國立彰化師範大學 99 學年度碩士班招生考試試題

系所：科學教育研究所　　組別：丁組　　科目：普通生物

☆☆請在答案紙上作答☆☆　　

一、選擇題：單選題 25 題，每題 2 分，共 50 分。

1. What was the theory put forward by Lamarck?
   a) Creationism b) Evolution c) Struggle for existence d) Transformism

2. The theory of natural selection was simultaneously invented by Charles Darwin and
   a) Alfred Russel Wallace
   b) Jean-Baptise Lamarck
   c) Thomas Henry Huxley
   d) Smith Andersen Folk

3. Fossils are the history of life. Life is thought to have originated approximately
   a) Two billion years ago
   b) Five and a half million years ago
   c) Three and a half billion years ago
   d) Six hundred million years ago

4. Catastrophism, meaning the regular occurrence of geological or meteorological disturbances (catastrophes), was Cuvier's attempt to explain the existence of
   a) evolution b) the fossil record c) uniformitarianism d) natural selection

5. If additive variance for a character is 3 and total phenotypic variance is 6, then what is the heritability of the character?
   a) 2 b) 0.5 c) 0.33 d) 0.1

6. The virulence of a parasite is measured by
   a) The extinction rate of the host species
   b) The extinction rate of the infected species
   c) The number of offspring fathered by an average male parasite
   d) The survival of infected relative to uninfected hosts

7. 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) heterogeneous genes d) Hox genes

8. How are matter and energy used in ecosystems?
   a) Energy is cycled through ecosystems; matter is not
   b) Energy can be converted into matter; matter cannot be converted into energy
   c) Matter is cycled through ecosystems; energy is not

d) Matter can be converted into energy; energy cannot be converted into matter

9. Which of the following are important biotic factors that can affect the structure and organization of biological communities?
   a) nutrient availability, soil pH
   b) predation, competition
   c) precipitation, wind
   d) temperature, water

10. What is one characteristic that separates chordates from all other animals?
   a) bilateral symmetry
   b) blastopore, which becomes the anus
   c) post-anal tail
   d) true coelom

11. Chordate pharyngeal slits appear to have functioned first as
   a) the digestive system's opening
   b) suspension-feeding devices
   c) components of the jaw
   d) gill slits for respiration

12. The earliest known mineralized structures in vertebrates are associated with which function?
   a) defense　b) feeding　c) locomotion　d) reproduction

13. Monkeys of South and Central America have prehensile tails, meaning that their tails can be used to grasp objects. The tails of African and Asian monkeys are not prehensile. Which discipline is most likely to provide an evolutionary explanation for how this difference in tails came about?
   a) Aerodynamics　b) Biochemistry　c) Biogeography　d) Physiology

14. If, on average, 46% of the loci in a species' gene pool are heterozygous, then the average homozygosity of the species should be
   a) 23%　b) 46%　c) 54%　d) 92%

15. 基因型為 AABBCC 豌豆與 aabbcc 豌豆雜交，產生的 F_2 用秋水仙素處理幼苗後得到的植株是
   a) 二倍體　b) 三倍體　c) 四倍體　d) 六倍體

16. 決定貓的毛色基因位於 X 染色體上，基因型 bb、BB、Bb 的貓分別是黃、黑和虎斑色。現有虎斑色雌貓與黃色雄貓交配，生下 3 只虎斑小貓和 1 只黃色小貓。這些小貓的性別是
   a) 全為雄貓或三雄一雌
   b) 全為雌貓或三雌一雄
   c) 全為雌貓或全為雄貓
   d) 雌雄貓各占一半

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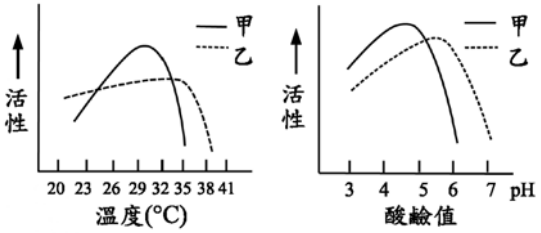
17. 小陳夫婦所生的兩個孩子的基因型分別為 AA 和 aa，試計算該夫婦在理論上接連生出這樣的兩個男孩的幾率為？
    a) 1/2　b) 1/4　c) 1/16　d) 1/32

18. 下圖為甲、乙兩種酵素，在不同溫度和酸鹼值下活性的變化，下列相關敘述何者正確？



    a) 甲酵素的最佳作用溫度比乙酵素高
    b) 甲酵素對酸性的容忍度比乙酵素高
    c) 在中性時，甲酵素的活性大於乙酵素
    d) 甲酵素的最高作用溫度是 40℃

19. 聚合酶連鎖反應（PCR）包括下列四個要項：
    (1)加熱至 95℃使兩股 DNA 分離以做為模板
    (2)聚合酶將核酸依序加在引子上
    (3)DNA 由兩股變成四股
    (4)降溫使引子與模板 DNA 配對
    以上反應過程的正確順序為何？
    a) (1)(2)(3)(4)　b) (1)(3)(2)(4)　c) (1)(4)(2)(3)　d) (2)(3)(1)(4)

20. 下列哪一化學反應完成後，細胞內的 ATP 含量會隨著增加？
    a) 蔗糖轉變為澱粉
    b) 脂肪酸轉變為脂質
    c) 胺基酸轉變為蛋白質
    d) 葡萄糖轉變為二氧化碳

21. 來自同一受精卵的細胞，如肌肉與神經細胞，其構造與功能為何有所不同？
    a) 因兩者的基因種類不同
    b) 因兩者的基因表現不同
    c) 因兩者的基因數目不同
    d) 因兩者的基因排列不同

22. 有30個分子的甘油與60個分子的脂肪酸化合，則可獲得多少個脂肪，並釋出多少個水分子？
    a) 20 個脂肪，20 個水分子
    b) 20 個脂肪，60 個水分子
    c) 30 個脂肪，30 個水分子
    d) 30 個脂肪，60 個水分子

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23. 骨骼肌收縮時，下列哪個結構的距離不變？
    a) A 帶　　b) I 帶　　c) H 區　　d) 肌小節

24. 在真核細胞中參與合成並分泌蛋白質的構造之順序，下列何者正確？
    a) 核糖體→內質網→溶體→細胞膜
    b) 核糖體→內質網→粒線體→細胞膜
    c) 核糖體→粒線體→高基氏體→細胞膜
    d) 核糖體→內質網→高基氏體→細胞膜

25. 下列有關於原核生物與真核生物的比較，何者正確？
    a) 皆具有明顯的胞器
    b) 皆以環狀 DNA 為遺傳物質
    c) 皆直接以 ATP 為供能物質
    d) 皆具有減數分裂和有性生殖

二、簡答題：3 題，共 50 分。

1. 植物細胞延長(elongation or expansion)方向與細胞骨架(cytoskeleton)有何關聯？植物細胞延長的作用機制為何？(20 分)
2. 誘導萵苣種子萌芽的下列處理中，(1)何者處理可增加萌芽率？(A)Dark (B)R－dark (C) R－FR－Dark (D)R－FR－R－FR (2)其與哪一種受體有關？ (3)其作用機制為何？(15 分)
3. 何謂電子傳遞鏈(Electron Transfer Chain)？葉綠體與粒線體電子傳遞鏈的成員有何不同？其電子傳遞鏈的成品有何差異？(15 分)