

## 國立中山大學100學年度碩士班招生考試試題

科目：生物化學【生科系碩士班甲組、乙組】

## 問答題 (100 分)

1. (1) Describe how to determine the primary structure of a protein and (2) discuss why it is important to know the primary structure of a protein. (14 分)
2. Discuss (1) why myoglobin and hemoglobin have different oxygen-binding properties and (2) the physiological significance of the differences. (14 分)
3. Describe (1) the structure, (2) the composition, and (3) the functions of biological membranes. (12 分)
4. Describe (1) how DNA and RNA differ and (2) the physiological significance of the differences. (12 分)
5. Describe the Sanger's chain termination or dideoxy method for determining the primary structure of nucleic acids. (14 分)
6. The chemiosmotic mechanism and the conformational coupling mechanism have been proposed to explain the coupling of electron transport and ATP production. Describe and compare these two mechanisms. (12 分)
7. A second messenger is a molecule that acts as a linker between the binding of a hormone to a cell membrane receptor and the metabolic effect the hormone has. Describe how the common second messenger cyclic AMP (cAMP) works. (12 分)
8. Matching the genetic diseases with the respective biochemical defects: (10 分)

Genetic diseases:

- |                                   |                          |
|-----------------------------------|--------------------------|
| (1) Phenylketonuria (PKU)         | (2) Gout                 |
| (3) familial hypercholesterolemia | (4) Lesch-Nyhan syndrome |
| (5) Lactose intolerance           |                          |

Biochemical defects:

- (A) Absence or dysfunction of LDL receptors
- (B) Lactase deficiency
- (C) Hypoxanthine-guanine phosphoribosyltransferase deficiency
- (D) Phenylalanine hydroxylase deficiency
- (E) Excess uric acid

- I. 選擇題：請自下列第 1~20 題各選出一正確答案；第 1~15 題，每題 2 分；第 16~20 題，每題 3 分。
- Histones are the most abundant proteins in chromatin. Which two histones are among the most conserved of all known proteins?  
(A) H1 and H2A            (B) H2A and H2B            (C) H2B and H4  
(D) H3 and H4            (E) H1 and H4
  - Microsatellite DNA is a type of simple-sequence DNAs in eukaryotic genomes. Which of the following statements is correct?  
(A) They are thought to have originated by forward slippage of the nascent daughter strand during DNA replication.  
(B) They have the repeats contain 1-50 base pairs.  
(C) They can be used as probes in DNA fingerprinting.  
(D) They are concentrated in specific chromosomal locations.  
(E) They occasionally occur within transcription units and expanded number of repeats may be associated with some hereditary diseases.
  - The U2 snRNA base pairs with  
(A) the 3' splice site of the intron.  
(B) the branch site/point within the intron.  
(C) a sequence spanning the first exon-intron boundary.  
(D) the 5' splice site of the intron.  
(E) a sequence spanning the intron-second exon boundary.
  - The 23S rRNA of the large subunit of bacterial ribosomes interacts with  
(A) small subunit ribosomal proteins only.  
(B) large subunit ribosomal proteins only.  
(C) the 3' CCA terminus of peptidyl tRNA in the P and A sites.  
(D) the 3' untranslated region of the mRNA.  
(E) the 5' untranslated region of the mRNA.
  - The closest known relative of mitochondria among bacteria is  
(A) cyanobacteria            (B) *E. coli*.            (C) *Salmonella*.  
(D) *Bacillus*.            (E) *Rickettsia*.
  - An increase in the rate of translation of an mRNA  
(A) is the fastest way to increase the amount of a protein.  
(B) can be due to a protein binding the 3'UTR of the mRNA.  
(C) can be due to lengthening the poly-A tail on the mRNA.  
(D) can be due to changes in the amount of translation initiation factors.  
(E) all of the above.

