

問答題 (100 分)

1. List two functions for each of the following biomolecules: (12 分)
 - (1) amino acids
 - (2) sugars
 - (3) fatty acids
 - (4) nucleotides
2. (1) List two types of column chromatography used to purify proteins. Describe how each separation method works. (2) How the protein purity is evaluated. (15 分)
3. Describe (1) the important features of protein tertiary structure and (2) the types of interactions that stabilize the tertiary structure of protein. (10 分)
4. The hydrolysis of ATP provides the free energy to drive a variety of endergonic biochemical reactions. Discuss (1) why ATP hydrolysis is so exergonic and (2) why ATP is ideally suited to its role as universal energy currency. (10 分)
5. Describe the important properties of enzymes. (12 分)
6. Metabolism, the sum of all chemical transformations taking place in a cell or organism, consists of two major processes. (1) What are they? (2) What function does each one process perform? (3) Give two examples of each process. (15 分)
7. The chemical coupling hypothesis failed to explain why mitochondrial membrane must be intact during ATP synthesis. (1) How does the chemiosmotic theory account for this phenomenon? (2) How does dinitrophenol inhibit ATP synthesis? (10 分)
8. Describe how an enzyme cascade amplifies an initial hormonal signal using glucagon promotes glycogenolysis as the example. (16 分)

1. 選擇題：請自下列 1-25 題各選擇題選出單一正確的答案。每題 2 分。

1. Which enzyme requires a primer?

- (A) RNA polymerase (B) DNA ligase (C) reverse transcriptase
(D) restriction enzyme (E) terminal transferase

2. What is the function of DNA polymerase γ (gamma)?

- (A) to unwind the DNA helix during replication
(B) to degrade damaged DNA molecules
(C) to rearrange the two DNA strands (one new and one old) after replication
(D) to add nucleotides to the end of a growing DNA strand in mitochondria
(E) to proof-reading the newly synthesized DNA strand in nucleus

3. Which of the following is true?

- (A) High humidity favors formation of Z form DNA.
(B) Methylation of cytosine and guanine is common in plants.
(C) Alternating purine and pyrimidine favors formation of B form DNA.
(D) Base pairing by complementary feature is only possible in DNA.
(E) None of the above.

4. In PCR experiment, which of the following DNA molecules would serve as a template for DNA synthesis and ensuing DNA amplification?

- (A) A double-stranded closed circle
(B) A single-stranded closed circle
(C) A double-stranded linear molecule with 3'-OH termini at each end
(D) A single-stranded closed circle base paired to a shorter linear strand with a 3'-OH terminus
(E) A single-stranded closed circle base paired to a shorter linear strand with a 3'-phosphate terminus

5. Translesion DNA synthesis is an important process in DNA replication of cells. Which of the following is not true?

- (A) Translesion DNA synthesis enables replication to continue across DNA damage.
(B) Translesion DNA synthesis has low error rate on DNA replication.
(C) Translesion DNA synthesis is catalyzed by the Y family of DNA polymerases.
(D) Translesion DNA synthesis occurs in eukaryotes only.
(E) None of the above.

6. In Southern blot or northern blot analysis, the radioactive-labeled probe is hybridized to the blot under high temperature condition in order to obtain nearly perfect complementarity of the target molecules.

- (A) true (B) false

7. Which of the following is the most common modification of the amino-terminal tails of the histones?

- (A) Acetylation (B) Methylation (C) Phosphorylation
(D) Ubiquitination (E) ADP-ribosylation

8. The excision repair of UV-induced DNA damage is defective in individuals suffering from

- (A) hereditary nonpolyposis colon cancer (B) Crohn's disease
(C) diabetes (D) xeroderma pigmentosum (E) Huntington's disease

9. Which of the following is the reason for occurring hypochromicity (decreased absorbance at 260 nm) during reannealing of two complementary DNA strands?

