

一、

1. 欲知成大校園內黑眶蟾蜍的族群量，要用何種方法？請說明此種方法的前題和原理。(10%)
2. 白頭翁主要分布於花蓮到楓港以西的平原地區，而烏頭翁則分布於上述地點以東的平原區。造成兩種分布差異的可能原因有哪些？何者最有可能，為什麼？(10%)

二、

1. How to testing the individualistic and interactive hypotheses of communities?(4%)
2. What limits length of a food chain? How to test of the energetic hypothesis for the restriction on food chain length?(4%)
3. How ecologist use the top-down model for lake restoration (biomanipulation)?(4%)
4. Why species richness generally declines along an equatorial-polar gradient?(4%)
5. What is the main abiotic factor that distinguishes primary from secondary succession?(4%)

三、

1. *Buchnera* 屬為 aphids 之內共生細菌，主要提供宿主必需胺基酸 tryptophan，兩者並有種間一對一的關係，請問以何方法可顯現二者之共演化 (co-evolution) 關係？其期望如何？(4%)
2. 何謂 inbreeding depression，試說明其可能機制。(4%)
3. 請說明英國 Manchester 工業革命前後以及後續環境的改善後，影響 pepper moth 族群變動的內在及外在因子 (提示: 1. 決定深色外表型的遺傳因子為 dominant, 2. migration)。(7%)
4. 請詳述 genetically modified organisms (GMO)的潛在生態危機。(5%)

四、

1. **Multiple Choice (1 pts each). Choose the best answer and write it in the blank space to the right of each question. (5%)**

1. Which of the following is NOT a step in the nitrogen cycle?
 - A. nitrogen fixation
 - B. nitrification
 - C. respiration
 - D. ammonification
 - E. denitrification
2. Which of the following is the most productive biome?
 - A. coral reef
 - B. grassland
 - C. temperate deciduous forest
 - D. open ocean
3. Comparing energy to matter reveals that
 - A. energy can be recycled, matter cannot.
 - B. matter can be recycled, energy cannot.
 - C. neither matter nor energy can actually be recycled.
 - D. both energy and matter can be recycled.

4. Which of the following conditions have to be TRUE for a population of a mosquito species to develop 'resistance' to an insecticide used to kill it?

- A. All mosquitoes in the population are killed by an application of the insecticide.
- B. Some mosquitoes in the population are not killed by an application of the insecticide.
- C. Susceptibility to the insecticide is genetically determined (heritable).
- D. A & B
- E. B & C

5. The relationship between legumes (e.g., peas, soybeans) and nitrogen-fixing bacteria is:

- A. parasitic.
- B. competitive.
- C. mutualistic.
- D. predatory.

2. Fill in the blanks with accurate words that complete the statements: (5 %)

Fill in the blanks with accurate words that complete the statements:

1. Organisms that obtain energy the same number of transformations from the sun's radiation are said to be in the same: _____.
2. A succession that begins on bare rock is called: _____.
3. The increase in number of species in zones of overlap of habitats is called the: _____.
4. The zone of overlap between two communities: _____.
5. A nondominant species upon which many other species in the community depend for their existence is called a/an: _____.

3. What is the Gaia Hypothesis, and how does it relate to the idea of global change? (5 %)

4. What is the relationship among gross production, net production, and net ecosystem production? (5 %)

五. (20%)

1. How does flower form and function relate to plant-pollinator interactions? Give an example.
2. Why Plant-pollinator mutualisms are among the most ecologically and economically important mutualisms on earth?
3. Pollination in plants can be achieved in different ways. Outline some ways of pollination in plants.
4. Explain the following terms.
 - (i) Self-incompatibility
 - (ii) Apomixis
 - (iii) Dioecy