

國立彰化師範大學 99 學年度碩士班招生考試試題

系所：生物學系

組別：甲組

科目：演化學

☆☆請在答案紙上作答☆☆

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壹、單選題：共 30%，每題 2%

1. The two theories combined in the synthetic theory of evolution, or neo-Darwinism, are
 - a) Evolution and natural selection
 - b) Natural selection and blending inheritance
 - c) Natural selection and adaptation
 - d) Natural selection and Mendelian inheritance
2. What kind of change has occurred in the brain size of humans?
 - a) Allometric
 - b) Heterochronic
 - c) Macromutational
 - d) Speciation
3. Which of the following terms or structures is properly associated only with animals?
 - a) autotrophy
 - b) cell wall
 - c) Hox genes
 - d) sexual reproduction
4. Which definition of evolution would have been most foreign to Charles Darwin during his lifetime?
 - a) change in gene frequency in gene pools
 - b) descent with modification
 - c) the gradual change of a population's heritable traits over generations
 - d) populations becoming better adapted to their environments over the course of generations
5. DNA sequences in many human genes are very similar to the sequences of corresponding genes in chimpanzees. The most likely explanation for this result is that
 - a) humans and chimpanzees share a relatively recent common ancestor
 - b) humans evolved from chimpanzees
 - c) chimpanzees evolved from humans
 - d) convergent evolution led to the DNA similarities
6. Which of these is the smallest unit that natural selection can change?
 - a) an individual's genome
 - b) an individual's phenotype

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- c) a species' gene frequency
 - d) a population's gene frequency
7. Which of these variables is likely to undergo the largest change in value as the result of a mutation that introduces a brand-new allele into a population's gene pool at a locus that had formerly been fixed?
- a) Average heterozygosity
 - b) Average number of loci
 - c) Geographic variability
 - d) Nucleotide variability
8. If the half-life of carbon-14 is about 5,730 years, then a fossil that has one-sixteenth the normal proportion of carbon-14 to carbon-12 should be about how many years old?
- a) 11,200
 - b) 16,800
 - c) 22,400
 - d) 28,000
9. If, someday, an archaean cell is discovered whose SSU-rRNA sequence is more similar to that of humans than the sequence of mouse SSU-rRNA is to that of humans, the best explanation for this apparent discrepancy would be
- a) homology
 - b) homoplasy
 - c) common ancestry
 - d) co-evolution of humans and that archaean
10. A phylogenetic tree that is "rooted" is one
- a) that extends back to the origin of life on Earth
 - b) at whose base is located the common ancestor of all taxa depicted on that tree
 - c) that illustrates the rampant gene swapping that occurred early in life's history
 - d) that indicates our uncertainty about the evolutionary relationships of the taxa depicted on the tree
11. Which of the following pairs are the best examples of homologous structures?
- a) bat wing and human hand
 - b) owl wing and hornet wing

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- c) porcupine quill and cactus spine
 - d) bat forelimb and bird wing
12. Which mutation should least require realignment of homologous regions of a gene that is common to several related species?
- a) 1-base deletion
 - b) 1-base duplication
 - c) 1-base insertion
 - d) 1-base substitution
13. A rapid method of speciation that has been important in the history of flowering plants is
- a) a mutation in the gene controlling the timing of flowering
 - b) behavioral isolation
 - c) genetic drift
 - d) polyploidy
14. Speciation
- a) can involve changes involving a single gene
 - b) occurs at such a slow pace that no one has ever observed the emergence of new species
 - c) occurs only by the accumulation of genetic change over vast expanses of time
 - d) must begin with the geographic isolation of a small, frontier population
15. Each of the following has a better chance of influencing gene frequencies in small populations than in large populations, but which one most consistently requires a small population as a precondition for its occurrence?
- a) Genetic drift
 - b) Natural selection
 - c) Non-random mating
 - d) Mutation

貳、看圖回答下列問題（共 20%）：

1. 按照原文 Figure A 的相對位置，將中文專有名詞填入 Figure B 的空格（每格 0.5%，共 5%）；
2. 請盡可能詳盡地說明 Figure B 的內容和其所呈現的意義（15%）。