- (A) change of salt concentration (B) change of temperature (C) change of pH
(D) change of viscosity (E) change of base stacking status

10. What is the name of the enzyme responsible for doing the first step in initiation of DNA replication?

- (A) Primase (B) Helicase (C) Polymerase (D) Ligase (E) Exonuclease

11. Telomeres are composed of particular repeated DNA sequences and associated protein molecules. Most of the repeated sequence is the double-stranded DNA, but the very end is single stranded.

- (A) true (B) false

12. Which of the following is the most critical component for DNA sequencing by the chain-termination method?

- (A) dUTP (B) Taq DNA polymerase (C) dNTPs
(D) dCTP (E) ddNTPs

13. During DNA synthesis, the 3'-OH of the last nucleotide of the growing DNA strand mediates the nucleophilic attack which phosphate of an incoming nucleotide?

- (A) Alpha (B) Beta (C) Gamma (D) Delta (E) Sigma

14. Which of the following experiment can be used to introduce a directed mutation, for example a missense mutation, in a cloned DNA molecule?
- (A) PCR (B) electrophoresis (C) site-directed mutagenesis
(D) DNA hybridization (E) restriction enzyme digestion
15. Which of the following researchers was/were responsible for the discovery of how chromosomes are protected by telomeres and the enzyme telomerase?
- (A) Matthew Meselson, Franklin Stahl, and Erwin Chargaff
(B) Elizabeth Blackburn, Carol Greider, and Jack Szostak
(C) Oswald Avery, Maclyn McCarty, and Colin MacLeod
(D) Harald Hausen, Françoise Barre-Sinoussi, and Luc Montagnier
(E) Mario Capecchi, Martin Evans, and Oliver Smithies
16. Which of the following proteins does not "footprint" the *lac* operon control region?
- (A) lac repressor
(B) β -galactosidase
(C) RNA polymerase
(D) cAMP-CAP
17. Which of the following is the correct order of binding of general transcription factors to initiate transcription at RNA polymerase II promoters?
- (A) TFIID, TFIIB, Pol II, TFIIH
(B) PolII, TFIID, TFIIB, TFIIH
(C) TFIIB, PolII, TFIIH, TFIID
(D) TFIID, TFIIH, TFIIB, PolII
18. The chicken lysozyme gene is considered to be a solitary gene because
- (A) it contains no introns.
(B) it is not present on a chromosome.
(C) it is represented only once in the haploid genome.
(D) none of the above
19. Which of the following is not a mobile DNA element?
- (A) transposon
(B) long terminal repeats (LTR)
(C) long interspersed elements (LINES)
(D) insertion sequence (IS) elements

國立中山大學99學年度碩士班招生考試試題

科目：分子生物學【生科系碩士班甲組選考、乙組選考】

20. All the following statements about heterochromatin except
- (A) It is a dark-staining area of a chromosome.
 - (B) It is usually transcriptionally active.
 - (C) It is often simple sequence DNA.
 - (D) It is a region of condensed chromatin.
21. A mutation in one gene that counteracts the effects of a mutation in another gene is known as a _____.
- (A) temperature-sensitive mutation.
 - (B) recessive mutation.
 - (C) conditional mutation.
 - (D) suppressor mutation.
22. All the following statements about λ phage are true except:
- (A) λ phage lyse *E. coli* upon release of newly synthesized phage.
 - (B) Foreign DNA up to approximately 50 kilobases can be cloned into λ phage.
 - (C) Both cDNA and genomic DNA can be cloned into λ phage.
 - (D) λ Phage consists of a head and tail region.
23. In the large-scale production of a particular human protein in *E. coli* cells, the cDNA corresponding to the protein was modified so that the expressed protein would have six histidine residues at the C-terminus. The purpose of this modification was
- (A) to facilitate transfer of the cDNA into the *E. coli* cells.
 - (B) to provide a promoter for the transcription of the cDNA in *E. coli*.
 - (C) to facilitate purification of the expressed protein through binding to an affinity column containing chelated nickel atoms.
 - (D) to prevent degradation of the expressed protein by *E. coli* proteases.
24. What method can be used to functionally inactivate a gene without altering its sequence?
- (A) gene knockout
 - (B) RNA interference
 - (C) dominant negative mutation
 - (D) b and c

