

單選題。第1~75題請將答案寫在是非、選擇題專用頁。第76~100題請將答案寫在答案欄，每行一題。

1. All membrane processes, such as pumping and channeling of molecules, are carried out by a) lipids b) carbohydrates c) proteins d) nucleic acids
2. An enzyme promotes a chemical reaction by a) lowering the energy of activation b) causing the release of heat, which acts as a primer c) increasing molecular motion d) changing the free energy difference between substrate and product.
3. Bacteria are examples of a) prokaryotic cells b) eukaryotic cells c) organelles d) plastids e) plasmids
4. DNA is unique among molecules in that it can a) form multipolymer complexes b) come apart and re-form c) withstand very high temperature d) replicate itself
5. Human sperm cells move by means of a a) cilium b) flagellum c) basal body d) hair e) rotor-like molecule
6. In most metabolic pathways, all needed enzymes are arranged together, in a multienzyme complex, within a a) solution of ATP b) membrane c) quaternary protein d) coenzyme
7. In plants, bacteria, and fungi, the proton pump in cells creates a negative membrane potential by transporting which ion from the cytoplasm to the extracellular fluid? a) K^+ b) Na^+ c) H^+ d) Ca^{+2} e) all above
8. Membrane potentials are caused by the unequal distribution inside and outside the membrane of a) ions b) electrons c) isotopes d) fatty acids e) glucose
9. Pressure on a plant cell wall caused by osmotic movement of water is called a) osmotic pressure b) turgor pressure c) tonic pressure d) hypertonic pressure
10. Sugars are characterized by having which two functional groups? a) carbonyl, hydroxyl b) carbonyl, methyl c) hydroxyl, amino d) sulfhydryl, phosphate
11. The most common monomer of carbohydrates is a a) amino acid b) phospholipid c) maltose d) glucose
12. The two types of cellular organelles that transform energy are a) chromoplasts and leucoplasts b) mitochondria and chloroplasts c) mitochondria and Golgi bodies d) chloroplasts and ribosomes e) lysosomes and ribosomes
13. Which is a polysaccharide? a) glucose b) glycogen c) maltose d) lactose e) fructose
14. Which of the following best describes the scientific method? a) doing experiments in laboratories b) collecting all known facts on a subject c) developing and testing hypothesis d) using sensitive electronic measuring instruments
15. Which of the following substances does not enter cells through membrane proteins or by endocytosis? a) oxygen b) glucose c) proteins d) amino acids e) lactose
16. Which taxonomic category contains organisms least similar to one another? a) species b) genus c) order d) class e) phylum
17. The processes by which a cell secretes macromolecules by fusing a transport vesicle to the plasma membrane is called a) pinocytosis b) endocytosis c) phagocytosis d) exocytosis

國立中山大學九十二學年度碩士班招生考試試題

科目：

普通生物學

共六頁 第二頁

18. The term anaerobic means a) with glucose b) with oxygen c) without glucose d) without oxygen
19. Which of the following processes makes direct use of oxygen? a) glycolysis b) fermentation c) Krebs citric acid cycle d) electron transport e) hydrolysis
20. Glycolysis is a process found in a) eukaryotic cells b) anaerobic bacteria c) most muscle cells d) virtually all cells
21. When a yeast is producing wine, which of the following is not formed? a) pyruvic acid b) ethanol c) carbon dioxide d) acetyl coenzyme A
22. In aerobic cellular respiration, most of the ATP is synthesized during a) glycolysis b) oxidation of pyruvic acid c) electron transport d) the Krebs citric acid cycle
23. Within the mitochondrion, the proton gradient develops across the a) inner membrane b) outer membrane c) intermembrane space d) matrix
24. Chemosynthetic autotrophs get their energy from a) organic molecules b) inorganic molecules c) light d) heat e) radiation
25. Which of the following organisms is not an autotroph? a) moss b) grass c) mushroom d) fern
26. The pigment molecules of a chloroplast are located a) within its thylakoid membranes b) within its intrathylakoid spaces c) within its inner membrane d) within the space between its inner and outer membranes
27. When sunlight is on the chloroplast, pH is lowest in the a) stroma b) space enclosed by the inner and outer membranes c) spaces enclosed by the thylakoid membranes d) cytosol
28. About how much of the sugar formed in a plant is used by the plant itself during cellular respiration? a) 1% b) 10% c) 50% d) 98% e) 100%
29. Mitosis is the process by which eukaryotic cells a) grow b) multiply c) become specialized in structure and function d) expose the genes for protein synthesis e) evolve
30. The spindle fibers formed during mitosis connect to the a) nuclei b) sugar-phosphate strands c) kinetochores d) nuclear membrane
31. The x-ray crystallography studies of Rosalind Franklin and Maurice H.F. Wilkins showed that a) DNA contains only 4 kinds of nucleotides b) DNA is a helix of uniform diameter c) the amount of adenine found in DNA equals that amount of thymine d) the same base-pairing rules apply to all species
32. If the sequence of bases along one side of a DNA molecule is AAGCT, then the complimentary sequence of bases on the other side of the DNA molecule is a) AAGCT b) GGTAC c) UUCGA d) TTCGA e) unpredictable
33. In the formation of base pairs in E. coli DNA replication, on the average one mistake occurs for every a) 100 pairs b) 1000 pairs c) 1,000,000 pairs d) 1,000,000,000 pairs
34. In DNA replication, the helix is unwound by a) helicase b) primase c) DNA polymerase d) Topoisomerase

