

※ 考生請注意：本試題不可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. How to construct life tables (6%)? Describe and illustrate how various parameters of a life table affect the shape of survivorship curves (9%).
2. The Nobel Prize in Physiology or Medicine 2017 was awarded to researchers who discover molecular mechanisms controlling the circadian rhythm. Biological rhythm being one of the essential properties of living organisms can be found in all eukaryotic life including microorganisms, plants, and animals. Discuss what the roles natural selection has on the formation of biological rhythms in various creatures (15%).
3. Discuss how a meta-population structure of any particular species may be affected by their associated landscape features such as the size of habitat patches, the distance among patches, and presence or absence of corridors between patches (8%)
4. A mammalian species X carries specific ecto-parasites Y that live only on individuals of this mammal through the parasite's life span, but these parasites can move freely among their hosts. If considering individual difference including sex, reproductive status, and body conditions, in this host-parasite system (a) you expect which groups of hosts individuals on average would carry higher parasite loadings, and (b) why? (4% each; total 8%)
5. Give an example of "indirect effect" and discuss its effects and significances to community structure. (8%)
6. Distinguish what functional responses and numerical responses of a predator are, respectively? (5%)
7. Describe (a) what mimicry is, and (b) what types of species interaction mimicry can be attributed to? (6%)
8. Please explain the following terms and give examples:
 - (a) Anthropocene (3%)
 - (b) Ecosystem service (4%)
 - (c) Bottom up and top down effect (4%)
 - (d) Climate mitigation and adaptation (3%)
9. What kinds of species are susceptible to extinction from human activities? Please explain your answers and give examples. (6%)

10. In "Half Earth: Our Planet's Fight for Life", the biologist Edward O. Wilson, professor emeritus at Harvard University, proposed an ambitious plan to stave off the mass extinction of species and preserve our biosphere. He suggested a global network of inviolable reserves covering half of the surface area on Earth. Certainly, the coverage of current protected areas is far from enough to secure biodiversity and ecosystem services. In Taiwan, only 19% of terrestrial areas are protected.

Can (a) you explain the major types of protected areas designated by different laws? (5%)

Climate change is causing shifts of geographical distribution of plant and animal species. Protected area may fail to accommodate current biota in the near future. One possible way is to create more permeable landscape to facilitate species movements. Can (b) you suggest appropriate approaches?(5%)

Another way is assisted colonization, which means deliberately moving species to climate suitable habitats.

What's your opinion about this approach? Please explain in details. (5%)