25. Which codon serves as the start codon in mRNA for translation?

- (A) ATG
- (B) AUG
- (C) UGA
- (D) UGG

II. 配合題：下列 26~30 題各題 請自右列 A~E 選出一個最相關之答案。每題 2 分。

- | | |
|--|----------------------------------|
| 26. Topoisomerases | A. Transcriptional silencing |
| 27. Most of acetylation of histone tails | B. Retrotransposons |
| 28. Photoreactivation | C. Excision repair |
| 29. Telomerase | D. Transcriptional activation |
| 30. LINE and SINE | E. Relax supercoiled DNA |
| | F. DNA-mediated transposition |
| | G. Direct reversal of DNA damage |
| | H. Inactivated in cancer cells |
| | I. Activated in cancer cells |

III. 問答題：

1. "If it is conserved, it must be important" is a concept that is critical in comparative genomics. How would you explain this concept in terms of molecular biology by using an example? (10 points)
2. Define the terms cis-acting DNA sequences and trans-acting proteins and deduce the experiments that you will conduct to prove their existence. (10 points)
3. Describe the A, P, and E sites of the ribosome. Where are they located? What occupies each of the sites during the following stages of translation: (2 points for each)
 - (a) upon creation of the 70s initiation complex
 - (b) after an initial round of peptidyl transfer, prior to aminoacyl tRNA binding
 - (c) following aminoacyl tRNA binding, but before the peptidyl transfer reaction
 - (d) after peptidyl transfer, but before translocation is completed by EF-G
 - (e) in the presence of puromycin, prior to peptidyl transfer
4. Describe in detail how prokaryotic RNA polymerase holoenzyme works in transcription, includes in your answer the domains or structures important or critical for each process of RNA transcription. (10 points)

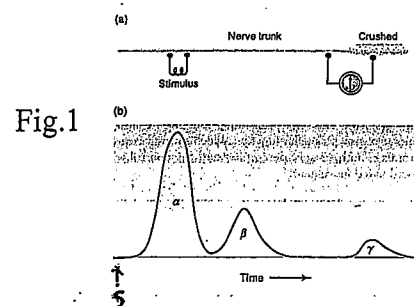
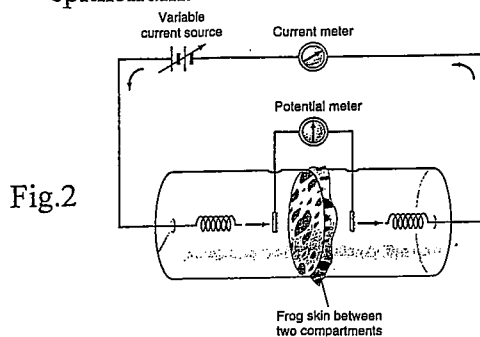
國立中山大學99學年度碩士班招生考試試題

科目：動物生理學【生科系碩士班甲組選考】

1. Describe techniques to measure functional lung capacity (FRC) of human beings and explain the physiological rules of FRC. (10%)
2. List all the lung capacities and lung volumes that can be measured by a conventional Spirometry.(10%)
3. Explain the mechanisms of the releasing and the action of ADH (antidiuretic hormone). (10%)
4. Discuss the factors that may affect cardiac output of human subjects. (10%)
5. Contrast sympathetic and parasympathetic systems in terms of (20%)
 - a). the origin of preganglionic outflow
 - b). location of ganglia
 - c). distribution of postganglionic fibers
 - d). neurotransmitters for preganglionic and postganglionic neurons
 - e). effects of these nerves, if been stimulated properly, on heart rates and blood pressure.
6. Describe the pathway that converts light signals (illumination of the photoreceptor such as rod cells in the dark) into action potentials in the optic nerves. (10%)
7. Fig.1 is a schematic representation of an experimental setup for (a) stimulating and (b) recording from a nerve (such as a sciatic nerves of a rodent) (15%)
 - a). what is the origin of the compound action potential in graph (b)
 - b). Explain why the three peaks in graph (b) appear at different times even though the nerve received only a single stimulation.
 - c). Explain why the amplitude of the three peaks in graph (b) are different

