※ 注意：請於試卷內之「選擇題作答區」依序作答。

一、單選題 (每題 3 分)

1. Non-native species, such as cats and dogs in Taiwan, that are introduced to new environments, spread far beyond the original point of introduction, and cause damage are called
(A) predators.
(B) pathogens.
(C) invasive species.
(D) herbivores.

2. Which statement best expresses the concept of natural selection?
(A) reproductive success influenced by inherited characteristics
(B) inheritance of acquired characteristics
(C) change in response to need
(D) a process of constant improvement, leading eventually to perfection

3. Which of the following represents a pair of homologous structures?
(A) the wing of a bat and the scales of a fish
(B) the wing of a bird and the front legs of a horse
(C) the antennae of an insect and the eyes of a bird
(D) the wing of a bat and the wing of a butterfly

4. A population is
(A) a group of individuals of the same species that live in the same area and interbreed.
(B) all individuals of a species, regardless of location or time period in which they live.
(C) a group of individuals of different species living in the same place at the same time.
(D) a group of individuals of a species plus all of the other species with which they interact.

5. The ultimate source of all new alleles is
(A) mutation.
(B) chromosomal duplication.
(C) genetic drift.
(D) natural selection.

6. Microevolution, or evolution at its smallest scale, occurs when
(A) an individual's traits change in response to environmental factors.
(B) a community of organisms changes due to the extinction of several dominant species.
(C) a new species arises from an existing species.
(D) a population's allele frequencies change over a span of generations.

7. Under the biological species concept, a species is a group of organisms that
(A) are physically similar.
(B) share a recent common ancestor.
(C) live together in a location and carry out identical ecological roles.
(D) have the potential to interbreed in nature and produce fertile offspring.

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8. The emergence of many diverse species from a common ancestor is called
(A) adaptive radiation.
(B) gradualism.
(C) allopatric speciation.
(D) hybridization.

9. Allopatric speciation is UNLIKELY to occur when
(A) there is no disruption in gene flow between two populations.
(B) a geographic barrier forms between two populations.
(C) several populations become isolated from one another as drying conditions cause a large body of water to become separate, smaller bodies of water.
(D) separated populations adapt to different environmental conditions.

10. A new plant species may arise in a single generation by
(A) a sudden geological disruption causing separation of two populations.
(B) errors in meiosis leading to polyploidy.
(C) mutations in genes for flower color.
(D) changes in the pollinator species.

11. A community is composed of
(A) potentially interacting populations of different kinds of organisms.
(B) one species of organism living in a specific environment on Earth.
(C) living organisms and their nonliving environment.
(D) the factors that constitute an organism's niche.

12. When two different populations in a community benefit from their relationship with each other, the result is called
(A) herbivory.
(B) mutualism.
(C) parasitism.
(D) competition.

13. What is an example of predation?
(A) the camouflage of a lizard in rocky habitats
(B) a hawk swooping down quickly to capture, kill, and eat a snake
(C) a goldfinch feeding on the seeds of a thistle plant
(D) the vivid colors of the poison-arrow frog in South America

14. The sum total of a population's use of the biotic and abiotic resources of its habitat constitutes its
(A) environment.
(B) evolution.
(C) range.
(D) niche.

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15. Within an ecosystem, a tree is a
(A) secondary consumer.
(B) detritivore.
(C) primary consumer.
(D) producer.

16. Which statement regarding food webs is TRUE?
(A) A consumer eats only one type of producer.
(B) Detritivores consume dead organic matter from a specific trophic level.
(C) Several species of primary consumers may feed on the same species of producer.
(D) Energy transfer moves from producer to consumer and back.

17. If an ecosystem has a carrying capacity of 1,000 individuals for a given species and 2,000 individuals of that species are present, we can predict that the population
(A) size will remain at equilibrium.
(B) size will decrease.
(C) will show a clumped dispersion pattern.
(D) size will slowly increase.

18. Currently, the single greatest threat to biodiversity is
(A) global warming.
(B) habitat destruction due to humans.
(C) the introduction of exotic species.
(D) overexploitation of populations for food.

19. Rising concentrations of carbon dioxide (CO_2) in the atmosphere result in the oceans
(A) becoming more acidic.
(B) becoming more basic.
(C) containing less dissolved oxygen.
(D) containing less dissolved carbon dioxide.

20. One of the key contributions of the punctuated equilibrium model is that it helps explain
(A) why transitional fossils are more common than Darwin would have predicted.
(B) why transitional fossils tend to be rare and certain common fossil species remain unchanged for long time spans.
(C) how new species arise from hybridization events.
(D) why large, widespread populations tend to be the ones that evolve most rapidly and unpredictably.

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※ 注意：請於試卷內之「非選擇題作答區」標明題號依序作答。

二、申論題 (每題 20 分)

21. (a) Under the context of evolutionary biology, explain what neutral theory is. (b) Polymorphism is common in many species of animals and plants. However, if natural selection is so effective, selection favoring a specific phenotype would eliminate the other phenotypes, and thus there would be no polymorphism any more. This is apparently not the case in the real world. How does the concept of neutral theory, together with natural selection and other evolutionary and ecological concepts (e.g., sexual selection, environmental heterogeneity, etc.), help explain polymorphism?

22. Assuming that you are interested in a native species (e.g., 台灣草蜥、長葉茅膏菜) OR a group of animals or plants (e.g., 霧林帶的木本植物、水棲昆蟲) in Taiwan, and are designing a one-year field sampling campaign to estimate the abundance of your target organisms for your MS thesis. Please write down the topic you are planning to investigate (e.g. 台大生態池水棲昆蟲群聚的時空變化), describe your sampling design, and explain the rationale of your sampling approaches. Please be aware that you are designing a one-year field survey for an MS thesis in Taiwan, and thus you need to make it reasonably doable for an MS student in NTU.

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