

一、選擇題 (80%):

- () 1. PCR 反應的功用是為了：(A) 大量複製 DNA (B) 大量複製 RNA (C) 大量複製蛋白質 (D) 純化蛋白質。
- () 2. 呈上題，PCR 使用的高溫酵素是提煉來自：(A) 大腸桿菌 (B) 酵母菌 (C) 熱泉菌 (D) 厭氧菌。
- () 3. 管制全球瀕危物種國際貿易的公約稱為：(A) 華盛頓公約 (B) 京都議定書 (C) 日內瓦協定 (D) 里約熱內盧條款。
- () 4. 在太陽底下，活著的植物主要藉由輻射 (H1) 與空氣對流 (H2) 吸收熱量，而主要藉由蒸散作用 (H3)、地面傳導 (H4)、與空氣對流 (H5) 排出熱量。其中，H3+H4+H5 的總和，與 H1+H2 的總和，必須：(A) 較大 (B) 較小 (C) 相等 (D) 均可。
- () 5. 在湖泊水域裡大量施肥，會造成環境的：(A) 優氧化 (B) 寡氧化 (C) 優養化 (D) 寡養化。
- () 6. 下列哪一個物種是外來種？(A) 日本樹蛙 (B) 印度蜓蜥 (C) 中國石龍子 (D) 巴西烏龜。
- () 7. 關於引進外來種的長期效應，下列何者描述錯誤？(A) 會增加當地的物種多樣性 (B) 會降低當地的物種多樣性 (C) 會造成農林漁牧的重大損失 (D) 大部分的外來物種是由人類攜帶造成。
- () 8. 章魚與哺乳動物同樣都有極為優異的視覺功能，在演化上稱為：(A) convergence evolution (B) divergence evolution (C) parallel evolution (D) vertical evolution。
- () 9. 台灣並不出產袋鼠，主要的原因是：(A) 氣候太過潮濕，不適合袋鼠棲息 (B) 與胎盤動物競爭，無法在台灣生存 (C) 遭受人類獵殺而滅絕 (D) 因為台灣的地質年代太新，所以根本就沒有出現過袋鼠。
- () 10. Ernst Mayr 所倡議的「biological species concept」，重點在於：(A) 模式標本 (B) 外觀特徵 (C) 生殖隔離 (D) 演化軌跡。
- () 11. 一個基因型為 AaBbCcDd 的個體，跟另一隻基因型完全相同的個體交配。產生的子代之中，出現 aabbccdd 的機率是：(A) 1/64 (B) 1/128 (C) 1/256 (D) 0。
- () 12. 每三個核甘酸代表一個轉譯成胺基酸的密碼。其中，發生在第三個位點的突變，通常：(A) 造成嚴重的突變 (B) 不會造成嚴重的突變 (C) 代表序列的終止 (D) 代表序列的開頭。

- () 13. 呈上題，如果在一個人類族群中，某一個基因序列中出現的全部變異都是來自第三位點突變，代表這個基因：(A) 受到強大的天擇壓力，是重要的基因 (B) 受到強大的天擇壓力，但是是不重要的基因 (C) 沒有受到強大的天擇壓力，但是是重要的基因 (D) 沒有受到強大的天擇壓力，也不重要。
- () 14. 最適合形容小丑魚與海葵之間的關係，是：(A) mutualism (B) parasitism (C) predation (D) coexistence。
- () 15. 下列哪一種物質可在常溫下儲存最久而不會遭到破壞？(A) DNA (B) RNA (C) 蛋白質 (D) 酵素。
- () 16. *Takydromus sexlineatus ocellatus* 這個學名中間包含三個字，其中最後一個字代表：(A) 種名 (B) 亞種名 (C) 命名者的名字 (D) 變異型。
- () 17. 以老鷹與麻雀做比較，前者的生殖策略屬於：(A) K 策略 (B) R 策略 (C) X 策略 (D) Z 策略。
- () 18. 保護熊貓，同時亦保護四川臥龍地區的整個棲地環境。這樣的一個物種，在保育生物學中稱為：(A) key species (B) keystone species (C) umbrella species (D) cryptic species。
- () 19. 【Losos, J. B., T. W. Schoener, and D. A. Spiller, 2004. Predator-induced behaviour shifts and natural selection in field-experimental lizard populations. *Nature* 432, 505-508.】上述這一大段話，代表的是：(A) 圖書館裡的一本書 (B) 圖書館裡的一種期刊 (C) 書的一個章節 (D) 期刊中的一篇文章。
- () 20. 呈上題，該文章的作者有：(A) 一位 (B) 三位 (C) 五位 (D) 並未全數列出，無法得悉。