Fig. 1

8. Ussing chamber technique has been used for many years to demonstrate active transport of Na^+ across an epithelium. Fig.2 shows schematically the experimental setups. (15%)
 - a). what is the use of the variable current sources shown in the graph
 - b). what would be the potential difference (PD) across the epithelium after balance.
 - c). what would the PD be affected when Ouabain, which blocks Na/K ion pump, was applied to one side of the skin epithelium.
 - d). what would the PD be affected when amiloride, a potent diuretic agent, was applied to one side of the skin epithelium.
 - e). Please list evidences, based on the Ussing chamber experiments, that may support the hypothesis of the active transport of Na ions through the skin epithelium.



國立中山大學99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】

1. Compare and contrast **aerobic respiration, fermentation, and anaerobic respiration.** (25%)

2. Define the follow terms:
 - (1) Retrovirus (5%)
 - (2) Adenovirus (5%)
 - (3) T4 phages (5%)
 - (4) Viroids (5%)
 - (5) Prions (5%)

3. Draw a figure of **nitrogen cycle.** Identify where the following processes occur: **ammonification, decomposition, denitrification, nitrification, nitrogen fixation.** Name at least one bacterium responsible for each process. (25%)

4. List a table to compare and contrast bacterial **endotoxin** and **exotoxin.** (25%)

一、 Please explain the following terms (30 points)

(1) aerenchyma (2) thigmotropism (3) allelopathy (4) pericycle (5) systemic acquired resistance (6) embryo sac (7) phototropin (8) phyllotaxy (9) oleosome (10) elicitor

二、 Please answer the following questions (70 points)

1. Please describe the photosynthesis of C_4 and explain why it has higher CO_2 fixation and less photorespiration compared to C_3 plants under arid conditions. (10 points)
2. Plants can synthesize photosynthate, organic compounds and plant growth regulators, and transport them from source to sink areas via phloem. Please explain the possible mechanism involved in the transport. (10 points)
3. Please explain the possible mechanism of auxin polar transport, which results in auxin gradient distribution from shoot tip to the root. (10 points)
4. Floral organ formation is regulated by many different developmental genes and can be predicted from ABC model proposed in *Arabidopsis*. (A) Please explain how the different classes A, B and C genes interact to affect floral organ formation. (B) Please predict the possible floral organ(S) affected when mutated in class A, class B, or class C genes, respectively. (10 points)
5. During barley seed germination, plant growth regulator GA plays a key role and is associated with macromolecular storage reserve breakdown into small molecules for seedling growth. Please describe and explain the procedure of barley seed germination after imbibition. (10 points)
6. Flooding is a serious problem in agriculture. When plant roots in the soil are exposed to flooding, one of the quick responses in leaves is epinasty. Please explain epinasty and the possible mechanism. (10 points)
7. In *Arabidopsis*, ABA plays a key role involved in normal development and environmental stress responses. Please (a) list 5 examples that ABA is involved and plays a key role in these events, and (b) briefly explain how their phenotypes are affected in ABA deficient or insensitive mutants. (10 points)

國立中山大學99學年度碩士班招生考試試題

科目：生態學【生科系碩士班丙組】

I. 解釋名詞，共 20 分 (20%)

1. Filter effect (5 分)
2. Intermediate disturbance hypothesis (5 分)
3. Compensation depth (5 分)
4. Production efficiency (5 分)

II. 問答題，共 80 分 (80%)

5. Explain why the minimum viable population size varies greatly among species. (20分)
6. Illustrate three types of survivorship curves and give examples of each. What factors cause the three different types to appear in nature? (20分)
7. Explain the differing roles of fundamental niches and species interactions in controlling community structure. (20分)
8. Describe the process of succession of heterotrophic organisms associated with decomposition of a fallen tree. (20分)

國立中山大學99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、解釋名詞（十小題，每小題4分，共40分）