國立中山大學九十二學年度碩士班招生考試試題

科目：普通生物學

共六頁 第三頁

35. The exact replication of DNA is possible due to a) the genetic code b) mitosis c) the base-pairing rules d) the fact that the DNA molecules are enclosed within a nuclear membrane
36. The metabolic activity of the different cell types within an organism varies because of differences in the kinds of a) genes in each cell b) ribosomes in each cell c) enzymes in each cell d) nucleoli in each cell
37. Transcription is most similar to a) amino-acid synthetase b) RNA decarboxylase c) RNA polymerase d) DNA polymerase
38. Genes that have been artificially synthesized without noncoding sequences often fail to yield proteins when placed inside a cell, because a) they curl up b) their mRNA fail to move through the pores in the nuclear envelope c) they bond to the DNA d) they are not transcribed
39. A polypeptide is assembled on a a) DNA molecule b) nuclear membrane c) nuclear pore d) ribosome
40. The signal to start translation is the initiator codon, usually AUG, the codon for a) tyrosine b) methionine c) leucine d) no amino acid
41. Genes that are inactive for long periods of time tend to be bonded to a) each other b) methyl groups c) actin and myosin d) the nucleolus e) Sulfate
42. Viral genes are made of a) RNA only b) DNA only c) either RNA or DNA d) either proteins or nucleic acids
43. In the lysogenic cycle, the DNA of a bacteriophage a) joins the bacterial chromosome b) attaches to the inner surface of the host membrane c) goes directly to the host's ribosomes for translation d) is immediately degraded when it enters the hosts
44. The process by which a bacterium acquires new genes by taking up parts of a "naked" DNA molecule from its surroundings is called a) transformation b) general transduction c) restricted transduction d) conjugation
45. In general, bacterial genes are regulated at the time of a) transcription b) posttranscription. c) translation d) posttranslation
46. Restriction enzymes are synthesized by a) bacteria only b) yeast and bacteria c) eukaryotic cells d) all kinds of cells
47. A restriction enzyme breaks bonds between the a) base pairs of DNA molecules b) base pairs of DNA-RNA hybrid molecules c) sugar and phosphate components of a nucleic acid molecule d) exons and introns of a DNA molecule
48. One way in which a eukaryotic chromosome differs from a bacterial chromosome is in having a) reverse transcriptase b) introns c) start and stop signals d) thymine instead of uracil
49. The somatic cells of each diploid organism all originated from a single a) gamete b) autosome c) chiasma d) zygote
50. In oogenesis, when a diploid cell in the ovary undergoes meiosis, how many ova result? a) 1 b) 2 c) 3 d) 4

