《生物》試題評析

曾正老師試題評析

一、命題分佈比重：

範疇	題數	範疇	題數
生物學概論	1 題	分子生物學	13 題
生物無機/有機化學	0 題	生物分類學	17 題
細胞學	8 題	植物生理學	1 題
生物能量學	3 題	動物生理學	8 題
遺傳學	3 題	演化及生態及行爲	26 題

二、試題評析：

1.後西醫今年生物試題實在是“真妙”！

(1)不偏重任何一種生物教本

(2)簡單題比插大還簡單(一行敘述而已)，甚至同一種題目出了兩次(答案全是幼形遺留)，但難題則直逼研究所入學試題的考生水準。

(3)不公平題(防止學生考滿分)出現一堆不知爲何的學名？此部份比例也過多了！

2.考前造謠的命題本確實出了若干題。(但課堂上皆有教過，甚至是去年題庫班，皆有該題目)

3.非常高興，其中一題計算遺傳變異喪失，正是本人第二次後中模擬考題，同學應可輕鬆過關。

4.出自課外的部分，偏重在分生、演化、生態，正是本人專長，課堂非常重視！同學可應付其中一些考題。

5.不重理解、死背、不求甚解型的考生此次又吃虧了，背題庫同學又暈了！本班優秀同學應可拿到 80 分以上，中等生亦應該可拿到 60-70 分之間。

曾正老師詳解及命中事實

題號	回數	頁數	說明
1	第1回	P242	酵素催化反應，酵素不影響△G 值
2	第1回	P143	膜流路徑：rER→ Golgi→ vesicle→ plasma membrane
3	第1回	P182	緻密接合形成連續的密閉封合空間，且限制物質移動
4	第1回	P255	終產物爲第一步催化酵素的原始受質之非競爭性抑制劑，(結構不似正常受質)，當酵素與該抑制劑結合，抑制劑發揮異位抑制作用，使酵素活性部位與受質間的親和性變差
5	第1回	P171	著絲點非 MTOC
6	第2回	P266	有兩個 ACU，故需一種 aminoacyl-tRNA synthetase，故全部需 4 種合成酶
7	第2回	P245	group II 與 pre mRNA splicing 皆產生 lariat structure(繫繩結構)
8	第1回	P312	共形成 5NADH +1$FADH_2$+3ATP 大約形成 5×2.5+1×1.5+3ATP≒34 ATPs 最接近答案 36ATPs
9	第1回	P180	focal adhesions 含有 integrins, actin filaments, fibronectin 及 Linker protein
10	第2回	P219	因二股皆需 5’ → 3’ 走向，一股接近 replication fork，一股遠離 replication fork，故 lagging strand 需以不連續的方式合成 (產生 Okazaki 片段)
11	第13回	P18	蛇之後肢骨屬於痕跡器官
12	第11回	P127	Opisthokonts 包括 choanoflagellates 及 animal 故最爲接近
13	第14回	P118	脊索動物四大特徵中不包括 protostome 發育
14			該實驗說明鳥的氣囊不參與氣體交換(因爲 CO 並不從氣囊進入血液)
15	第5回	P24	海馬具 salt glands 可分泌因喝入海水中的 Nacl
16	第10回	P167	Apoptosis(凋亡)的特徵之一是細胞產生 blebbing(泡泡)
17	第2回	P259	Suppressor tRNA anticodon 可結合 mRNA 上的 stop codon 故 suppressor tRNA 的 anticodon 可選 5’ UUA3’ (上課補充過，考前總復習一再提及)
18	第2回	P82	雙性雜種雜交 F_1×F_1 爲 PpDd × PpDd 所得 F_2 爲 9：3：3：1(注意:purple、dwarf 爲 dominant,依題意)
19	第1回	P192	Fatty acid 愈短，愈不飽和則膜愈流體
20	第2回	P222	Linking number 由 35→ 38；則 supercoils 則由 (-5)→ (-2) ⇨ 2 negative supercoils
21	第5回	P83	釋放訊息的細胞與接受訊息的細胞距離便在附近，故爲 paracrine signaling 的模式
22	第1回	P143	葉綠體不屬於 endomembrane system
23	第10回	P111	生物所有基因的 complete complement, 稱爲其基因組
24	第9回	P12	反芻類動物其消化道腔室(胃)含有共生微生物可消化纖維素物質
25	第5回	P38	腎臟受傷時，在尿液中也會出現 RBC