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科目：分子生物學【生科系碩士班甲組選考、乙組選考】

7. The majority of human transposable elements are  
(A) insertion sequences (B) simple transposons  
(C) composite transposons (D) non-replicative transposons  
(E) retrotransposons
8. Nucleotide excision repair primarily works on  
(A) abasic sites in DNA (B) double strand breaks  
(C) uracil in DNA (D) bulky, helix-distorting DNA damage  
(E) normal, but mismatched bases
9. Gene conversion is a consequence of:  
(A) repair of ultraviolet light damage to DNA (B) heteroduplex formation  
(C) defects in recombinational repair (D) transposition  
(E) retrotransposition
10. A common mechanism for regulated alternative splicing involves:  
(A) mutation of a 5' splice site (B) mutation of a 3' splice site  
(C) mutation of the internal branch site (D) use of a slicing repressor protein  
(E) use of mircoRNA
11. The precursor to a microRNA is:  
(A) tRNA (B) mRNA (C) rRNA  
(D) snoRNA (E) a double-stranded region of RNA
12. In *E. coli*, what marks the strand to use as template in mismatch repair?  
(A) A methyl group on adenine (B) An ethyl group on guanine  
(C) A methyl group on uracil (D) A nick in the DNA  
(E) A gap in the DNA
13. On many plasmid modern cloning vectors, the multiple cloning site used for insertion of DNAs is present  
(A) within a drug-resistance gene (B) at the origin of replication  
(C) within the *lacZ* gene (D) at the centromere  
(E) at the telomere
14. A mutation in a protein-coding sequence that does not alter the amino acid sequence is  
(A) a neutral mutation (B) a frame-shift mutation  
(C) a non-sense mutation (D) an expansion mutation  
(E) a silent mutation
15. During transcription initiation, what acts as a bridge between regulatory eukaryotic transcription factors and RNA polymerase?  
(A) The TATA box (B) CAP  
(C) Mediator (D) CREB  
(E) The carboxyl terminal domain (CTD)

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請注意：第 16~20 題，每題 3 分。

16. You prepare four different human gene libraries. One is a genomic library made from skin, the second is a genomic library made from skeletal muscle, the third is a brain cDNA library, and the fourth is a pancreatic cDNA library. Which pair of libraries will have the greatest overlap in the cloned sequences they contain?
- (A) Skeletal muscle genomic and pancreatic cDNA libraries
  - (B) Skeletal muscle cDNA and brain cDNA libraries
  - (C) Skin genomic and pancreatic cDNA libraries
  - (D) Skin genomic and brain cDNA libraries
  - (E) Skin genomic and muscle genomic libraries
17. Position effect variegation of *Drosophila* eye color provided insight into:
- (A) the effect of chromatin structure on gene expression
  - (B) the existence of mutagens
  - (C) the role of insulators in the regulation of gene expression
  - (D) the existence of eye color mutations
  - (E) the random and spontaneous nature of mutation
18. A loss-of-function mutation in a histone deacetylase gene is predicted to:
- (A) decrease mRNA stability
  - (B) increase the frequency transcription initiation
  - (C) decrease the frequency transcription initiation
  - (D) increase rates of translation
  - (E) decrease rates of translation
19. The reason an ampicillin-resistance gene is present on many cloning vectors is to provide
- (A) a site for inserting DNA fragments into the plasmid
  - (B) a means of learning which cells have taken up the cloning vector
  - (C) a means of distinguishing which cells have taken up native cloning vector and which have taken up a recombinant cloning vector
  - (D) a mechanism for blue/white colony screening
  - (E) a mechanism for protecting mammalian cells from ampicillin toxicity
20. Which of the following levels of control provides the most rapid means of changing transcription factor activity?
- (A) Transcriptional control of transcription factor activity
  - (B) Splicing control of transcription factor activity
  - (C) mRNA stability control of transcription factor activity
  - (D) Translational control of transcription factor activity
  - (E) Post-translational control of transcription factor activity

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科目：分子生物學【生科系碩士班甲組選考、乙組選考】

II. 配合題：請將左邊名詞配合最適合的右邊敘述（單選）。每題 3 分。

- |                           |   |
|---------------------------|---|
| 21. Xenoderma pigmentosum | A. Involved in RNA interference.                                |
| 22. AAUAAA                | B. A RNA polymerase making short RNA primers.                   |
| 23. Sex-lethal protein    | C. DNA-bending protein involved in transcription initiation     |
| 24. S-adenosylmethionine  | D. Associated with cellular aging.                              |
| 25. Primase               | E. A genetic disease defective in nucleotide excision repair    |
| 26. Operon                | F. 5' end of the intron joined to branch point A.               |
| 27. miRNA and siRNA       | G. Involved in post-translational control.                      |
| 28. TATA-binding protein  | H. A genetic disease defective in mismatch repair.              |
| 29. Lariat structure      | I. A negative regulator for alternative splicing in Drosophila. |
| 30. Telomeres             | J. Methyl donor for eukaryotic 5'-cap synthesis.                |
|                           | K. Pre-mRNA cleavage and polyadenylation.                       |
|                           | L. A DNA polymerase making short RNA primers.                   |

III. 問答題: 25 分

1. 此題 10 分 (A) How can a single RNA transcript be translated into different polypeptides in most operons, for example lac operon, of prokaryotes? (B) How can a single primary transcript be translated into different polypeptides in gene expression of eukaryotes?
2. 此題 15 分 The following techniques are very important in both research of molecular biology and biotechnology. Describe briefly the essential points of (A) DNA sequencing; (B) PCR; (C) Site-directed mutagenesis.