- () 21. Which process in eukaryotic cells will proceed normally whether oxygen (O_2) is present or absent? (A) electron transport (B) glycolysis (C) the citric acid cycle (D) oxidative phosphorylation (E) chemiosmosis
- () 22. Which of the following is the first plant to have its entire genome sequenced (A) *Arabidopsis* (B) *Cycas* (C) *Magnolia* (D) *Phaseolus* (E) *Taxa*
- () 23. Where are the proteins of the electron transport chain located? (A) cytosol (B) mitochondrial outer membrane (C) mitochondrial inner membrane (D) mitochondrial intermembrane space (E) mitochondrial matrix
- () 24. Which plant hormones might be used to enhance stem elongation and fruit growth? (A) brassinosteroids (B) gibberellins (C) abscisic acid (D) cytokinins (E) phytochrome
- () 25. The function of a root nodule's leghemoglobin is to (A) extract macronutrients from the soil. (B) regulate the supply of oxygen to *Rhizobium*. (C) promote ion exchange in the soil. (D) form a mutualistic relationship with insects. (E) supply the legume with fixed nitrogen.
- () 26. Which of the following flower parts develops into a fruit? (A) stigma (B) style (C) ovary (D) ovule (E) receptacle
- () 27. Suppose the interior of the thylakoids of isolated chloroplasts were made acidic and then transferred in the dark to a pH-8 solution. What would be likely to happen? (A) The isolated chloroplasts will make ATP. (B) The Calvin cycle will be activated. (C) Cyclic photophosphorylation will occur. (D) Only A and B will occur. (E) A, B, and C will occur.
- () 28. All of the following are directly associated with photosystem II *except* (A) extraction of hydrogen electrons from the splitting of water. (B) release of oxygen. (C) harvesting of light energy by chlorophyll. (D) $NADP^+$ reductase. (E) P680 reaction-center chlorophyll.
- () 29. With respect to angiosperms, which of the following is *incorrectly paired with its chromosome count*? (A) egg cell- n (B) megaspore- $2n$ (C) microspore- n (D) zygote- $2n$ (E) sperm- n
- () 30. Where is ATP synthase located in the mitochondrion? (A) cytosol (B) electron transport chain (C) outer membrane (D) inner membrane (E) mitochondrial matrix

- () 31. Where does the Calvin cycle take place? (A) stroma of the chloroplast
(B) thylakoid membrane (C) cytoplasm surrounding the chloroplast (D)
chlorophyll molecule (E) outer membrane of the chloroplast
- () 32. The reaction-center chlorophyll of photosystem I is known as P700 because
(A) there are 700 chlorophyll molecules in the center. (B) this pigment is best at
absorbing light with a wavelength of 700 nm. (C) there are 700 photosystem I
components to each chloroplast. (D) it absorbs 700 photons per microsecond.
(E) the plastoquinone reflects light with a wavelength of 700 nm.
- () 33. The following are all adaptations to life on land *except* (A) rosette
cellulose-synthesizing complexes. (B) cuticles. (C) tracheids. (D)
reduced gametophyte generation. (E) seeds
- () 34. In pine trees, microsporangia form _____ microspores by _____.
(A) triploid; fertilization (B) diploid; mitosis (C) diploid; meiosis
(D) haploid; mitosis (E) haploid; meiosis
- () 35. In analyzing the number of different bases in a DNA sample, which result
would be consistent with the base-pairing rules? (A) $A=G$ (B) $A+G=C+T$
(C) $A+T=G+T$ (D) $A=C$ (E) $G=T$
- () 36. CAM plants keep stomata closed in daytime, thus reducing loss of water.
They can do this because they (A) fix CO_2 into organic acids during the
night. (B) fix CO_2 into sugars in the bundle-sheath cells. (C) fix CO_2 into
pyruvate in the mesophyll cells. (D) use the enzyme phosphofructokinase,
which outcompetes rubisco for CO_2 . (E) use photosystems I and II at night.

- ()37. Which of the following mutations would be most likely to have a harmful effect on an organism? (A) a base-pair substitution (B) a deletion of three nucleotides near the middle of a gene (C) a single nucleotide deletion in the middle of an intron (D) a single nucleotide deletion near the end of the coding sequence (E) a single nucleotide insertion downstream of, and close to, the start of the coding sequence
- ()38. Which component is not directly involved in translation? (A) mRNA (B) DNA (C) rRNA (D) ribosomes (E) GTP
- ()39. In recombinant DNA methods, the term vector can refer to (A) the enzyme that cuts DNA into restriction fragments (B) the sticky end of a DNA fragment (C) a RFLP marker (D) a plasmid used to transfer DNA into a living cell. (E) a DNA probe used to identify a particular gene
- ()40. Homologous chromosomes move toward opposite poles of a dividing cell during (A) mitosis (B) meiosis I (C) meiosis II (D) fertilization (E) binary fission

二、問答題：(20%)

1. 請簡述 ectotherms 與 endotherms 的差異 (4%)。
2. 何謂生物多樣性？生物多樣性考慮的是哪些層級？請簡述之 (6%)。
3. Describe the mechanism leading to the elongation of plant cell in response to auxin. (5%)
4. In mice, black color(B) is dominant to white(b). At a different locus, a dominant allele (A) produces a band of yellow just below the tip of each hair in mice with black fur. This gives a frosted appearance known as agouti. Expression of the recessive allele(a) results in a solid coat color. If mice that are heterozygous at both loci are crossed, what is the expected phenotypic ratio of their offspring? (5%)