※ 注意：全部題目均請作答於試卷內之「非選擇題作答區」，請標明題號依序作答。

Part I:

（一）簡答題：(共 40 分)

Question 1 – 10. A herpetologist surveyed five islands (A – E) at a southeastern Asia region, and found several species of lizards (species 1 – 8) on each. He estimated population size of each species, and summarized his data in table 1. Please use the table to answer the following questions.

Table 1. Population sizes of 8 species of lizards on 5 islands.

	1	2	3	4	5	6	7	8
A	480	363	726	242	726	243	364	121
B	484	602	606	485	603	0	486	481
C	600	0	482	362	487	122	604	0
D	605	0	607	0	365	0	479	0
E	241	0	0	0	483	0	120	0

1. Which island has the highest species richness? Please explain. (3 分)

2. Which island has the highest species evenness? Please explain. (3 分)

3. Please use the data set to explain alpha, beta, & gamma diversity. (6 分)

4. Which island is likely the smallest one? Please explain. (3 分)

5. Which island is likely the closest in distance to a continent? Please explain. (3 分)

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6. Please show graphically the model of island biogeography as proposed by MacArthur and Wilson (1967). (5 分)

7. Please explain the model of island biogeography as proposed by MacArthur and Wilson (1967). (6 分)

8. Are species 1, 2, 3 more likely a habitat specialist or habitat generalist? Please explain. (3 分)

9. Which species is most likely to become endangered? Please explain. (3 分)

10. The herpetologist visited island F, and wanted to estimate the population size of species 5. He captured and marked 100 individuals. One month later, he revisited, and captured 75 individuals. Among them, 25 were marked individuals. Please estimate the population size. Show your work. (5 分)

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（二）單選題：(每題 2 分，共 10 分)

11. Which two biomes are the most similar with regard to rainfall?
(A) tundra and taiga
(B) tundra and desert
(C) rain forest and savanna
(D) temperate forest and prairie

12. In a population of elk, two males will use their antlers to fight over available females. This is an example of:
(A) scramble competition
(B) exploitative competition
(C) interspecific competition
(D) contest competition

13. Population A has a reproductive rate of 4 per year, Population B has a reproductive rate of 2 per year. Population A has a life span of 4 years, population B has a life span of 10 years. Assuming they are reproductively capable all the years of their life, which has the greater biotic potential?
(A) Population A
(B) Population B
(C) Both are equal
(D) cannot be determined

14. In the nitrogen cycle, the term "denitrification" refers to
(A) the conversion of ammonia into nitrogen
(B) the conversion of nitrogen into ammonia
(C) the conversion of nitrates into nitrogen gas
(D) the conversion of nitrogen gas into nitrates

15. Which of the following cannot be recycled on the Earth?
(A) nitrogen
(B) carbon
(C) water
(D) energy

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Part II:

（三）配合題：將最適合左邊解釋的名詞，從右邊選出(20 分，每題兩分)

1. Nonrandom changes in allele frequencies that occur due to differing reproductive success
2. Random changes in allele frequencies that occur due to chance
3. The evolution of a function for a gene than the one it was originally adapted for
4. certain alleles of each gene are inherited together more often than would be expected by chance
5. accumulation of deleterious mutations in a small population in the absence of sexual reproduction.
6. over-representation of a "favored" codon for a given amino acid in a genetic sequence, relative to other synonymous codons
7. a trait within a population is the proportion of observable differences in a trait between individuals within a population that is due to genetic differences
8. the occurrence of two (or more) phenotypic effects caused by the same allele, one of which is beneficial early in life, and the other detrimental late in life
9. movement of genes from one species to another
10. the ability of a population of organisms to not merely generate genetic diversity, but to generate adaptive genetic diversity, and thereby evolve through natural selection

A. Norm of Reactions
B. Selection
C. Gene pool
D. Muller's ratchet
E. Heritability
F. Punctuated equilibria
G. Antagonistic pleiotropy
H. Non-coding pseudogene
I. Genetic drift
J. Concerted evolution
K. Co-option
L. Endosymbiosis
M. Red Queen Hypothesis
N. Linkage equilibrium
O. Evo-devo
P. Codon bias
Q. Senescence
R. Zygomorphy
S. Horizontal gene transfer
T. Genetic assimilation
U. Evolvabilty
V. Homoplasy
W. Macroevolution

（四）名詞解釋(對比每組名詞) Briefly contrast the following pairs of terms. (12 分每題 4 分)

1. Floral ABC model/ Homeobox gene
2. Phylogeography / Phylogeny
3. Vicariance / Sympatry

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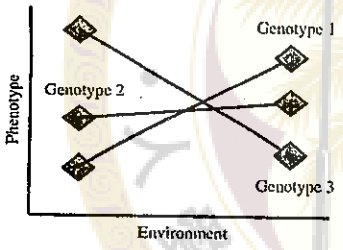
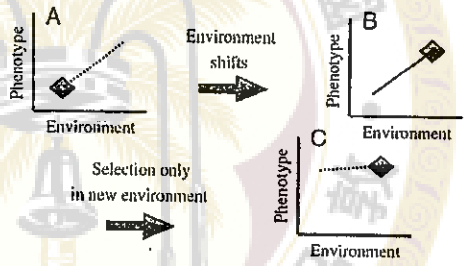
（五）簡答題（18 分）

1. 由下方左圖中三個個體（菱形）的外表型改變與環境交互作用分析看來，你可以列出哪些演化生物學英文名詞或理論來解釋這個現象（5 分）？根據你列出的這些名詞或衍生出的理論，如何來解釋下右圖這個現象？（5 分）

左圖



右圖



2. 對於基因如何影響外表形態變異，有兩派學說：一派認為是基因的 protein-coding sequence 差異調控形態，另一派認為是基因的 noncoding regulatory sequences 控制。請提出你支持哪一派學者的論點理由？（8 分）

試題隨卷繳回