## 國立中山大學100學年度碩士班招生考試試題

科目：動物生理學【生科系碩士班甲組選考】

1. Discuss the mechanisms of Calcium in skeletal and cardiac muscle contraction. (20%)
2. Describe all you know about the Nobel Prize in physiology or medicine 2010. (15%)
3. A person is taking a drug that inhibits the tubular secretion of hydrogen ions. Discuss what effect does this drug have on the body's balance of sodium, water, and hydrogen ions? (10%)
4. Describe the sequence of events by which an action potential in a motor neuron produces an action potential in the plasma membrane of a skeletal muscle fiber. (20%)
5. Why iron, folic acid and vitamin B12 are essential for the production of erythrocytes? (15%)
6. Describe the role of the Renin-Angiotensin system in maintaining a normal arterial pressure despite wide variations in salt intake. (10%)
7. Describe the sequence of events that cause air to move into the lungs during inspiration and out of the lungs during expiration. (10%)

## 國立中山大學100學年度碩士班招生考試試題

科目：免疫學【生科系碩士班甲組選考】

1. Complement activation can occur via the classical, alternative, or lectin pathway. (15%)
  - a. How do the three pathways differ in the substances that can initiate activation? (5%)
  - b. Which portion of the overall activation sequence differs in the three pathways? Which portion is similar? (5%)
  - c. How do the biological consequences of complement activation via these pathways differ? (5%)
  
2. Edward Mitre and colleagues investigated the roles of basophils in *Brugia malayi* (a filarial worm) infections and host hypersensitivity responses. Helminth infections often pose challenges to host resistance. They looked at the amount of histamine released by the basophils in whole blood of normal and infected individuals (Figure 1a). They also looked at the dose of antigen that induced histamine release (Figure 1b). (35%)

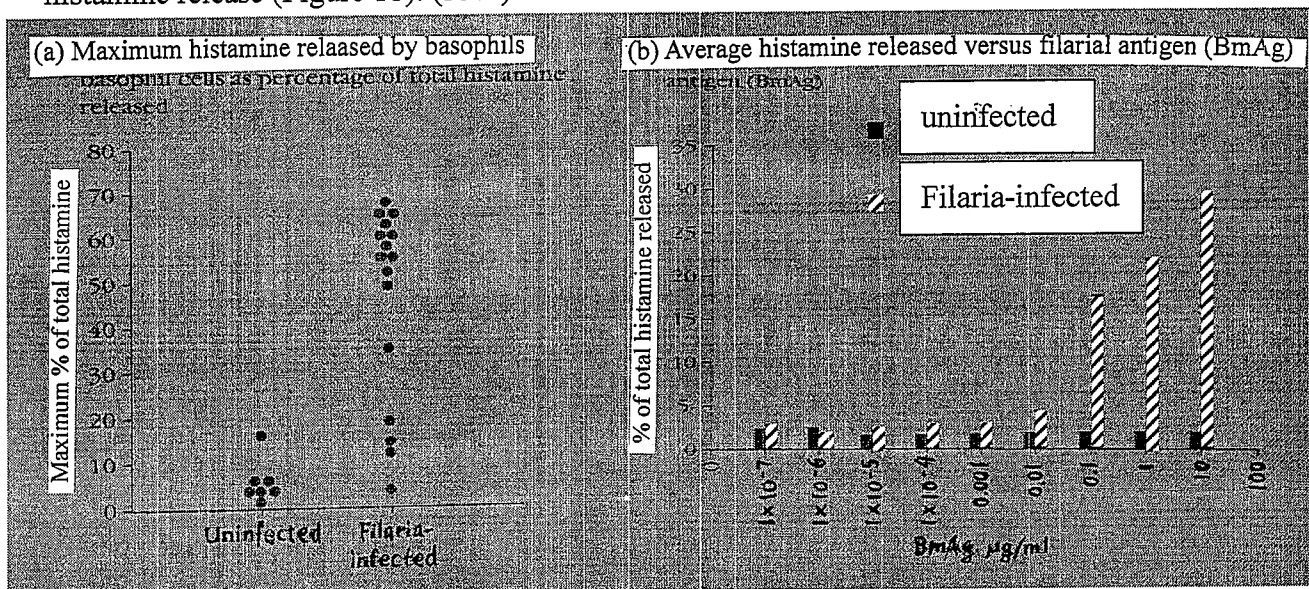


Figure 1. Histamine released by the basophils in normal and infected individuals (a) and dose of antigen that induced histamine release (b).