國立中山大學九十二學年度碩士班招生考試試題

科目：

普通生物學

共六頁 第四頁

51. The males of ants, bees and wasps are a) haploid b) polyploid c) X/X d) X/O e) X/Y
52. To make a karyotype, chromosomes are photographed during a) fertilization b) meiosis c) mitosis d) interphase
53. A man receives his X chromosome from a) his mother only b) his father only c) either his father or his mother d) both parents (par from each)
54. Which of the following alterations of the codons ATTGCC is most serious? a) ATCGCC b) ATTGCA c) ATTCCCGCC d) ATTTGCC
55. The maximum frequency of a recombination of genes (I.e., % recombinant forms in zygotes) at two loci is a) 25% b) 50% c) 75% d) 100%
56. Down's syndrome is an example of a) aneuploidy b) polytene c) polyploidy d) monoploidy
57. The pelvis and the leg bones of a snake are a) analogous structure b) homologous structure c) vestigial structure d) phylogenetic structure
58. How many different kinds of gametes can an organism of genotype AaBBcc produce? a) 3 b) 4 c) 9 d) 16
59. The most important evidence since Darwin that bears on his theory has been in the area of a) paleontology b) genetics c) comparative anatomy d) comparative embryology
60. A mutation spreads from one population to another by means of a) removed bottlenecks b) emigrants and immigrants c) mutation pressure d) crossovers
61. Of all the taxa, the only one that exists in nature as a biologically cohesive unit is the a) species b) genus c) phylum or division d) kingdom
62. The richest source of fossils is a) basalt b) granite c) larva d) sedimentary rock
63. Which of the following is not true of organisms in the kingdom Monera? a) they reproduce by mitosis b) they have prokaryotic cellular organization c) they originated at least 3.5 billion years ago d) most have cell walls
64. Ciliates differ from all other protozoans in a) having 2 types of nuclei b) capturing prey with pseudopodia c) having contractile vacuoles d) not using flagella for locomotion
65. Which of the following ways of acquiring nutrients is not characteristic of fungi? a) heterotrophic b) autotrophic c) saprophytic d) parasitic
66. Which of the following genera exhibits an alternation of generations, with haploid and diploid multicellular phases? a) Chlamydomonas b) Ulva c) Ulothrix d) Volvox
67. Earthworms are in the phylum a) Platyhelminthes b) Arthropoda c) Annelida d) Pogonophora
68. Which of the following animals is a deuterostomes? a) starfish b) sea anemone c) ant d) octopus
69. About how long ago was the earth formed? a) 20 billion years ago b) 10 billion years ago c) 5 billion years ago d) 3 billion years ago

70. Which of the following substances is the best for concentrating monomers? a) sand b) glass
c) clay d) granite
71. The first organisms to give off oxygen gas were probably the a) methanogens b)
cyanobacteria c) anaerobic chemoautotrophs d) Euglena
72. Terrestrial plants appear to have evolved from the a) Chlorophyta b) Charophyta c)
Phaeophyta d) Rhodophyta
73. The most diverse and widespread of all contemporary plants are the a) mosses b) ferns
c) conifers d) angiosperms
74. Gas change in an insect occurs within tracheae, an adaptation for a) high oxygen consumption
b) conservation of water c) flight d) conservation of carbon dioxide
75. White blood cells that are nonspecific killers of microbes are a) B cells b) phagocytes c)
killer T cells d) helper T cells
76. Minerals enter a plant mainly by a) diffusion b) pressure flow c) translocation d)
active transport
77. Plants that have mutualistic relations with nitrogen-fixing bacteria provide the bacteria with a)
Nitrogen b) enzymes c) sugars d) nitrite
78. Antibodies are synthesized by a) B lymphocytes b) phagocytes c) helper T cells d)
killer T cells
79. The parts of neurons that receive neurotransmitters and pass on graded electronic potentials
toward the soma are the a) myelin sheaths b) axons c) axon hillocks d) dendrites
80. The sodium-potassium pump a) transports Na⁺ and K⁺ out of the neuron b) transports Na⁺
into neuron and K⁺ out c) transports K⁺ into the neuron and Na⁺ out d) transports Na⁺ and
K⁺ into the neuron
81. Which of the following is not a function of transpiration? a) cooling of leaves b) uptake of
minerals c) excretion of minerals d) uptake of water
82. The energy source that drives the upward flow of water is a) light b) sucrose c) solar heat
d) ATP
83. The narrow band of meristematic tissue between the xylem and phloem is the a) pith meristem
b) cortex meristem c) cork cambium d) vascular cambium
84. The tissue in the root that absorbs water and minerals is a) epidermis b) parenchyma c)
collenchyma d) sclerenchyma
85. The first animals to have neurons were probably similar to modern a) sponges b)
cnidarians c) flatworms d) annelid worms
86. A role of accessory structures, such as the bones of the middle ear, in a sense organ is to a)
transduce the stimulus b) integrate the response c) amplify the stimulus d) amplify the
response
87. The molt of an insect is triggered by a) thyroxine b) ecdysone c) juvenile hormone d)
a pheromone