1. actinomorphic (4分)
2. androecium (4分)
3. apomorphy (4分)
4. herbarium (4分)
5. homoplasy (4分)
6. inflorescence (4分)
7. palynology (4分)
8. paraphyly (4分)
9. sympetalous (4分)
10. multiple fruit (4分)

簡答題（每題15分，共60分）

- 二、請討論台灣的植物與鄰近地區的關係。(15分)
- 三、請敘述並討論 Linnaeus 的分類系統與影響。(15分)
- 四、請敘述並討論單子葉植物與雙子葉植物的區別。(15分)
- 五、請敘述如何建構支序樹 (cladogram)。(15分)

國立中山大學99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】

- The body lengths (cm) of fish *Lutjanus argentimaculatus* caught were measured as follows: 21.0, 22.3, 24.0, 19.2, 25.0, 24.0. Determine
 - the mean, median, standard deviation, coefficient of variation, and range. (5 pts)
 - the 95% confidence interval of the mean. (5 pts)
- The body length (cm) of an amphipod is normally distributed with mean of 5 and standard deviation of 1.
 - What proportion of body length of this population is 5.4 cm or shorter? (5 pts)
 - What is the probability of an amphipod randomly selected with a length between 4.5 and 4.8 cm? (5 pts)
- If $\bar{x}_1 = 16$, $s_1 = 3$, $n_1 = 9$; $\bar{x}_2 = 11$, $s_2 = 1$, $n_2 = 11$:
 - test the null hypothesis that the variances of the sampled populations are the same. (10 pts)
 - test the hypothesis $H_0: \mu_1 = \mu_2$ vs. $H_A: \mu_1 > \mu_2$. $\alpha = 0.05$ (10 pts)
- The following data are number of fertilized wasps in the flowers of three species of fig tree. Test the null hypothesis that the number of wasps is the same among the three species. (20 pts)

	<i>F. erecta</i>	<i>F. askeotsang</i>	<i>F. microcarpa</i>
	8	15	19
	10	16	20
	11	14	16
	9	15	14

- The following are the body weights and lengths of snake *Amphiesma miyajimae*.

Sample no.	1	2	3	4	5
Length (X)	50.0	52.0	48.0	60.0	58.0
Weight (Y)	5.0	4.0	3.8	6.2	6.0

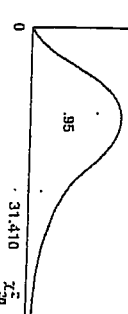
- Regression coefficients; $a = \underline{\hspace{2cm}}$, $b = \underline{\hspace{2cm}}$ (10 pts)
 - Test whether $\beta = 0$. (10 pts)
 - What is the proportion of variation that can be explained by the regression line? (5 pts.)
- A sample of 360 patients examined for SNP genotypes are shown below. Test whether the SNP groups should follow a 1:1:1 ratio. (15 pts.)