題號	回數	頁數	說明
26	第13回	P239	生態系中能量的最終來源爲陽光
27	第9回	P78	本題中僅有碘(I)屬於微量元素
28	第1回	P21	生命之單一性的證據之一爲所有生物共用一套相同遺傳密碼
29	第13回	P49	天擇作用至個體的表型
30	第13回	P37～38 補充資料	fixed 指的是一特別基因座上僅有一種對偶基因，故 nucleotide variability 及 average heterozygosity，皆會發生改變
31	第13回	P75 補充資料	雜交區之 reinforcement 指的是二基因庫中基因流的發生下降(即生殖隔離強化)
32	第13回	P36	基因流的最大單位----種 (species)
33	第13回	P25	狗與狼的關係密切，指二動物共有一最近的共同祖先
34	第11回	P62	原核生物的生殖爲二分裂法(binary fission)且不具有 Mitosis 或 Meiosis
35	第11回	P90	原核生物在生態系的角色是作爲分解者----recycling of nutrients
36	第11回	P244	陸生植物演化趨勢之一：配子體愈不發達，而孢子體愈來愈發達
37	第14回	P43	頭化現象與二側對稱性有關
38	第14回	P3	海綿是側生動物(不具有真正的組織)
39	第14回	P51	減少血吸蟲的中間宿主----snail 減少，是減少血吸蟲感染人類族群的可行方法
40	第14回	P141	二生類(或兩棲類)屬於非羊膜類
41	第11回	P271 P273	植物生活史中 (1)配子體行有絲分裂(2)孢子體行減數分裂， 而被子植物的花中含有配子體
42	第11回	P478	植物無似肌肉組織的運動使葉子捲曲及去捲曲-----而是種似神經系統的動作電位
43	第13回	P309	河口的生產者數目眾多生產力極高
44	第13回	P172	容納量(k)系指一特別環境所能支持的最大的族群大小
45	第13回	P91	由一共同祖先分岐而至一新的環境稱爲適應-輻射
46	第13回	P189	K 選擇種會適當配置能量以用於自身的存活及子代的存活(有極佳的親護行爲)
47	第14回	P194	動物的導航需具有計時器(維持 24 小時活動韻律或周期)
48	第13回	P85	幼形遺留係指成體生物仍保有其幼體的特徵
49	第13回	P49	平衡選擇的代表例爲異型合子優勢，而非同型合子優勢
50	模考	試題	1/ 2×500 x 20=2% (命中後中模擬考生物試題)
51	第13回	P278	佛洲地鼠陸龜(gopher tortoises 爲 keystone species 非 umbrella species
52	第13回	P75	台灣畫眉遺傳多樣性透過地理隔離不完全而與他種發生雜交
53	第13回	P186	颱風屬於非生物因子所導致的 density-independent effect
54	第14回	P201	台灣水雉的交配系統爲一妻多夫制(polyandry)
55	第2回	P121	控制果蠅眼色基因位於 X chromosome 上