國立中山大學九十二學年度碩士班招生考試試題

科目：

普通生物學

共六頁 第六頁

88. Tiny animals, such as the larvae of cnidarians, move from place to place chiefly by a) cytoplasmic streaming b) amoeboid movement c) contractions of muscle cells d) the beating movement of cilia
89. Carnivorous plants live in soils that are deficient in a) water b) worms c) oxygen d) nitrogen
90. The main effect of auxin is to stimulate cell a) division b) elongation c) differentiation d) turgor
91. What type of tissue forms the inner lining of a blood vessel? a) epithelial b) connective c) nervous d) muscle
92. In a closed circulatory system, blood is completely enclosed within a) skeleton b) sinuses c) vessels d) hearts
93. Gastric juice has a pH of about a) 1 b) 2 c) 7 d) 10
94. A disease caused by insufficient amounts of insulin is a) jaundice b) elephantiasis c) diabetes d) stroke
95. Which of the following animals has no need for a gallbladder? a) horse b) dog c) lion d) human
96. Which chamber of the heart has the thickest muscular walls? a) right atrium b) left atrium c) right ventricle d) left ventricle
97. Both erythrocytes and leukocytes form in the a) bone marrow b) thymus c) arterial walls d) lymph nodes
98. Energy is stored in the liver and muscles as a) glycogen b) starch c) fat d) cholesterol
99. A Malpighian tubule empties urine into the a) gut b) coelom c) ureters d) lymph
100. Nephrons are found in a) the brain b) the heart c) the kidney d) lymph node

(A) 解釋名詞 (每題 3 分)

1. extracellular matrix
2. eicosanoid
3. nuclear pore
4. cytochrome
5. chaperone
6. facilitated diffusion
7. apoptosis
8. basilar membrane
9. muscle spindle
10. nitric oxide

(B) 問答題 (每題 7 分)

1. Compare the differences between "presynaptic inhibition" and "inhibitory postsynaptic potential"
2. Describe the role of the hypothalamus in the regulation of anterior pituitary hormone secretion.
3. Compare the mechanisms by which cytosolic calcium initiates contraction in skeletal muscle and smooth muscle.
4. Describe the ionic basis of the parasympathetic and sympathetic effects on SA nodal pacemaker potential.
5. Why must a person floating on the surface of the water and breathing through a snorkel increase his breathing frequency to maintain a normal alveolar ventilation.
6. Describe the roles of the kidneys and lungs in hydrogen-ion regulation.
7. Describe the cellular processes involved in the secretion of HCl by the parietal cells.
8. Describe the role of insulin in growth.
9. Describe the causes of the changes in LH secretion profile throughout the 28-day menstrual cycle.
10. Describe the process of tissue-implant rejection.

一、複選題：每題 5 分

1. 何者是植物：(1) algae (2) Rhodophyta (3) Mycoplasma (4) Bryophyta
2. 植物根部吸水的途徑及經過之構造有：(1) apoplastic pathway (2) symplastic pathway (3) Casparian strip (4) Plasmadesmata
3. 何者是植物生態學研究的單位：(1) plant population (2) plant community (3) ecotype (4) cell

二、問答題：

1. 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. 高等植物葉綠體之內部構造及各構造代表之功能 (5%)
 - c. 畫出單子葉植物根之維管束構造並說明各構造之功能 (5%)
 - d. 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 (5%)
2. 光合作用
 - a. 解釋並圖示光合作用電子傳遞鏈 (5%)
 - b. 解釋並圖示 C3 cycle (10%)
 - c. 解釋並圖示 C4 cycle (10%)
3. 列出五大類植物荷爾蒙及其作用 (20%)
4. 說明光週期現象與植物之關係 (10%)