**(All groups need to compare are marked by marking pen in particular)**

- a. What type of hypersensitivity reaction is manifested by people that are infected? (5%)
- b. Why is histamine used to measure this response? If you didn't have an assay to measure histamine, how could you measure a host response after BmAg administration? (5%)
- c. Describe what immunoglobulin isotype you would isolate from the surface of the basophils if you analyzed the cells. (5%)
- d. The data in Figure 1b show that basophils respond to antigen in a dose-dependent fashion. What occurs at the basophil surface to induce the response? What occurs intracellularly in response to that process? (5%)
- e. Explain why you would or would not expect eosinophils to be found in filaria-infected individuals. (5%)
- f. Does a filarial infection induce a humoral response? Explain your answer. (5%)
- g. What kind of helper T cells involved in increase of IL-4 secretions? (5%)

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科目：免疫學【生科系碩士班甲組選考】

3. Francois and colleagues investigated the effects of Toll-like receptor (TLR) agonists on apoptosis of neutrophils, which make up the largest population of white blood cells and play the role of first responders against bacteria. Although neutrophils are short-lived, they play a critical role in innate immunity by targeting infected tissue, where they defend the host by making reactive oxygen species, proteolytic enzymes, and other antimicrobial products. Francois incubated neutrophil cells with SN50, an inhibitor of NF- $\kappa$ B, or a control. Samples were then treated with TLR agonists and a measure of the inhibition of apoptosis was determined (Figure 2a). The investigators also examined a signal transduction pathway activated upon TLR ligand binding (Figure 2b). (30%)

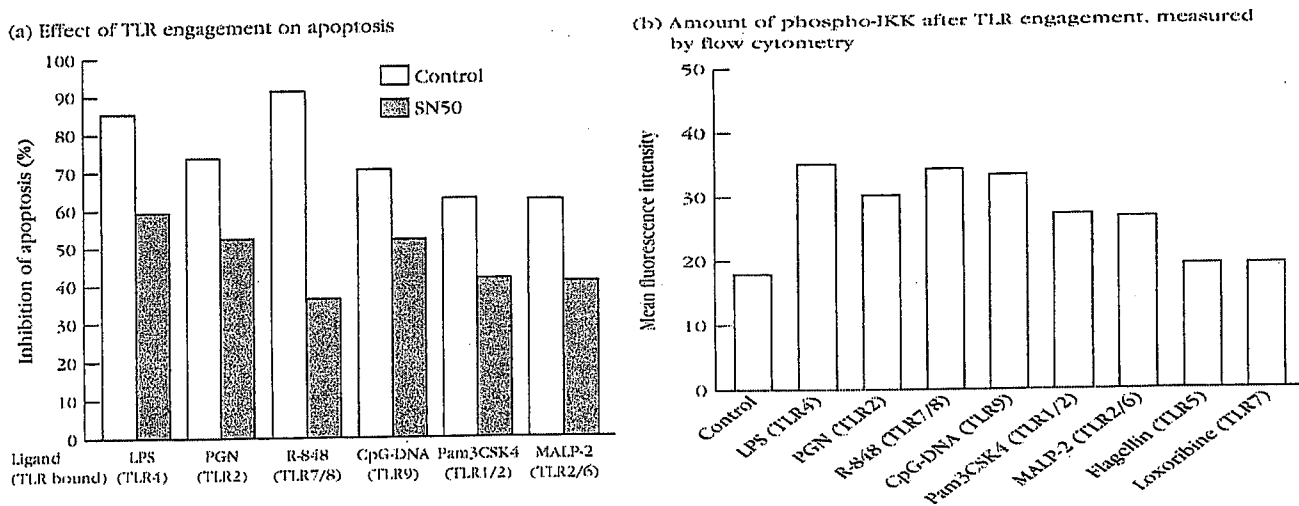


Figure 2. Effects of TLR on apoptosis (a) and signal transduction pathway (b).