SNP	A	B	C
	180	150	130

國立中山大學99學年度碩士班招生考試試題

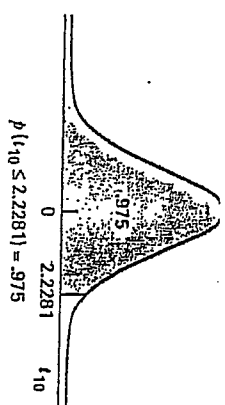
科目：生物統計學【生科系碩士班丙組選考】

TABLE F Percentiles of the Chi-Square Distribution



$P(\chi^2_{df} \leq 31.410) = 0.95$

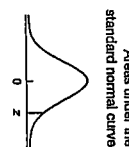
d.f.	$\chi^2_{0.95}$	$\chi^2_{0.90}$	$\chi^2_{0.85}$	$\chi^2_{0.80}$	$\chi^2_{0.75}$	$\chi^2_{0.70}$	$\chi^2_{0.65}$	$\chi^2_{0.60}$	$\chi^2_{0.55}$	$\chi^2_{0.50}$	$\chi^2_{0.45}$	$\chi^2_{0.40}$	$\chi^2_{0.35}$	$\chi^2_{0.30}$	$\chi^2_{0.25}$	$\chi^2_{0.20}$	$\chi^2_{0.15}$	$\chi^2_{0.10}$	$\chi^2_{0.05}$	$\chi^2_{0.025}$	$\chi^2_{0.01}$	$\chi^2_{0.005}$
1	0.000993	0.000992	0.000993	2.706	3.841	5.024	6.635	7.879	9.210	10.597	12.017	13.442	14.860	16.277	17.535	18.808	20.090	21.315	22.538	23.685	24.786	25.835
2	0.100	0.210	0.300	4.605	5.991	7.378	8.901	10.597	12.401	14.449	16.277	18.009	19.778	21.565	23.200	24.779	26.296	27.655	29.191	30.578	31.924	33.182
3	0.071	0.352	0.454	6.251	7.815	9.348	11.143	12.838	14.698	16.765	18.475	20.278	22.041	23.828	25.564	27.204	28.902	30.578	32.191	33.924	35.564	37.156
4	2.07	4.04	5.41	7.779	9.488	11.143	13.277	15.086	16.750	18.475	20.278	22.041	23.828	25.564	27.204	28.902	30.578	32.191	33.924	35.564	37.156	38.582
5	0.412	0.831	1.145	9.236	11.070	12.832	15.086	16.812	18.548	20.315	22.154	24.000	25.790	27.554	29.316	31.054	32.801	34.554	36.191	37.782	39.316	40.756
6	0.676	1.297	1.685	10.645	12.592	14.449	16.812	18.548	20.278	22.041	23.828	25.564	27.204	28.902	30.578	32.191	33.924	35.564	37.156	38.582	40.000	41.401
7	0.989	1.680	2.167	12.017	14.067	16.013	18.475	20.278	22.041	23.828	25.564	27.204	28.902	30.578	32.191	33.924	35.564	37.156	38.582	40.000	41.401	42.782
8	1.344	2.180	2.783	13.362	15.507	17.535	19.979	22.041	23.828	25.564	27.204	28.902	30.578	32.191	33.924	35.564	37.156	38.582	40.000	41.401	42.782	44.154
9	1.735	2.700	3.325	14.684	16.919	19.023	21.666	23.589	25.188	26.757	28.301	29.819	31.319	32.768	34.204	35.654	37.156	38.582	40.000	41.401	42.782	44.154
10	2.156	3.166	3.816	15.987	18.307	20.483	23.029	24.779	26.180	27.688	29.191	30.654	32.119	33.564	35.000	36.415	37.801	39.179	40.538	41.882	43.216	44.538
11	2.603	3.247	3.940	17.275	19.675	21.920	24.725	26.757	28.301	29.819	31.319	32.768	34.204	35.654	37.156	38.582	40.000	41.401	42.782	44.154	45.500	46.815
12	3.074	3.816	4.575	18.599	21.026	23.336	26.217	27.901	29.538	31.154	32.654	34.119	35.564	37.000	38.415	39.801	41.179	42.538	43.882	45.216	46.538	47.815
13	3.565	4.404	5.226	19.812	22.362	24.736	27.688	29.819	31.319	32.768	34.204	35.654	37.156	38.582	40.000	41.401	42.782	44.154	45.500	46.815	48.119	49.415
14	4.075	5.009	5.892	21.064	23.685	26.119	29.141	31.319	32.768	34.204	35.654	37.156	38.582	40.000	41.401	42.782	44.154	45.500	46.815	48.119	49.415	50.715
15	4.601	5.682	6.571	22.307	24.996	27.488	30.578	32.801	34.204	35.654	37.156	38.582	40.000	41.401	42.782	44.154	45.500	46.815	48.119	49.415	50.715	52.015