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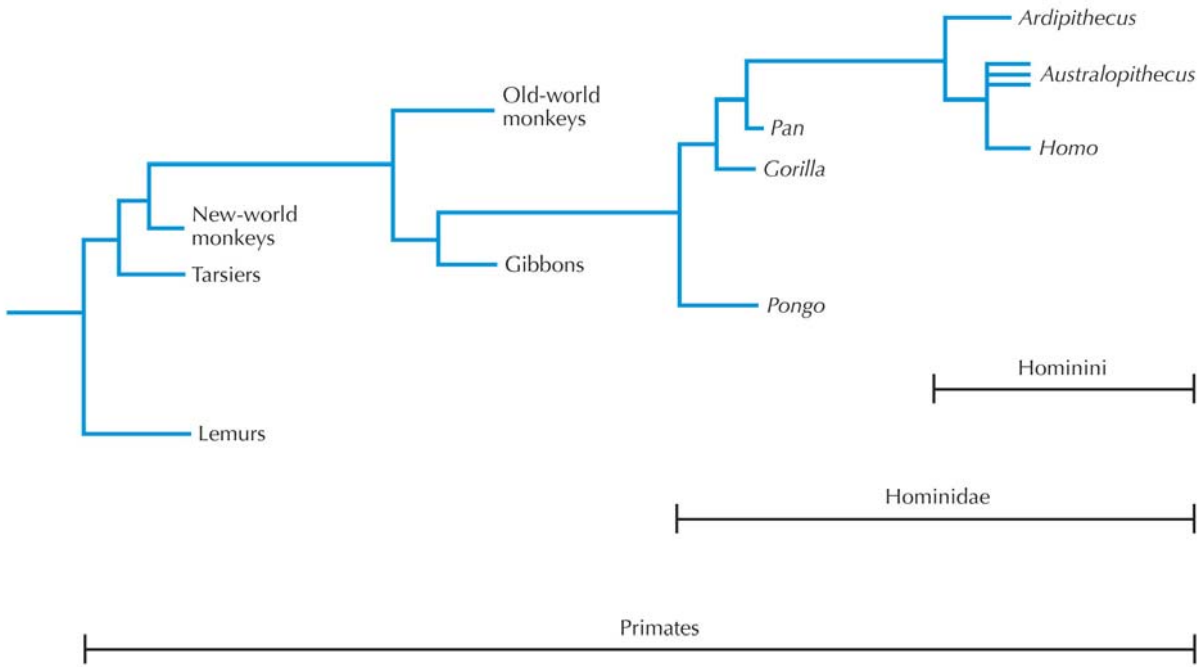


Figure A: Organization of the order Primates. Based on data at <http://www.tol.org>

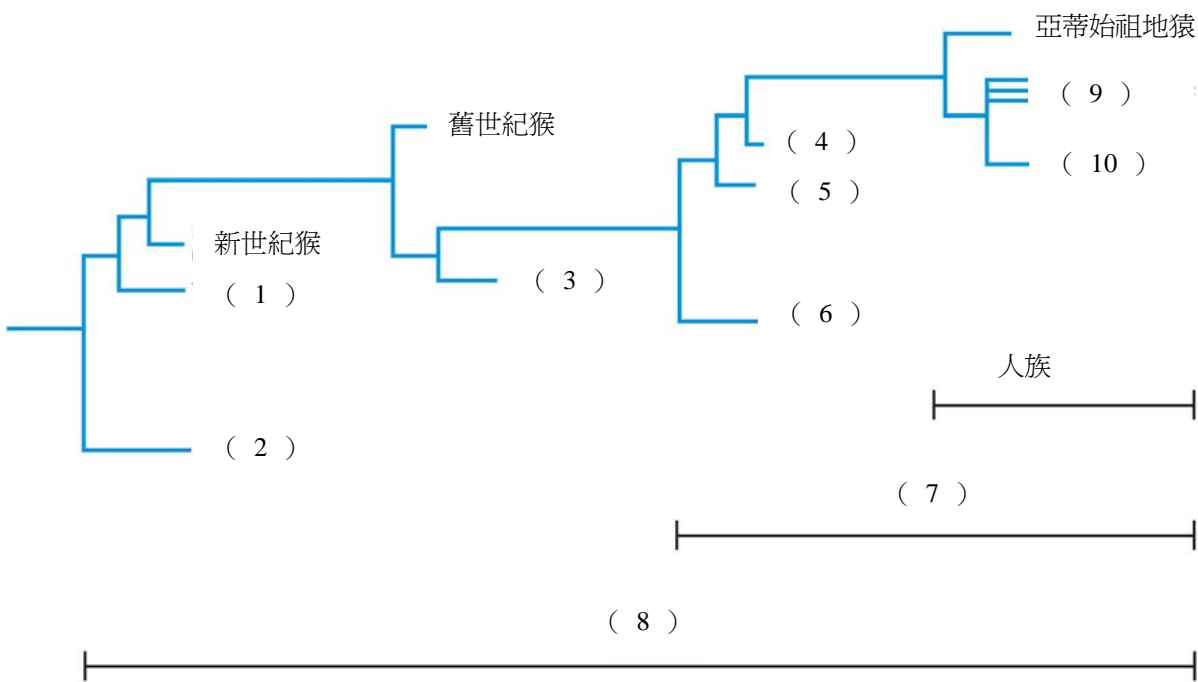


Figure B: Organization of the order Primates.

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叁、問答題（50%）：

1. 哈溫定義(Hardy-Weinberg theorem)下所描述達到哈溫平衡的族群有何狀態？(10%)
2. 解釋與比較 Sympatric speciation, Allopatric species, Peripatric speciation 及 Parapatric speciation。(10%)
3. 請概述以下幾個種的概念 (species concept)。(20%)
 - A. Phenetic (morphospecies) species concept
 - B. Biological species concept
 - C. Recognition species concept
 - D. Ecological species concept
 - E. Cladistic (phylogenetic) species concept
4. 能影響族群中等位基因頻率的四個主要因素為何？其中以哪兩種最重要，並說明之。(10%)