

招生學年度	104	招生類別	碩士班
系所班別	自然資源與環境學系碩士班（生態與保育組）		
科目名稱	生物學		
注意事項	本考科禁止使用掌上型計算機		

1. Most plant and animal cells range between $10\ \mu\text{m}$ and $100\ \mu\text{m}$ in diameter. List factors that might set the limits to cell size and explain why or how each factor acts on limitation of cell size. (10 points)
2. Photosynthetic systems in plants are classified as C3, C4 and CAM. On the basis of photosynthesis, which system above should thrive under the climate of lowland area in Taiwan? (10 points)
3. Plants take up water molecules from soil. These water molecules exit plant body through stomata in leaves. Such process is affected by physical factors in the environment, such as wind and sunshine. Explain why wind and sunshine may affect water loss in plants. (15 points)
4. In temperate zone, many deciduous plants change leaf colors before leaf fall. Explain why the leaves present these non green colors. (10 points)
5. In what sense is natural selection more an editing process than a creative process? (10 points)
6. For vertebrates, where (which organ systems) and how do they exchange materials with environment? How do body cells get these materials? (10 points)
7. Animals dispose of their nitrogenous waste as ammonia, urea or uric acid, depending on their evolutionary history and habitat. What are the advantages or disadvantages of excreting wastes in these forms? (10 points)
8. Sensory organs tend to come in pairs. Propose a testable hypothesis that could explain the advantage of having two ears or eyes instead of one. (10 points)

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9. In the following is the abstract of a new report by Ray, et al (2015). What is the objective of the research? How do they approach the research question? What do they find? What's the implication of the study? (15 points)

Many studies have examined the role of mean climate change in agriculture, but an understanding of the influence of inter-annual climate variations on crop yields in different regions remains elusive. Ray, et al (2015) use detailed crop statistics time series for ~13,500 political units to examine how recent climate variability led to variations in maize, rice, wheat and soybean crop yields worldwide. They find while some areas show no significant influence of climate variability, in substantial areas of the global breadbaskets, >60% of the yield variability can be explained by climate variability. Globally, climate variability accounts for roughly a third (~32–39%) of the observed yield variability.

(Source: Deepak K. Ray, James S. Gerber, Graham K. MacDonald, Paul C. West. **Climate variation explains a third of global crop yield variability.** *Nature Communications*, 2015; 6: 5989.)