題號	回數	頁數	說明
56	第10回	P163	C. elegans 是第一完成定序的無脊椎 (1998)，其意義是有些序列與脊椎動物的功能序列有緊密的關聯性
57	第4回	P111	魚鰓的〝逆流交換〞機制目的是用來放大(擴增)擴散梯度
58	第6回	P4	有性生殖重組使得子代更能在變動的環境下存活
59	第13回	P17 P21	題目要求 homology 且基於趨同演化故僅能選編碼共同蛋白質的核苷酸序列等同
60	第 13 回	P38	二倍性使有害的隱性對偶基因存在於人體
61	第 13 回	P85	又重覆出現一次，是命題者的失誤還是大方送分呢?成體保留幼體的結構稱爲幼形遺留
62	第 13 回	P86	肢芽的位置、數目、對稱改變皆涉及同源異型基因 (homeotic gene)的變化
63	第 13 回	P158	置於相同的系統發生演化樹，亦只有判定同源基因且一定爲高度保守
64	第 14 回	P195	感覺訊息溝通可以是視覺、聽覺、及化學訊息(ex:費洛蒙)等
65	第 2 回	P336	組蛋白乙醯化促使組蛋白與 DNA 間的親和力下降，不會形成 30nmfiber
66	第 2 回	P362、364	Mi RNA 由內源基因製造，過程涉及髮夾環的前趨物，而 SiRNA 則是由外源 22 股 RNA 注入細胞內經酵素切割而產生
67	第 2 回	P318	此題像是 trp Operon，Gal 4(TF) 結合至四環黴素，使該複合體結合至 tet 的 operator 上
68	第 8 回	P11	靜止的神經元，K^+ 的通透性(向內)大於 Na^+ 的通透性(向外)
69	第 2 回	P262 P360	S noRNA 涉及真核 pre rRNA 的加工並非是 RNA e dition
70	第 2 回		5-Azacytosine 可使得 DNA 去甲基化，∵它併入 DNA 可不受甲基化，故使得 DNA 序列不再甲基化
71	第 1 回	P154	題目給予 PH-sensitive ，故選擇酸性胞器膜，(lysosome)相關的膜 (ex endosome)
72	第 14 回	P7	體腔是由中胚層所圍繞，而假體腔是由中胚層的外覆及內胚層的內層
73	第 2 回	P321	*E..coli* 部份雙套有關 *Lac* operon 的基因型在 IPTG 有無存在之下的表型爲 O^C/O^+，R (無 IPTG 存在下)無法結合至 O^C ，在 R 在 IPTG 存在下失活，此二種皆使 lac Z^+ 基因表現
74	第 1 回	P152	無 mannose 6-phosphate receptor ，高基氏體中的蛋白質(產物)無法送至溶酶體，故另一命運是分泌出細胞外。
75	第 2 回	P10	有絲分裂的正確順序 ： 姐妹染色分體濃縮→核膜裂解→姐妹染色分體排列在中期板上→姐妹染色分體分離→形成分裂凹溝(細胞質分裂)

楊老師試題評析

一、回歸後醫以往出題方式：

1.去年後醫，生理學出快要一半，今年只有出 15 分，回歸以往常態出題模式。

2.去年後醫題目老師自己出，今年回歸以往部分抄自題庫。

二、後醫題目很多，又是以英文出題，題目正常架構如下：

1.大部份題目還是基本送分題，只要英文看的懂，有讀就有分。例如：2、3、5～～

2.直接由題庫抄出：前 50 題大多都是

3.鑑別程度的題目、如：7、20、71、74～～

三、遺傳考 3 題，分生 11 題，共佔 22%，(去年 18%)(前年 24%)(大前年 21%)

四、生理考 9 題，佔 13%，比例偏低(去年 42%)(前年 21%)(大前年 30%)

五、分類、演化考約 27%(去年 12%)(前年 12%)(大前年 4%)

六、植物學，佔 3%(去年 8%)(前年 6%)(大前年 10%)

七、生態學上升，佔 14%(去年 6%)(前年 22%)(大前年 10%)

