

- I. Multiple choices (30%, 2% each)
1. A number of mosquito populations today are resistant to specific insecticides even though those species were not resistant when the insecticides were first introduced. Biologists believe that insecticide resistance evolved in mosquitoes because _____.
(A) individual mosquitoes built up an immunity to an insecticide after being exposed to it (B) mosquitoes needed to develop insecticide resistance to survive after the insecticide was used (C) a few mosquitoes were probably resistant to the insecticide before it was ever used, and these survived to reproduce (D) mosquitoes attempted to adapt to their environment (E) individual mosquitoes built up an immunity to an insecticide after being exposed to it, and mosquitoes needed to develop insecticide resistance to survive after the insecticide was used
 2. In a certain group of African people, 4% are born with sickle-cell anemia (homozygous recessive). If this group is in Hardy-Weinberg equilibrium, what percentage of the group has the selective advantage of being more resistant to malaria (heterozygous) than those individuals who are homozygous for normal hemoglobin or for sickle-cell anemia? (A) 2% (B) 4% (C) 8% (D) 16% (E) 32%
 3. Bacteria such as *Streptococcus pneumoniae* can cause disease in humans when _____. (A) the host's immune system is compromised (B) sufficient nutrients are available for *S. pneumoniae* to multiply on host tissues (C) the bacterium develops resistance to all antibiotics (D) a cohost such as *Streptococcus* is present on the host (E) that protozoan has pathogenic factors such as pili or capsules
 4. In an experiment, a microbiologist put equal numbers of each of the following organisms into a flask of sterile broth consisting mostly of sugar and a few amino acids. She then placed the flask in the dark. Which of the organisms would be best able to survive? (A) chemoheterotrophic bacteria (B) cyanobacteria (C) diatoms (D) thermoacidophilic bacteria (E) green algae
 5. Pollen is _____ and contains _____. (A) diploid ... spores (B) diploid ... sperm nuclei (C) haploid ... spores (D) haploid ... sperm nuclei (E) diploid ... a new sporophyte

(背面仍有題目,請繼續作答)

6. The economic value of new drugs from living organisms will probably not help preserve biodiversity and ecosystems unless _____. (A) those who live in the source ecosystems share in the economic benefits of the new drugs (B) new methods for extracting medicinal compounds are developed (C) pollution by chemicals that mimic estrogen is reduced (D) scientists make faster progress in naming new species (E) all of the above
7. Lichens are _____. (A) mutualistic associations of fungi and plant roots (B) predatory fungi (C) the sexual stage of deuteromycetes (D) symbiotic associations of photosynthesizers and fungi (E) used to produce blue cheese
8. Tapeworms are highly specialized worms that make their living as endoparasites. To which of the following phyla and classes do the tapeworms belong? (A) phylum Annelida, class Oligochaeta (B) phylum Annelida, class Hirudinoidea (C) phylum Nematoda, class Polychaeta (D) phylum Platyhelminthes, class Cestoidea (E) phylum Platyhelminthes, class Turbellaria
9. Eutrophication (excessive algal growth resulting in decreased concentrations of dissolved O_2) in lakes is frequently the direct result of _____. (A) nutrient enrichment (nitrate and phosphate runoffs from land) (B) industrial poisons (C) a diminished supply of nitrates and phosphates (D) an increase in predators (E) none of these
10. The average global temperature is relatively high because carbon dioxide and other gases trap the longer wavelengths of infrared light (heat) and prevent them from radiating back into space. This is known as _____. (A) acid precipitation (B) the ozone hole (C) the green revolution (D) the slash-and-burn effect (E) the greenhouse effect
11. No population can grow indefinitely. The ultimate size of any population is limited by _____. (A) its r (B) its birth rate (C) its death rate (D) the carrying capacity of its environment (E) reproductive isolation
12. Which one of the following is most likely a density-dependent growth regulator of animal populations? (A) a decrease in clutch size (B) hurricanes (C) fires (D) droughts (E) all of the above

13. Two species of cuckoo doves live in a group of islands off the coast of New Guinea. Of 33 islands, 14 have one species, 6 have the other, 13 have neither, and none has both. What might best explain this? The two species of birds could _____. (A) be on different trophic levels (B) have similar niches (C) have a mutualistic relationship (D) have different niches (E) be keystone predators
14. A species of malaria-carrying mosquito lives in a forest in which two species of monkeys, A and B, coexist. Species A is immune to malaria, but species B is not. The malaria-carrying mosquito is the chief food for a particular kind of bird in the forest. If all these birds were suddenly eliminated by hunters, which of the following would be an immediately observable consequence? (A) increased mortality (death rate) in monkey species A (B) increased mortality in monkey species B (C) increased mortality in the malaria-carrying mosquitoes (D) emergence of malaria-resistant strains in monkey species B (E) emergence of malaria-sensitive strains in monkey species A
15. An animal has segments, bilateral symmetry, pharyngeal gill slits, a post-anal tail, and deuterostomic development. It must be a member of the phylum _____. (A) Annelida (B) Arthropoda (C) Chordata (D) Mollusca (E) Platyhelminthes

(背面仍有題目,請繼續作答)

II. Short Essays (70%)

1. What is a keystone species? Please give an example. (5%)
2. What is competitive exclusion? When will it happen? (5%)
3. In a long term study, biologists found that the number of male individuals of a frog species is decreasing. They speculate this is caused by the herbicide (atrazine). However, the concentration of atrazine in the environment is lower than the standard of EPA. Can the change of sex ratio in this frog be explained by the use of herbicide? How do you prove or disprove it? (10%)
4. Please explain how the plants and animals transport the water and organic materials to their living cells. Please also make a brief comparison between the two, if can. (10%)
5. Please explain how the plants and animals respire, and what this function means to them, respectively. Please also make a brief comparison between the two, if any. (10%)
6. Please explain how the plants and animals usually respond to an environmental stress or hazard, regardless of its media of entry. Please briefly discuss the individual mechanism, and make a comparison between the two, if can. (10%)
7. Dengue Fever infection has been a public health concern in Taiwan. What type of discussion you are able to offer on the relationship between the prevalence of the above-mentioned disease and the essence of "Kyoto Protocol", effective globally on Feb. 16, 2005. (10%)
8. Two national statistics has taken the headlines of many domestic news reports. One, the rising prevalence and incidence of Tuberculosis; the other, high incidence and prevalence of breast cancer found in Taiwan's younger population, compared to those of western countries. Researchers have proposed that the overuse of antibiotics in Taiwan was likely to be attributable to the first observation, and the significant exposure to pesticide applied in our environment might be to the latter. Please discuss, based on the theory of biology, whether you think those rationales are reasonable and why. (10%)