

國立彰化師範大學 98 學年度博士班招生考試試題

系所：科學教育研究所

組別：丁

科目：基礎生物(含分生、普通動植物學)

☆☆請在答案紙上作答☆☆

共 2 頁，第 1 頁

一、選擇題(共 15 分、每題 3 分)

1. Which of the following sequences represents the hierarchy of biological organization from the least to the most complex level?
 - A. organelle, tissue, biosphere, ecosystem, population, organism
 - B. cell, community, population, organ system, molecule, organelle
 - C. ecosystem, cell, population, tissue, organism, organ system
 - D. molecule, cell, organ system, population, ecosystem, biosphere
2. Which of the following is a reasonable explanation for why unsaturated fatty acids help keep any membrane more fluid at lower temperatures?
 - A. The double bonds form kinks in the fatty acid tails, forcing adjacent lipids to be further apart
 - B. Unsaturated fatty acids have a higher cholesterol content and therefore more cholesterol in membranes
 - C. Unsaturated fatty acids permit more water in the interior of the membrane
 - D. The double bonds block interaction among the hydrophilic head groups of the lipids
3. The number of legs an insect has, the number of vertebrae in a vertebral column, or the number of joints in a digit (such as a finger) are all strongly influenced by
 - A. haploid genomes
 - B. heterotic genes
 - C. Hox genes
 - D. introns within genes
4. Which of these genetic processes may be most helpful in accounting for the Cambrian explosion?
 - A. binary fission
 - B. gene duplication
 - C. mitosis
 - D. random segregation
5. Which term most precisely describes the cellular process of breaking down large molecules into smaller ones?
 - A. anabolism
 - B. catalysis
 - C. catabolism
 - D. metabolism

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二、簡答題(共 20 分、每題 10 分)

1. 請簡述 karyotype。

2. 請簡述 paracrine signaling。

三、翻譯(共 15 分)：請將下列一段敘述，翻譯成中文

Alfred Russel Wallace (8 January 1823 – 7 November 1913) was a British naturalist, explorer, geographer, anthropologist and biologist. He is best known for independently proposing a theory of natural selection which prompted Charles Darwin to publish his own theory. Wallace did extensive fieldwork, first in the Amazon River basin and then in the Malay Archipelago, where he identified the Wallace Line that divides Indonesia into two distinct parts, one in which animals closely related to those of Australia are common, and one in which the species are largely of Asian origin. He was considered the 19th century's leading expert on the geographical distribution of animal species and is sometimes called the "father of biogeography". Wallace was one of the leading evolutionary thinkers of the 19th century and made a number of other contributions to the development of evolutionary theory besides being co-discoverer of natural selection. These included the concept of warning colouration in animals, and the Wallace effect, a hypothesis on how natural selection could contribute to speciation by encouraging the development of barriers against hybridization.

四、申論題：(共 50 分)

1. 植物接受光會有光型態化作用 (photomorphogenesis)，已知的三個光受體 (photoreceptor) 為何？分別接受哪些光？其生理反應為何？其中幼苗的去蒼白化作用 (de-etiolation) 屬於何種光受體的影響？其訊息作用機制為何？(15 分)
2. 何謂 PCR (polymerase chain reaction)？PCR 在植物方面有關的研究是什麼？何謂 Northern blot？以水稻幼苗在鹽分逆境為例，說明 PCR 及 Northern blot 的相關研究之用途是什麼？(15 分)
3. 木質部水分上昇及韌皮部糖類運輸的機制分別為何？其與水勢有何關聯？根部由土壤吸收水分的水勢相關組成式子為何？並說明此公式的吸水及植物萎凋的水勢相關組成因子條件。(20 分)