Values of $F_{\alpha, p, q}$

Degrees of freedom for denominator	Degrees of freedom for numerator																									
	1	2	3	4	5	6	7	8	9	10	12	15	20	1	2	3	4	5	6	7	8	9	10	12	15	20
1	151	200	216	225	230	234	237	239	241	242	244	246	248	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4
2	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4	10.1	9.35	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66
3	10.1	9.35	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.56	
4	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.56	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.87		
5	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.87	5.39	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.44		
6	5.39	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.44	5.12	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.15		
7	5.12	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.15	4.86	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.77		
8	4.86	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.77	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.65		
9	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.65	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.54		
10	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.54	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.66	2.60	2.46		
11	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.66	2.60	2.46	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.39		
12	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.39	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.33		
13	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.33	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.48	2.42	2.28		
14	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.48	2.42	2.28	4.45	3.59	3.20	2.97	2.81	2.70	2.62	2.55	2.49	2.44	2.38	2.23		
15	4.45	3.59	3.20	2.97	2.81	2.70	2.62	2.55	2.49	2.44	2.38	2.23	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.45	2.40	2.34	2.19		
16	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.45	2.40	2.34	2.19	4.38	3.52	3.13	2.90	2.74	2.63	2.55	2.48	2.42	2.37	2.31	2.16		
17	4.38	3.52	3.13	2.90	2.74	2.63	2.55	2.48	2.42	2.37	2.31	2.16	4.35	3.49	3.10	2.87	2.71	2.60	2.52	2.45	2.39	2.34	2.28	2.12		
18	4.35	3.49	3.10	2.87	2.71	2.60	2.52	2.45	2.39	2.34	2.28	2.12	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.26	2.10		
19	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.26	2.10	4.30	3.44	3.05	2.82	2.66	2.55	2.47	2.40	2.35	2.30	2.24	2.07		
20	4.30	3.44	3.05	2.82	2.66	2.55	2.47	2.40	2.35	2.30	2.24	2.07														

TABLE II (cont.) Areas under the standard normal curve



d.f.	$f_{.90}$	$f_{.95}$	$f_{.975}$	$f_{.99}$	$f_{.995}$
1	3.078	6.3138	12.706	31.821	63.657
2	1.886	2.9200	4.3027	6.965	9.9248
3	1.638	2.3534	3.1825	4.541	5.8409
4	1.533	2.1318	2.7764	3.747	4.6041
5	1.476	2.0150	2.5706	3.365	4.0321
6	1.440	1.9432	2.4469	3.143	3.7074
7	1.415	1.8946	2.3646	2.998	3.4954
8	1.397	1.8559	2.3060	2.896	3.3554
9	1.383	1.8331	2.2632	2.821	3.2498
10	1.372	1.8125	2.2281	2.764	3.1693
11	1.363	1.7959	2.2010	2.718	3.1058
12	1.356	1.7823	2.1788	2.681	3.0545
13	1.350	1.7709	2.1604	2.650	3.0123
14	1.345	1.7613	2.1448	2.624	2.9768
15	1.341	1.7530	2.1315	2.602	2.9467
16	1.337	1.7459	2.1199	2.583	2.9208
17	1.333	1.7396	2.1098	2.567	2.8982
18	1.330	1.7341	2.1009	2.552	2.8784
19	1.328	1.7291	2.0930	2.539	2.8609
20	1.325	1.7247	2.0860	2.528	2.8453

Second decimal place in z

z	Second decimal place in z									
	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7421	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289				

國立中山大學99學年度碩士班招生考試試題

科目：脊椎動物學【生科系碩士班丙組選考】

20分，每題1分。

- ___ 1. Which of the following practice internal fertilization?
a. Salamndridae b. Hynobidae c. Cryptobranchidae d. Sirenidae
- ___ 2. Which moves as fold-and extension progression?
a. salamanders b. frogs c. caecilians d. news
- ___ 3. Which would deposit eggs underground?
a. salamanders b. toads c caecilians d. frogs
- ___ 4. Which is false about reptiles?
a. epidermal scales b. no gills c. two occipital condyle d. internal fertilization
- ___ 5. Which is true about the lizards?
a. four limbs in most species b. no external ear opening c. no eyelids d. tails short
- ___ 6. Which of the following has a tail not fragile?
a. geckos b. skinks c. anguid lizards d. agamids
- ___ 7. Which has vestigial hind limbs?
a. blind snakes b. colubrines c. vipers d. boas
- ___ 8. The snakes in the family ___ have tubular hinged fangs.
a. Hydrophiidae b. Elapidae c. Viperidae d. Pythonidae
- ___ 9. ___ group includes an ancestor and some but not all of its descendants.
a. Monophyletic b. Paraphyletic c. Polyphyletic d. none of the above
- ___ 10. Jones described a species *Mus leucopus* in 1890 and Smith describe another species also as *Mus leucopus* in 1899. Which of the following is ture?
a. *Mus leucopus* Smith, 1899 is a junior homonym.
b. *Mus leucopus* Smith, 1899 is a senior synonym.
c. *Mus leucopus* Jones, 1890 is a junior homonym.
d. *Mus leucopus* Jones, 1890 is a junior synonym.