- Does engagement of TLR receptors affect neutrophil life span? Why is this an advantage to the host? Why might this be a disadvantage? (10%)
- If a mutant mouse has a defect in IKK (I $\kappa$ B kinase; I $\kappa$ B, inhibitor of nuclear factor NF- $\kappa$ B), would you predict a longer or shorter neutrophil half life? (10%)
- What TLR molecules appear to use a different signal transduction pathway than TLR4? Assume that the agonists used in this study are appropriate. Explain your answer. (10%)

4. Professor Wong, your research advisor has discovered a new receptor thought to be important in the development of Alzheimer's disease recently. Other lab members have cloned the receptor and transfected the gene into a cell line for further study. Your task is to perform cell sorting on the transfected cells to screen out nonexpressers and select a population of high-level expressers. You have available a rabbit antibody to the receptor, a control mouse antibody that binds to untransfected cells, fluorescein-conjugated goat anti-mouse antibodies, and rhodamine-conjugated monkey anti-rabbit antibodies. (20%)

- Describe how you would set up the FACS experiment. (10%)
- Draw a representative FACS histogram of the expected results with the x-axis showing the level of fluorescein and the y-axis showing the level of rhodamine. Include in your histogram where you would set the gates for cell separation. (10%)



## 國立中山大學100學年度碩士班招生考試試題

科目：微生物學【生科系碩士班乙組選考】

一、選擇題（每題 2 分，每題請選出一個最恰當的答案）50%

- 1) A sexually transmitted disease is an example of  
A) Fomite. B) Vector. C) Droplet transmission. D) Direct contact.  
E) Vehicle transmission.
- 2) Normal microbiota of the adult vagina consist primarily of  
A) *Mycobacterium*. B) *Candida*. C) *Bacillus*. D) *Lactobacillus*. E) *Neisseria*.
- 3) Methane made from bacterial biomass is produced by  
A) Fermentation. B) The Krebs cycle. C) Photosynthetic algae. D) Oxidation.  
E) Anaerobic respiration.
- 4) The most common route of accidental AIDS transmission to health care workers is  
A) Needlestick. B) Mouth to mouth. C) Fecal—oral.  
D) Environmental surface contact. E) Aerosol.
- 5) What will happen if a bacterial cell is placed in distilled water with lysozyme?  
A) The cell will undergo osmotic lysis. B) No change will result; the solution is isotonic.  
C) The cell will plasmolyze. D) Water will leave the cell.  
E) Lysozyme will diffuse into the cell.
- 6) *Legionella* is transmitted by  
A) Vectors. B) Foodborne transmission. C) Person-to-person contact. D) Fomites.  
E) Airborne transmission.
- 7) Which of the following causes an infection of the liver?  
A) *Escherichia* B) Hepatitis A virus C) *Vibrio* D) *Shigella* E) *Salmonella*
- 8) Which of the following lacks a cell wall?  
A) *Clostridium* B) *Mycobacterium* C) *Mycoplasma* D) *Borrelia* E) *Nocardia*
- 9) During which growth phase will gram-positive bacteria be most susceptible to penicillin?  
A) Lag phase B) Log phase C) Stationary phase D) Death phase  
E) The culture is equally susceptible during all phases.
- 10) You have isolated a motile, gram-positive cell with no visible nucleus. You can safely assume that the cell  
A) Has a cell wall. B) Lives in an extreme environment. C) Has a mitochondrion.  
D) Has 9 pairs + 2 flagella. E) Has a nucleus.
- 11) The definition of lysogeny is  
A) Lysis of the host cell due to a phage. B) Phage DNA is incorporated into host cell DNA.  
C) When the burst time takes an unusually long time. D) The period during replication when virions are not present. E) Attachment of a phage to a cell.
- 12) The etiologic agent of chickenpox is  
A) Herpes zoster. B) Poxvirus. C) Parvovirus. D) HHV-6. E) Herpes simplex.

