are regulated by their predators.
4. Hydrothermal vent communities are related to the following items EXCEPT
   (a) The southern Atlantic Ocean
   (b) Sulfer bacteria
   (c) Giant tube worms
   (d) Rich in minerals
   (e) Volcanic hot springs
5. Intraspecific competition does NOT lead to
   (a) dispersal
   (b) character displacement
   (c) territoriality
   (d) resource partitioning
   (e) emigration

6. Predation relates to the following items EXCEPT
   (a) Oligophagous
   (b) Polyphagous
   (c) Specialist
   (d) community species composition
   (e) Eusocial society
7. Which one of the following biomes is TERRESTRIAL?
   (a) Esutaries
   (B) Tundra
   (c) Salt marsh
   (d) Mangrove
   (e) Mud flat
8. El Nino does NOT relate to
   (a) upwelling of cold water
   (b) environmental fluctuation
   (c) Peruvian anchoveta
   (d) harvesting level
   (e) Western Atlantic Ocean
9. Greenhouse effect is caused by increase in
   (a) acid deposition
   (b) eutrophication
   (c) pesticides
   (d) soil pollution
   (e) atmospheric carbon dioxide concentration
10. By means of the mark release recapture method and fish traps, the total number of fish of a target species in a local population (N) estimated with the following data (Number of fish originally marked=100 fish; Total trapped one week after release of marked fish=200 fish ; Number of marked recaptures=20 fish) is
    (a) 500 fish
    (b) 1000 fish
    (c) 1500 fish
    (d) 2000 fish
    (e) 2500 fish

Part B. Define **SIX** of the following terms (five points each):

1. Commensualism
2. Natality
3. Ecotone
4. Competitive exclusion
5. Polyandry
6. Ecotourism
7. Island biogeography
8. Stratospheric ozone depletion
9. Phosphorus cycle
10. Survivorship curve

Part C. Free-response questions. (Answer ALL questions).

1. What is biodiversity? Discuss the issue on conserving biodiversity. (15 points)
2. Two distinct life history strategies are described by r- and K selection theory. How does the concept of this theory relate to the logistic equation for population growth? Compare the differences between r-selected and K-selected species. (15 points)
3. A theoretical solution to predict the maximum long-term yield is known as the maximum sustainable yield approach (i.e., the maximum catch that can be harvested from the population sustainably). Explain this approach by relating population density, birth rate and death rate. (10 points)