八、還是老話：

1.不要好高騖遠，講義讀熟，拿該拿的分數就會考上。

2.準備方向不要偏，書不在讀的多，考試是考有沒有讀熟。很偏的題目，就算花再多的時間也不容易掌握，反而捨本逐末。

楊老師講義命中事實

題號	回數	頁數	題號	回數	頁數
1	總複習 1	P11→ 第 1→4 分支	39	總複習 2	P49→ 第 1→2 分支
2	總複習 1	P8→ 第 2 分支	40	總複習 1	P48
3	總複習 1	P10→ 第 7→4 分支	41	總複習 2	P57
4	總複習 1	P12→ 第 3→3 分支	42	總複習 2	P68
5	總複習 1	P9→ 第 4→1→3 分支	43	總複習 1	生態學 P52→ 第 5 分支
6	總複習 1	P28→ 第 1 分支	44	總複習 1	生態學 P61→ 第 1 分支
7	總複習 1	P27	45	總複習 2	P30 第 1→3 分支
8	總複習 1	P14→ 第 6→2 分支	46	總複習 1	生態學 P61
9	總複習 1	P10→ 第 7→1 分支	47	總複習 1	P52
10	總複習 1	P25→ 第 2→2 分支	48	總複習 2	P32→ 第 1→2 分支
11	總複習 2	P27→ 第 4→3 分支	49	總複習 2	P28
12	總複習 2	P51→ 第 1→5 分支	50	總複習 1	P61
13	總複習 2	P51→ 第 2→1 分支	51	總複習 2	P59→ 第 3→3→2 分支
14	總複習 1	P97	52	總複習 2	P67→ 第 1 分支
15	總複習 1	P101	53	總複習 2	P70→ 第 3 小分支
16	總複習 1	P45→ 第 8→2 分支	54	總複習 1	P16
17	總複習 1	P26→ 第 1 分支	55	總複習 1	P22→ 第 5 小分支
18	總複習 1	P20	56	總複習 1	P43→ 第 3 小分支
19	總複習 1	P14→第 6→2 分支	57	總複習 1	P97
20	總複習 1	P32→ 第 1 分支	58	總複習 1	P22
21	總複習 2	P15	59	總複習 2	P27→ 第 4→3 分支
22	總複習 1	P8→ 第 2 分支	60	總複習 2	P28
23	總複習 2	P28→ 第 1 分支	61	總複習 2	P45
24	總複習 1	P182：第 19 行	62	總複習 2	P32→ 第 2 分支
25	總複習 1	P103→ 第 3→1 分支	63	總複習 2	P32→ 第 2 分支
26	總複習 1	P15→ 第 1 分支	64	總複習 2	P10
27	總複習 1	P3→ 第 1→2→3 分支	65	總複習 1	P36→ 第 4→4 分支
28	總複習 2	P27→ 第 4→5 分支	66	總複習 1	P36→ 第 4→4 分支
29	總複習 2	P28→ 第 3→5 分支	67	總複習 1	P31→ 第 3 小分支
30	總複習 2	P28→ 第 3 分支	68	總複習 2	P2
31	總複習 2	P28→ 第 3→2 分支	69	總複習 1	P36→ 第 4→5 小分支
32	總複習 2	P28→ 第 3→2 分支	70	總複習 1	P36→ 第 1 小分支
33	總複習 2	P27→ 第 4→3 分支	71	總複習 1	P8→ 第 2 小分支
34	總複習 2	P47→ 第 1 分支	72	總複習 2	P47→ 第 1 分支
35	總複習 2	P37	73	總複習 1	P31
36	總複習 2	P57	74	總複習 1	P8→ 第 4→1 小分支
37	總複習 2	P47→ 第 1 分支	75	總複習 1	P19
38	總複習 2	P48→ 第 1 分支			

《生物》

I.【單選題】1-50 題，每題 1 分，共計 50 分。答錯 1 題倒扣 0.25 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

(B) 1. If the amount of enzyme in a reaction with an initial △G of -5 kcal/mole was doubled, what would the △G be?
(A) -2.5 kcal/mole (B) -5 kcal/mole (C) -10 kcal/mole (D) +5 kcal/mole (E)+10 kcal/mole

(D) 2. Which is the most common route through which a protein is secreted from a eukaryotic cell?
(A) plasmid →plasma membrane →nuclear envelope →smooth endoplasmic reticulum (ER)
(B) Golgi apparatus →lysosome →vesicles →plasma membrane
(C) nuclear envelope →vesicles →Golgi apparatus →plasma membrane
(D) rough endoplasmic reticulum →Golgi apparatus →vesicles →plasma membrane
(E) rough endoplasmic reticulum →lysosomes →vesicles →cell membrane

(D) 3. Movement of integral membrane proteins between the apical and basolateral domains of an epithelial cell membrane is restricted by the presence of
(A) lipid rafts. (B) basal lamina. (C) desmosomes.
(D) tight junctions. (E) gap juncitions.