## 國立中山大學100學年度碩士班招生考試試題

科目：微生物學【生科系碩士班乙組選考】

- 13) Which of the following is **NOT** a chemical component of a bacterial cell wall?  
A) N-acetylmuramic acid    B) Cellulose    C) Teichoic acids    D) Peptidoglycan  
E) Peptide chains
- 14) Treatment for tetanus in an unimmunized person with a puncture wound is  
A) Tetanus immune globulin.    B) Penicillin.    C) Tetanus toxoid.    D) DTaP.  
E) Debridement.
- 15) Which of the following structures is **NOT** found in prokaryotic cells?  
A) Axial filament    B) Flagellum    C) Pilus    D) Cilium    E) Peritrichous flagella
- 16) *Escherichia coli* belongs to the  
A) Spirochetes.    B) Proteobacteria.    C) Gram-positive bacteria.    D) Green sulfur bacteria.  
E) Actinomycetes.
- 17) You advise your pregnant friend to give her cat away because  
A) She could get listeriosis.  
B) She could contract plague.  
C) She could give the cat tularemia.  
D) She could get toxoplasmosis.  
E) She could get salmonellosis
- 18) In which of the following animals would you expect to find a specialized organ that holds cellulose-degrading bacteria and fungi?  
A) Human    B) Wolf    C) Cat    D) Dog    E) Termite
- 19) Cyanobacteria are a type of  
A) Chemoheterotroph.    B) Photoautotroph.    C) Photoheterotroph.    D) Chemoautotroph.  
E) Auxotroph
- 20) Assume the two *E. coli* strains shown below are allowed to conjugate.  
Hfr: pro<sup>+</sup>, arg<sup>+</sup>, his<sup>+</sup>, lys<sup>+</sup>, met<sup>+</sup>, ampicillin-sensitive  
F: pro<sup>-</sup>, arg<sup>-</sup>, his<sup>-</sup>, lys<sup>-</sup>, met<sup>-</sup>, ampicillin-resistant  
What supplements would you add to glucose minimal salts agar to select for a recombinant cell that is lys<sup>+</sup>, arg<sup>+</sup>, amp-resistant?  
A) Lysine arginine  
B) Ampicillin, proline, histidine, lysine  
C) Proline, histidine, methionine  
D) Ampicillin, lysine, arginine  
E) Ampicillin, proline, histidine, methionine
- 21) The source of nutrients in nutrient agar is  
A) Peptone and beef extract.    B) Peptone and NaCl.    C) Nutrient.    D) Agar.  
E) Distilled water.
- 22) Which of the following is **NOT** a communicable disease?  
A) AIDS    B) Tetanus    C) Malaria    D) Typhoid fever    E) Tuberculosis

23) What type of immunity results from vaccination?

- A) Innate immunity
- B) Naturally acquired active immunity
- C) Naturally acquired passive immunity
- D) Artificially acquired active immunity
- E) Artificially acquired passive immunity

24) The bacteria contributing most of the bacterial biomass to soil are

- A) Actinomycetes.    B) Photoheterotrophs.    C) Chemoautotrophs.    D) Coliforms.
- E) Rhizobiaceae.

25) In the presence of penicillin, a cell dies because

- A) It lacks a cell membrane.    B) It lacks flagella.    C) It plasmolyzes.
- D) It undergoes osmotic lysis.    E) Its proteins had been denatured.

## 二、問答題 50%

1. 請詳細列出革蘭氏染色的步驟與細胞顏色變化（包括陽性菌與陰性菌）。（20%）
2. 敘述一個 (+) sense RNA 病毒的繁殖過程，請繪圖輔助說明。（15%）
3. 請畫出一個細菌的 growth curve，並註明各階段的英文名稱及 X-軸和 Y-軸的單位。（15%）

**一、 Please answer the following questions (100 points)**

1. Please explain the following terms: (30 points)

ABC model, acid growth hypothesis, ethylene triple response, morphogenesis, secondary metabolite, hypersensitive response, acquired resistance, dormancy, statocyte and statolith.

2. Please (a) draw the basic structure of a chloroplast and (b) mark or describe where the light reaction, Calvin cycle,  $H^+$ -ATPase pump, accumulated  $H^+$ , and electron transport system are located. (10 points)

3. Plants can absorb water and mineral nutrients from soil with root system, and transport them via stem xylem to leaves. Please explain the possible mechanisms involved in the transport. (10 points)

4. Please explain phototropism and the possible mechanisms in plants. (10 points)

5. The oil-containing seeds generally store the triacylglycerols in the oil body. When seeds germinate, the stored triacylglycerols can be metabolized and converted into sucrose for transport and seedling growth. Several steps located in different cellular compartments are involved. Please explain the process. (10 points)

6. Abscisic acid (ABA) plays important roles during seed development and maturation. (a) Please explain the main functions of ABA during seed development and maturation. (b) What are the characteristics or phenotypes of seeds likely affected in ABA-deficient mutants? (10 points)

7. Ethylene and auxin are two key regulators in leaf abscission. Please list and explain the steps of leaf abscission process. (10 points)

8. *Arabidopsis* plant is a facultative long-day plant, and transition from vegetative to reproductive growth is affected by photoperiod and vernalization. Please explain how these factors affect the reproductive transition and flowering. (10 points)

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科目：生態學【生科系碩士班丙組】

## I. 解釋名詞，共 20 分 (20%)

1. La Niña (5 分)
2. Phenotypic plasticity (5 分)
3. Green house gases (5 分)
4. Water use efficiency (5 分)

## II. 問答題，共 80 分 (80%)

5. Discuss at least four major factors in deep that will affect biodiversity. (20分)
6. Discuss four important characteristics of species that affect their potential rates of colonization and extinction. (20 分)
7. Explain why an invasive species represent a threat to native species. Discuss and give three examples of invasive species in Taiwan threatening the ecology of native species. (20分)
8. Discuss and give examples of bottom-up and top-down control in food chains. Design a series experiments to test these hypotheses. (20分)

