※ 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。

請詳讀題意，注意每題中可能有多重子題，並請依序作答。

1. From adaption point of view and based on the physical differences between water and air, explain how the environment constraint the (a) forms and (b) mechanisms of gas exchange organs in both aquatic and terrestrial animals, and (c) provide specific examples to compare those of any aquatic animal with those of any terrestrial animal. **(10%)**

2. Please (a) describe "**soil microbial loop**"- the role of plant roots, decomposers, and microbial grazers, their C/N ratios and assimilation rates, and (b) how the plant-microbe interaction facilitates plant growth. **(15%)**

3. What (a) are the **dominant food chains** in terrestrial and aquatic ecosystems, and (b) why? **(10%)**

4. (a) How do plants physiologically respond to higher **CO_2 levels**? (b) Will increased CO_2 lead to higher net primary production? (c) Give **reasons** for your answer. **(15%)**

5. Provide (a) specific examples, and discuss (b) why and (c) how **behaviors** of animals may affect **abundance** and **distribution** of species (all or most plants, animals, fungus, and microbes included.) **(10%)**

6. When (a) density increase through time, what changes we may observe in a population (list as many as you can think of that are reasonable)? Compare (b) your answers with and without incorporating the **Allee effect** and discuss how or why the discrepancies would occur? **(10%)**

7. List (a) three major life history characteristics that are associated with long-lived species, and (b) discuss from **trade-offs** and the points of view of **evolution** why these characteristics have evolved? **(10%)**

8. Distinguish (a) **Bottom-up** and **top-down** effects in ecology, and discuss (b) how each would affect the composition and stability of communities. **(10%)**

9. What (a) is a **meta-population**, and (b) why this concept is important and (c) how it is related to conservation at species and population levels? **(10%)**