

※ 請依序作答，並標明作答之部份及其題號。

一、普通生物學第一部份考題(共 25 分)

1. 請簡述有絲分裂(mitosis)及減數分裂(meiosis)的過程中包含的步驟(steps) (6分)
2. 染色體的重組(rearrangement)包括 deletion, duplication, inversion, translocation; 也因此造成許多的疾病。Chronic myelogenous leukemia (CML) 為一常見的血癌，即擁有 Philadelphia chromosome 為特徵。試簡述此一疾病的成因，即 Philadelphia chromosome 的那一類的染色體重組。(2分)
3. 在 1990 年代由 J. Craig Venter 等人領導所進行的”人類全基因體定序”(Human Genome Project, HGP)已於 2001-2003 完成。人類所擁有的約 10^{13} 核苷酸序列位置可被完整及精確的解讀及圖譜出來，其中運用許多邏輯性方法學及步驟。請排列其步驟及解釋每一步驟的目的。(4分)
a. DNA sequencing b. physical mapping c. linkage mapping
4. 請簡述 steroid 及 non-steroid 賀爾蒙(hormones)在其作用機轉上主要的差異?(4分)
5. 胚胎發育的三個胚層:外胚層(ectoderm)、中胚層(mesoderm)及內胚層(endoderm)可分化成為不同的器官跟組織。下列器官或組織其正確的來源胚胎胚層分別為何?(3分)
a. 神經系統(nervous system)
b. 肝臟(liver)
c. 骨骼(skeletal system)
6. 人體的神經系統被分為二部分：第一部份為中樞神經系統，包括 a 及 b 組成；第二部份為周圍神經系統，主要分為 c 神經系統和 d 神經系統。(4分)
7. 肌肉纖維(myofibril)含量最多的兩種蛋白為何?(2分)

二、普通生物學第二部份考題 (共 25 分)

1. Sketch and describe the structure of a eukaryotic flagellum. (8分)
2. Compare and contrast photophosphorylation and oxidative phosphorylation. (8分)
3. 請解釋下列各名詞:(每小題 3 分，共 9 分)
(1) antigenic determinant (2) lymphatic system (3) diaphragm

見背面

三、普通生物學第三部份考題 (共 25 分)

1. 選擇題 (※ 注意：請於試卷上「選擇題作答區」依序作答，共10分)

- (1) Which of the following poses the single greatest threat to biodiversity?
 - a. introduced species
 - b. overhunting
 - c. movement corridors
 - d. habitat loss
 - e. global warming
- (2) With regard to its rate of growth, a population that is growing logistically
 - a. grows fastest when density is lowest
 - b. has a high intrinsic rate of increase
 - c. grows fastest at an intermediate population density
 - d. grows fastest as it approaches carrying capacity
 - e. is always slowed by abiotic factors
- (3) An ecologist monitoring the number of great apes in a wildlife refuge over a five-year period is studying ecology at which level?
 - a. organism
 - b. community
 - c. ecosystem
 - d. population
 - e. biosphere
- (4) Natural selection is sometimes described as “survival of the fittest.” Which of the following most accurately measures an organism’s fitness?
 - a. how strong it is when pitted against others of its species
 - b. its mutation rate
 - c. how many fertile offspring it produces
 - d. its ability to withstand environmental extremes
 - e. how much food it is able to make or obtain
- (5) Which of the following would most likely provide the best data for determining the phylogeny of three very closely related species?
 - a. the fossil record
 - b. a comparison of embryological development
 - c. an analysis of their morphological differences and similarities
 - d. a comparison of nucleotide sequences in homologous genes and mitochondrial DNA
 - e. a comparison of their ribosomal DNA sequences

2. What are the two main modes of speciation? Please define the concepts and use examples to describe the mechanisms of these speciation events. (6分)
3. What is the biogeochemical cycle of nitrogen? Please describe the key processes. What roles do microorganisms play in cycling these inorganic and organic components? (9分)

四、普通生物學第四部份考題 (共 25 分)

1. 解釋名詞(每題 4 分)

- (1) transformation, transduction
- (2) binary fission, biofilms
- (3) apoplast, symplast
- (4) ectomycorrhizae, arbuscular mycorrhizae

2. According to the ABC model of floral development, which genes would be expressed in an ornamental flower with multiple sepals and petals but no stamens or carpels? (5分)

3. Write down the tissue system of the following structures. (4分)

- (1) root hair
- (2) tracheid
- (3) palisade parenchyma
- (4) guard cell