## 國立中山大學100學年度碩士班招生考試試題

科目：植物分類學【生科系碩士班丙組選考】

一、請簡要敘述可以鑑定出下列各科的花果特徵。每小題 5 分，共 40 分。

1. 菊科 Compositae (Asteraceae) 。 5 分。
2. 景天科 Crassulaceae 。 5 分。
3. 十字花科 Cruciferae (Brassicaceae) 。 5 分。
4. 葫蘆(瓜)科 Cucurbitaceae 。 5 分。
5. 莎草科 Cyperaceae 。 5 分。
6. 殼斗科 Fagaceae 。 5 分。
7. 木蘭科 Magnoliaceae 。 5 分。
8. 錦葵科 Malvaceae 。 5 分。

二、請簡述下列各題中所列二名詞之間的區別。每小題 4 分，共 20 分。

1. 特徵 character, 特徵值 character state 。 4 分。
2. 分類 classification, 分類(學) taxonomy 。 4 分。
3. 正模式 holotype, 選定模式 lectotype 。 4 分。
4. 數量分類學 phenetics, 支序分類學 cladistics 。 4 分。
5. 同質的 homogeneous, 同源的 homologous 。 4 分。

三、請簡略描劃下列各題中所列之形態名詞。每小題 4 分，共 20 分。

1. 自由中央胎座 free-central placentation 。 4 分。
2. 穗狀花序 spike 。 4 分。
3. 鋸齒狀 serrate 。 4 分。
4. 二回羽狀複葉 bipinnate 。 4 分。
5. 二強雄蕊 didynamous 。 4 分。

四、請列出台灣自生之裸子植物五種(中文及學名)及其各自在台灣之地理及海拔分佈。20 分。

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科目：生物統計學【生科系碩士班丙組選考】

$\alpha=0.05$  for all tests. State hypothesis for each test.

1. The diameter of the biceps of people from vegetarian and normal diet groups was measured. Assume that the diameter is normally distributed and two groups with equal variances, test whether the diameter is the same between two groups. (15 pts.)

vegetarian group: 25.3, 25.5, 24.3, 18.5, 20.8

normal diet group: 22.5, 19.8, 27.5, 21.8, 23, 21.2

2. A randomized block design was conducted to test whether mean number of nests constructed is the same among three tern species. The two islands were assumed to form the block factor. Use an ANOVA table to test the hypothesis. (25 pts.)

Island	Roseate tern	Bridled tern	Crested tern
Baisa	159	60	75
Chisan	37	38	20

3. The ability for stair-climbing test is measured as times per minute. It probably can be predicted by man's age with a linear equation.

Climbing stairs	86	75	71	67	65	53
age	20	28	35	46	52	61

- Determine the equation of the least squares fitted line. (10 pts.)
- Test whether the regression coefficient is different from zero? (9 pts.)
- Compute the linear correlation coefficient. What does it mean? (10 pts.)
- Determine the coefficient of determination. What does it mean? (6 pts.)

4. A survey was conducted to assess the association between diabetic status and hypertension.

	Severe diabetic patients	Mild diabetic patients	Healthy subjects
Hypertension	210	100	130
Without hypertension	180	50	80

- Test whether there is association between diabetic status and hypertension. (15 pts.)
- What is the odds ratio of severe diabetic status (over healthy subjects) for a hypertension person compared with a person without hypertension? What does it mean? (10 pts.)

國立中山大學100學年度碩士班招生考試試題

科目：生物統計學【生科系碩士班丙組選考】

$P[T_v \leq t]$

$v$	.6	.75	.9	.95	.975	.99	.995	.999	.9995
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	318.317	636.607
2	0.289	0.816	1.886	2.920	4.303	6.965	9.925	22.327	31.598
3	0.277	0.765	1.638	2.353	3.182	4.541	5.841	10.215	12.924
4	0.271	0.741	1.533	2.132	2.776	3.747	4.604	7.173	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	5.893	6.869
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707	5.208	5.959
7	0.263	0.711	1.415	1.895	2.365	2.998	3.499	4.785	5.408
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355	4.501	5.041
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250	4.297	4.781
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169	4.144	4.587
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106	4.025	4.437
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055	3.930	4.318
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012	3.852	4.221
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977	3.787	4.140
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947	3.733	4.073