(D) 4. Which of the following statements about feedback inhibition in metabolic pathways is most correct?
(A) The product of the pathway inhibits its own production by competitively binding to reactants in the metabolic pathway.
(B) The product of the pathway inhibits its own production by noncompetitively binding to reactants in the metabolic pathway.
(C) The product of the pathway inhibits its own production by competitively inhibiting the binding of a substrate to the active site of an enzyme within the metabolic pathway.
(D) The product of the pathway inhibits its own production by noncompetitively inhibiting the binding of a substrate to the active site of an enzyme within the metabolic pathway.
(E) All of the above

(D) 5. Which is **NOT** a microtubule-organizing center (MTOC)?
(A) centrosome (B) basal body of cilia (C) mitotic spindle pole
(D) kinetochore (E) all of the above

(C) 6. An mRNA sequence is 5'-AUG-GGC-ACU-CAU-ACU-UAA-3', where AUG is the start codon and UAA is the stop codon. How many distinct aminoacyl-tRNA synthetases are required to translate the mRNA sequence?
(A) 2 (B) 3 (C) 4 (D) 5 (E) 6

(D) 7. Self-splicing of group II introns is similar to nuclear pre-mRNA splicing because
(A) both need snRNPs. (B) both need guanosine. (C) both need ATP.
(D) both form lariat structure. (E) both form spliceosome.

(D) 8. Assuming a fat molecule can be oxidized into 2 glycerol molecules, which are then converted to glyceraldehyde-3-phosphate in intermediate glycolysis, how many ATP can be produced from a fat molecule?
(A) 4 (B) 8 (C) 24 (D) 36 (E) 48

(A) 9. Which of the following proteins is **NOT** a component of focal adhesions?
(A) cadherins (B) integrins (C) actin filaments
(D) linker protein (E) fibronectin/collagen

(B) 10. Why is there a need to produce Okazaki fragments on the lagging strand, but **NOT** on the leading strand of DNA?
(A) It is substantially more efficient to make several shorter strands rather than one longer strand of DNA.

(B) The two parental strands of DNA are antiparallel and DNA polymerase makes DNA in the 5' to 3' direction only.
(C) There lacks enough DNA ligase for bonding Okazaki fragments together if they were produced from both parental strands.
(D) By having one leading strand and one lagging strand the cell can limit the amount of DNA polymerase used for chromosomal replication.
(E) It is faster to make several smaller fragments than one larger fragment.

(B) 11. When observing the skeleton of a snake, you see the remains of hip and hind leg bones associated with four legged animals. These bones are called
(A) convergent traits. (B) vestigial structures. (C) homologous structures.
(D) analogous structures. (E) both homologous and analogous structures.

(B) 12. The group of protists to which humans are most closely related is:
(A) Rhizaria. (B) the choanoflagellates. (C) slime molds.
(D) Foraminifera. (E) Stramenopila.

(E) 13. Which of the following is **NOT** a defining trait of the phylum Chordata?
(A) notochord (B) dorsal hollow nerve cord (C) pharyngeal slits
(D) post anal tail (E) protostome development

(E) 14. The physiologist J. Soum surgically sealed off an air sac of a pigeon and injected carbon monoxide into it. What did he observe and conclude from this experiment?
(A) The bird died demonstrating the toxicity of this gas.
(B) The bird was fine, demonstrating this gas is not actually toxic.
(C) The bird died, indicating diffusion of gases across the air sac into the blood.
(D) The bird showed no ill effects, indicating diffusion of gases from the air sac into the blood.
(E) The bird showed no ill effects, indicating gases do not diffuse from the air sac into the blood.

