

※ 注意：請於試卷內之「非選擇題作答區」依序作答，並應註明作答之大題及小題題號。

一、對應題一將左邊名詞的最適名詞解釋，自右邊的選項選出(15分)

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| 1. ___ Autapomorphy | A) Named group of organisms |
| 2. ___ Haldane's Rule | B) Shared ancestral character |
| 3. ___ Parsimony | C) Locations species persisted where extinct elsewhere |
| 4. ___ Vicariance | D) Allopatric isolation due to geologic event |
| 5. ___ Synapomorphy | E) Uniquely derived character |
| 6. ___ Stochastic | F) Noncomparable DNA content & phenotypic complexity |
| 7. ___ Symplesiomorphy | G) Least number of steps |
| 8. ___ Taxon | H) Similarity of due to convergence |
| 9. ___ Maximum likelihood | I) Give benefits to others at own cost |
| 10. ___ Cladogenesis | J) No difference on fitness |
| 11. ___ Altruism | K) Random process |
| 12. ___ C-value paradox | M) Lineage branching |
| 13. ___ Mimicry | N) Shared derived character |
| 14. ___ Neutral gene | O) Optimality Criterion |
| 15. ___ Refugia | P) Heterogametic sex sterile |

二、名詞比較與解釋 (每題6分，共36分)

1. monophyletic vs. paraphyletic
2. orthologous vs. paralogous genes
3. synonymous vs. nonsynonymous substitution
4. microevolution vs. macroevolution
5. autopolyploid vs. allopolyploid
6. disruptive selection vs. diversifying selection

三、簡答題 (共34分)

1. 假設你在研究一群鳥類的兩種多基因性狀(polygenic traits)，在量測一子代的這兩種性狀之後，將結果繪製分散圖，並計算其遺傳率(heritability)。實驗結果顯示這兩種性狀之遺傳率分別為0.02與0.99。試繪一示意圖說明所繪圖之大概型式，並說明其演化上的意義為何？(10分)
2. 為什麼基因複製(gene duplication)在功能性基因的演化上很重要？試就基因複製後的命運來闡述說明。(10分)
3. 試列出四種種(species)的概念及其定義(8分)
4. 若你在一族群大小為5240隻的*Drosophila*族群中，隨機取兩隻出來，分別定序其相對應12500 bp的片段。若已知中性基因的突變率在 2×10^{-7} ，則在此片段中兩隻*Drosophila*的序列差異期望值有多大？(6分)

四、閱讀題：閱讀下段文字並回答問題。(共15分)

Our textbooks like to illustrate evolution with examples of optimal design—nearly perfect mimicry of a dead leaf by a butterfly or of a poisonous species by a [tasty] relative. But ideal design is a lousy argument for evolution.... Odd arrangements and funny solutions

見背面

are the proof of evolution.

Giant pandas are peculiar bears, members of the order Carnivora. Conventional bears are the most omnivorous representatives of their order, but pandas subsist... almost entirely on bamboo. They live in dense forests of bamboo at high elevations in the mountains of western China. There they sit, largely unthreatened by predators, munching bamboo ten to twelve hours each day. They yawned, stretched, and ambled a bit, but they spent nearly all their time feeding on their beloved bamboo. They sat upright and manipulated the stalks with their forepaws, shedding the leaves and consuming only the shoots.

It was amazing for their dexterity and how they adapted for running could use its hands so adroitly. They held the stalks of bamboo in their paws and stripped off the leaves by passing the stalks between an apparently flexible thumb and the remaining fingers. But if you counted the panda's other digits and you will be surprised that there were five, not four digits.

The panda's "thumb" is not, anatomically, a finger at all. It is constructed from a bone called the radial sesamoid, normally a small component of the wrist. In pandas, the radial sesamoid is greatly enlarged and elongated until it almost equals [the length of the first bones of the true fingers. It] underlies a pad on the panda's forepaw; the five digits form the framework of another pad.... A shallow furrow separates the two pads and serves as a channelway for bamboo stalks.

Answer the following questions:

- (1) Why perfect design is not easy to be seen? (5 points)
- (2) Why odd arrangements are the better proof of evolution? (5 points)
- (3) If the ancestor of panda did not eat bamboo for food, but eat fishes instead. Do you think the modern panda will still have the 'thumb'? Why? (5 points)

試題隨卷繳回