$P[F_{v_1, v_2} \leq f] = .90$

$v_2$	$v_1$									
	1	2	3	4	5	6	7	8	9	10
1	39.862	49.500	53.593	55.833	57.240	58.204	58.906	59.439	59.857	60.195
2	8.526	9.000	9.162	9.243	9.293	9.326	9.349	9.367	9.381	9.392
3	5.538	5.462	5.391	5.343	5.309	5.285	5.266	5.252	5.240	5.231
4	4.545	4.325	4.191	4.107	4.051	4.010	3.979	3.955	3.936	3.920
5	4.060	3.780	3.619	3.520	3.453	3.405	3.368	3.339	3.316	3.297
6	3.776	3.463	3.289	3.181	3.108	3.055	3.014	2.983	2.958	2.937
7	3.589	3.257	3.074	2.961	2.883	2.827	2.785	2.752	2.725	2.703
8	3.458	3.113	2.924	2.806	2.726	2.668	2.624	2.589	2.561	2.538
9	3.360	3.006	2.813	2.693	2.611	2.551	2.505	2.469	2.440	2.416
10	3.285	2.924	2.728	2.605	2.522	2.461	2.414	2.377	2.347	2.323
11	3.225	2.860	2.660	2.536	2.451	2.389	2.342	2.304	2.274	2.248
12	3.177	2.807	2.606	2.480	2.394	2.331	2.283	2.245	2.214	2.188
13	3.136	2.763	2.560	2.434	2.347	2.283	2.234	2.195	2.164	2.138
14	3.102	2.726	2.522	2.395	2.307	2.243	2.193	2.154	2.122	2.095
15	3.073	2.695	2.490	2.361	2.273	2.208	2.158	2.119	2.086	2.059
16	3.048	2.668	2.462	2.333	2.244	2.178	2.128	2.088	2.055	2.028
17	3.026	2.645	2.437	2.308	2.218	2.152	2.102	2.061	2.028	2.001
18	3.007	2.624	2.416	2.286	2.196	2.130	2.079	2.038	2.005	1.977
19	2.990	2.606	2.397	2.266	2.176	2.109	2.058	2.017	1.984	1.956
20	2.975	2.589	2.380	2.249	2.158	2.091	2.040	1.999	1.965	1.937

$P[\chi^2 \leq \chi^2]$

$v$	0.005	0.010	0.025	0.050	0.100	0.250	0.500	0.750	0.900	0.950	0.975	0.990	0.995
1	0.0000393	0.000157	0.000982	0.00393	0.0158	0.102	0.455	1.32	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	0.575	1.39	2.77	4.61	5.99	7.38	9.21	10.6
3	0.0717	0.115	0.216	0.352	0.584	1.21	2.37	4.11	6.25	7.81	9.35	11.3	12.8
4	0.207	0.297	0.484	0.711	1.06	1.92	3.36	5.39	7.78	9.49	11.1	13.3	14.9
5	0.412	0.554	0.831	1.15	1.61	2.67	4.35	6.63	9.24	11.1	12.8	15.1	16.7
6	0.676	0.872	1.24	1.64	2.20	3.45	5.35	7.84	10.6	12.6	14.4	16.8	18.5
7	0.989	1.24	1.69	2.17	2.83	4.25	6.35	9.04	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	5.07	7.34	10.2	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	5.90	8.34	11.4	14.7	16.9	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	6.74	9.34	12.5	16.0	18.3	20.5	23.2	25.2



## 國立中山大學100學年度碩士班招生考試試題

科目：昆蟲學【生科系碩士班丙組選考】

進行一個昆蟲學議題的研究所需要的不僅僅是課本上的粗淺知識，還需具備相當的實務常識與經驗，請在答案紙上(並非試題紙)上回答以下問題。答題時請留意文字表達的結構與嚴謹性，並配合有效的圖表說明。

1. 請說明除中山大學以外，在台灣進行昆蟲演化或行為生態學老師的姓名，所屬系所以及研究方向五名 (20%)
2. 請描述一個你經常造訪的昆蟲採集地點，說明其植被與昆蟲相之特色 (20%)
3. 請以一種內生翅群昆蟲為例說明你如何進行一個小研究評估其成蟲與幼蟲對棲地利用的差異？請清楚說明這個研究的背景、問題、假說、研究策略與預期成果 (30%)
4. 請於後列挑選三種昆蟲說明你將打算如何飼養管理以提供昆蟲生理相關研究所需之受試蟲源？(1) 薄翅蜻蜓 (2) 扁鍬形蟲 (3) 紋白蝶 (4) 小菜蛾 (5) 白蟻 (6) 舉尾蟻 (7) 蜚蠊 (8) 粉蝨 (9) 台灣大蝗 (10) 步行蟲 (30%)