(E) 15. Humans cannot survive at sea by drinking salt water. However, marine vertebrates such as sea turtles and various sea birds can survive by drinking salt water. What **DO** they have that humans **DO NOT**?
(A) kidneys that are extremely good at producing a concentrated urine.
(B) body fluid concentrations that are similar to or greater than those of seawater.
(C) the ability to secrete salts and wastes into their intestinal contents like an insect.
(D) They use ammonia as their primary nitrogenous waste.
(E) salt glands.

(C) 16. Which of the following is **NOT** a feature of apoptosis?
(A) formation of apoptotic body (B) DNA fragmentation (C) cell swelling
(D) activation of caspases (E) release of cytochrome C from mitochondria

(C) 17. A nonsense suppressor tRNA may have the anticodon
(A) 5'-CAU-3' (B) 5'-UAA-3' (C) 5'-UUA-3' (D) 5'-CCC-3' (E) 5'-UAG-3'

(B) 18. Which of the following accurately gives the distribution of phenotypes produced from a cross of purple dwarf pea plants that are heterozygous for flower color and plant height?
(A) 27 purple dwarf; 28 purple tall; 31 white dwarf; 29 white tall
(B) 63 purple dwarf; 28 purple tall; 27 white dwarf; 7 white tall
(C) 132 purple dwarf; 138 white tall
(D) 54 purple dwarf; 6 white tall
(E) 100% purple dwarf

(B) 19. Which of the following components and conditions increases membrane fluidity?
(A) phospholipids with long, saturated fatty acyl chains
(B) phospholipids with short, unsaturated fatty acyl chains
(C) lower temperatures
(D) cholesterol at the usual concentrations found in biomembranes
(E) lipid rafts

(D) 20. A 400-bp covalently closed circular DNA with a linking number of 35 has 5 negative supercoils. When the linking number of this DNA is changed to 38 by a topoisomerase, this DNA will have
(A) 3 positive supercoils. (B) 3 negative supercoils. (C) 2 positive supercoil.
(D) 2 negative supercoils. (E) relaxed.

(C) 21. When a cell releases a signal molecule into the environment and a number of cells in the immediate vicinity respond, this type of signaling is
(A) typical of hormones. (B) autocrine signaling. (C) paracrine signaling.
(D) endocrine signaling. (E) synaptic signaling.

(B) 22. Which structure is **NOT** part of the endomembrane system?
(A) nuclear envelope (B) chloroplast (C) Golgi apparatus
(D) plasma membrane (E) ER

(E) 23. What is a genome?
(A) An ordered display of chromosomes arranged from largest to smallest.
(B) A specific set of polypeptides within each cell.
(C) A specialized polymer of four different kinds of monomers.
(D) A specific segment of DNA that is found within a prokaryotic chromosome.
(E) The complete complement of an organism's genes.

(E) 24. Why are cattle able to survive on a diet consisting almost entirely of plant material?
(A) They are autotrophic.
(B) Cattle, like the rabbit, reingest their feces.
(C) They manufacture all 15 amino acids out of sugars in the liver.
(D) Cattle saliva has enzymes capable of digesting cellulose.
(E) They have cellulose-digesting, symbiotic microorganisms in chambers of their stomachs.

(D) 25. Which one of the following, if present in a urine sample, would likely be caused by trauma?
(A) amino acids (B) glucose (C) salts (D) erythrocytes (E) vitamins

(A) 26. The main source of energy for producers in an ecosystem is
(A) light energy. (B) kinetic energy. (C) thermal energy. (D) chemical energy. (E) ATP.