1. Distiguish the following terms: holotype, type series, neotype, syntype, paratype. (10%)
2. Distinguish the mating system of monogamy, polygyny and polyandry. (9%)
3. Describe the morphology and function of the following feathers: contour feathers, down feathers, semiplumes, bristles. (12%)
4. a. Differentiate between digitgrade and plantigrade. Give one animal as an example of each. (8%)
b. Describe the following glandular structures in mammals: Sebaceous glands, apocrine glands, sweat glands and mammary glands. (8%)
5. Distinguish the following terms: antlers, true horns, and hair horns. What kinds of animals are associated with each of the above? (12%)
6. Compare the heart structure of mammals, reptiles and amphibians. (15%)
7. Explain the following terms: anadromous, ganoid scales, heterocercal tail, leptocephalus larvae, adipose fin, mesopelegic, spines, Webrian apparatus. (16%)

國立中山大學99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】

答題建議：

1. 本試卷僅有一大題，總分 100 分，請詳閱題意，並留意作答文字中對議題、策略、預測、與結果陳述的邏輯性與文字的精確性。
2. 若能引用或引述您曾經讀過的書籍文獻來佐證您的看法尤佳(不需詳列文獻來源)
3. 建議以圖表來協助文字的表達
4. 本科目的出題用意在於檢驗考生是否有成為研究生的潛力，而非在大學背了多少的高考用題庫

題目：

紫斑蝶與青斑蝶的遷徙與越冬生態在近 10 年來已經成功地吸引學術界與在地保育投入大量人力進行教育宣導與監測活動。然而無論是紫斑蝶與青斑蝶的標放與監測都將面臨科學的檢驗，請就您對昆蟲學、生態學、保育生物學、遺傳學及演化學的理解，回答以下問題：

- A. 若族群遺傳研究結果顯示，台灣產的青斑蝶(*Parantica sita nipponica*)具有遷飛與不遷飛的族群，請問您認為有什麼樣的假說可能可以解釋這樣的現象？(註：根據目前的分類處理，台灣產的青斑蝶與日本、朝鮮半島產者屬於同一亞種，原名亞種 *P. sita sita* 產於中國東南至西南部)(20%)
- B. 經過多年標放研究結果顯示在台灣可採獲來自日本的個體，而在日本也可採獲來自台灣的青斑蝶個體。請問您認為這樣的結果是否即可證實青斑蝶具有季節性的遷徙(seasonal migration)？若是，請問為什麼？若否，又請問是為什麼？(20%)
- C. 承上題，若這些在異地被重新採獲的個體皆為雄性，請問您認為有什麼樣的假說可能解釋此種現象呢？(註：雌雄在體型與翅型上均無顯著差異)(20%)
- D. 許多學者與民間團體疾呼保育紫斑蝶的越冬地點，然而紫斑蝶卻又不在紫蝶谷內繁殖，且紫蝶谷的位置年年不同。請問您認為什麼樣的保育政策較適合這類型的生物？(例如保護區的劃設、棲地保育、遷徙廊道的維持等)(20%)
- E. 若多種斑蝶在越冬時集體共同棲息於一個蝴蝶谷中，但卻又未見雜交的現象，請問您認為牠們之間的生殖隔離可能由什麼機制所貢獻與維持？(假設每一種紫斑蝶與青斑蝶的性費洛蒙皆相同，但性費洛蒙所在位置不同)(20%)