A. 選擇題 (30%) (每題 3 分) (均為單選)

1. An organism's adaptations promote normal cellular activities within a restricted range of climate conditions. This range is the organism's
 - (a) life span.
 - (b) reproductive stretch.
 - (c) range of latitude.
 - (d) tolerance range.
2. Which site in a forest has the lowest wind velocity?
 - (a) Above the canopy;
 - (b) In the canopy;
 - (c) Beneath the canopy but above the shrubs;
 - (d) Next to the ground.
3. The leaves of plants in warm, wet, shaded microclimates are
 - (a) large and thin.
 - (b) small and thin.
 - (c) large and thick.
 - (d) small and thick.
4. By growing close to the ground, a tundra plant
 - (a) avoids the wind.
 - (b) avoids herbivores.
 - (c) attracts pollinators.
 - (d) forms mutualistic relations with soil animals.
5. The function of red pigments in tundra plants is to
 - (a) expand the range of light used in photosynthesis.
 - (b) warm the plants.
 - (c) track the sun.
 - (d) measure time.
6. Seasonal movements of animals from one defined place of residence to another are called
 - (a) dispersals.
 - (b) migrations.
 - (c) homings.
 - (d) emigrations.
7. Which of the following is *not true* of singing in male birds?
 - (a) It is done to claim a territory;
 - (b) The typical song is characteristic of a species;
 - (c) All songs are learned from their parents;
 - (d) They generally sing at dawn or dusk.
8. When a wolf exposes its throat ("shows its jugular vein") to another wolf, this means
 - (a) it wants to mate with the other wolf.
 - (b) it wants to be groomed by the other wolf.
 - (c) it wants to fight the other wolf.
 - (d) it is subordinate to the other wolf.

9. Parental care behaviors are selected for because they
- (a) reduce fighting among the young.
 - (b) increase the frequency of the parent's genes in the next generation.
 - (c) ensure the survival of the parents.
 - (d) force the parents to cooperate with one another and so decrease competition.
10. Exponential growth occurs when there is
- (a) asexual reproduction only.
 - (b) sexual reproduction only.
 - (c) no inhibition from crowding.
 - (d) a fixed carrying capacity.

B. 解釋名詞 (請任選其中六小題作答) (30%)

1. Ecology
2. Environmental factors
3. Biosphere
4. ENSO (El Nino-Southern Oscillation)
5. Greenhouse effect
6. Inbreeding
7. Succession
8. Niche

C. 問答題 (40%)

1. 除了仙人掌和駱駝之外，沙漠地區的植物及動物如何適應當地特殊的溫度變化情形？試分別舉例說明之。(10%)
2. 何謂邏輯型成長方程式(logistic equation)？其在生態學上之意義為何？(15%)
3. 請舉出一種推算水中生物族群數量的方法，並說明其內容。(15%)

1. 解析下列各名詞：(30分)
 - a. Coastal fishing ground
 - b. anadromous fish
 - c. Sr:Ca ratio
 - d. chitin
 - e. complementary DNA (or cDNA)
 - f. leptocephalus larvae
 - g. weight conversion coefficient
 - h. thyroxin
 - i. veliger
 - j. marine pharmaceuticals
2. 請列出調查資源量的方法。(6分)
3. 什麼現象可判斷有過漁的情形發生。(6分)
4. 請說明漁業管理之目的和方法。(6分)
5. 請說明 El Nino 發生的原因和對漁業的影響。(6分)
6. 請說明九孔常見的氣泡病產生的原因及治療的方法。(6分)
7. 請說明昆布 *Laminaria* sp. (brown algae, Phaeophyta) 的生活史。(6分)
8. 請說明 dinoflagellates 對漁業可能發生的影響。(6分)
9. 請說明 *Penaeus monodon* 之飼料中的四個主要成分。(6分)
10. 請列出兩個蝦類的免疫活性的指標因子。(6分)
11. 頭足綱 (Cephalopoda) 共區分為八腕目 (Octopoda), 槍形目 (Teuthoidea), 和烏賊目 (Sepioida), 請列出此三目在分類特徵上的差別。(6分)
12. 請閱讀下列的英文資料後用中文指出其內容之重點：(10分)

Strict implementation of food safety regulations.

A survey of aquaculture products was conducted in 1997 with the purpose of improving food quality. Regulations have since been legislated relating with water pollution, waste treatment, feed management, and feed additive control before the marketing of any seafood from aquaculture. There are also relevant regulations on food hygiene, processing trade, and export.

In order to meet international quality standards, HACCP, GMP (Good Manufacture Practice), SSOP (Sanitation Standard Operating Procedure), ISO (International Organization for Standardization), and CNS (Chinese National Standard) have been adopted in Taiwan since the 1990s. Reaching all national and international quality standards is the ultimate goal to guarantee consumers health and the competitiveness of Taiwanese aquaculture products in the international market.

(Source: Liao, I.C. and N.H. Chao. 2001. Optimization of essential factors for aquacultural development in Taiwan. *J. Fish Soc. Taiwan*. 28(4):259-260)