一、單選題（每題 5 分共 50 分）※ 注意：請於試卷內之「選擇題作答區」依序作答。

1. The main cause of the increase in the amount of CO2 in Earth's atmosphere over the past 170 years is (A) increased worldwide primary production. (B) increased worldwide fertilizer production. (C) increased infrared radiation absorption by the atmosphere. (D) the burning of fossil fuels and deforestation.

2. What is the single greatest threat to biodiversity? (A) overharvesting of commercially important species. (B) habitat alteration, fragmentation, and destruction. (C) introduced species that compete with native species. (D) novel pathogens

3. The discipline that applies ecological principles to returning degraded ecosystems to a more natural state is known as (A) restoration ecology. (B) thermodynamics. (C) eutrophication. (D) biogeochemistry.

4. According to the island equilibrium model, species richness would be greatest on an island that is (A) large and remote. (B) small and remote. (C) large and close to a mainland. (D) small and close to a mainland.

5. Predators that are keystone species can maintain species diversity in a community if they (A) competitively exclude other predators. (B) prey on the community's dominant competitors. (C) reduce the number of disruptions in the community. (D) prey on the least abundant species in the community.

6. Food chains tend to be short because (A) only a single species of herbivore feeds on each plant species. (B) local extinction of a species causes extinction of the other species in its food chain. (C) most of the energy in a trophic level is lost as energy passes to the next higher level. (D) most producers are inedible.

7. A population's carrying capacity (A) may change as environmental conditions change. (B) can be accurately calculated using the logistic growth model. (C) increases as the per capita population growth rate decreases. (D) can never be exceeded.

8. Analyzing ecological footprints reveals that (A) Earth's carrying capacity would increase if per capita meat consumption increased. (B) current demand by industrialized countries for resources is much smaller than the ecological footprint of those countries. (C) it is not possible for technological improvements to increase Earth's carrying capacity for humans. (D) the ecological footprint of the United States is large because per capita resource use is high.

9. One population of a species has 25 individuals, all with genotype AA; a second population of this species has 40 individuals, all with genotype aa. Assume that these populations live far apart but in similar environmental conditions. Based on this information, the observed genetic variation most likely resulted from (A) genetic drift. (B) gene flow. (C) nonrandom mating. (D) directional selection.

10. A fruit fly population has a gene with two alleles, A1 and A2. Tests show that 70% of the gametes produced in the population contain the A1 allele. If the population is in Hardy-Weinberg equilibrium, what proportion of the flies carry both A1 and A2? (A) 0.7　(B) 0.49　(C) 0.42　(D) 0.21

二、簡答題（共 50 分、每小題分數以百分比%顯示）※ 注意：請於試卷內之「非選擇題作答區」作答，並應註明作答之題號。

1. What ecosystem in Taiwan would you think is most vulnerable to global warming (5%)? Explain why you think so (5%). Can you also suggest ways how to lobby congress to strengthen the law to conserve biodiversity (5%)?

2. Do speciation rates in closely related clades of flowering plants show that flower shape such as floral bilateral symmetry is

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correlated with the rate at which new species form or that flower shape/bilateral symmetry is responsible for this rate (5%)? Explain (5%).

3. Darwin suggested looking at a species' close relatives to learn what its ancestors may have been like. Explain how his suggestion anticipated recent methods, such as applying maximum parsimony to infer phylogenetic relationships (5%) and the use of outgroups in cladistic analysis (5%).

4. The two monkey flower species are visited by different pollinators: Hummingbirds prefer the red-flowered *Mimulus cardinalis*, and bumblebees prefer the pink-flowered *M. lewisii*. Pollinator choice is affected by at least two loci in the monkey flowers, one of which, the"yellow upper,"or *yup*, locus, influences flower color. By crossing the two parent species to produce F1 hybrids and then performing repeated backcrosses of these F1 hybrids to each parent species, researchers succeeded in transferring the *M. lewisii* allele at this locus into *M. cardinalis*. *M. cardinalis* plants with the *M. lewisii yup* allele received 74-fold more visits from bumblebees than did wild-type *M. cardinalis*. Summarize evidence that the *yup* locus acts as a prezygotic barrier to reproduction in two species of monkey flowers (5%). Do these results show that the *yup* locus alone controls barriers to reproduction between these species (5%)? Explain (5%).