(C) 27. Trace elements are those required by organisms in only minute quantities. Which of the following is a trace element that is required by humans and other vertebrates?
(A) nitrogen (B) calcium (C) iodine (D) sodium (E) phosphorus

(D) 28. Which of the following pieces of evidence most strongly supports the common origin of all life on Earth?
(A) All organisms require energy.
(B) All organisms show heritable variation.
(C) All organisms reproduce.
(D) All organisms use essentially the same genetic code.
(E) All organisms have undergone evolution.

(E) 29. Which of these is the smallest unit upon which natural selection directly acts?
(A) a species' gene frequency (B) a population's gene frequency
(C) an individual's genome (D) an individual's genotype
(E) an individual's phenotype

(E) 30. The higher the proportion of loci that are "fixed" in a population, the lower is that population's
(A) nucleotide variability. (B) genetic polyploidy.
(C) average heterozygosity. (D) A, B, and C
(E) A and C only

(A) 31. Which of these should decline in hybrid zones where reinforcement is occurring?
(A) gene flow between distinct gene pools (B) speciation
(C) the genetic distinctness of two gene pools (D) mutation rate
(E) hybrid sterility

(B) 32. The largest unit within which gene flow can readily occur is a
(A) population. (B) species. (C) genus. (D) hybrid. (E) phylum.

(D) 33. Which statement represents the best explanation for the observation that the nuclear DNA of wolves and domestic dogs has a very high degree of homology?
(A) Dogs and wolves have very similar morphologies.
(B) Dogs and wolves belong to the same order.
(C) Dogs and wolves are both members of the order Carnivora.
(D) Dogs and wolves shared a common ancestor very recently.
(E) Convergent evolution has occurred.

(C) 34. Which of these statements about prokaryotes is correct?
(A) Bacterial cells conjugate to mutually exchange genetic material.
(B) Their genetic material is confined within a nuclear envelope.
(C) They divide by binary fission, without mitosis or meiosis.
(D) The persistence of bacteria throughout evolutionary time is due to their genetic homogeneity (i.e., sameness).
(E) Genetic variation in bacteria is not known to occur, nor should it occur, because of their asexual mode of reproduction.

(D) 35. If all prokaryotes on Earth suddenly vanished, which of the following would be the most likely and most direct result?
(A) The number of organisms on Earth would decrease by 10—20%.
(B) Human populations would thrive in the absence of disease.
(C) Bacteriophage numbers would dramatically increase.
(D) The recycling of nutrients would be greatly reduced, at least initially.
(E) There would be no more pathogens on Earth.

(B) 36. Which of the following is an ongoing trend in the evolution of land plants?
(A) decrease in the size of the leaf
(B) reduction of the gametophyte phase of the life cycle
(C) elimination of sperm cells or sperm nuclei
(D) increasing reliance on water to bring sperm and egg together
(E) replacement of roots by rhizoids

(E) 37. Cephalization is primarily associated with
(A) adaptation to dark environments. (B) method of reproduction.
(C) fate of the blastopore. (D) type of digestive system.
(E) bilateral symmetry.

(D) 38. The distinction between sponges and other animal phyla is based mainly on the absence versus the presence of
(A) a body cavity. (B) a complete digestive tract.
(C) a circulatory system. (D) true tissues. (E) mesoderm.

(B) 39. What would be the most effective method of reducing the incidence of blood flukes in a human population?
(A) Reduce the mosquito population. (B) Reduce the freshwater snail population.
(C) Purify all drinking water. (D) Avoid contact with rodent droppings.
(E) Carefully wash all raw fruits and vegetables.

(A) 40. Which of these is **NOT** considered an amniote?
(A) amphibians (B) nonbird reptiles (C) birds
(D) egg-laying mammals (E) placental mammals

(E) 41. Which of the following is true in plants?
(A) Mitosis occurs in gametophytes to produce gametes.
(B) Meiosis occurs in sporophytes to produce spores.
(C) The gametophyte is within the flower in angiosperms.
(D) A and B only
(E) A, B, and C

(B) 42. We tend to think of plants as immobile when, in fact, they can move in many ways. All of the following are movements plants can accomplish **EXCEPT**
(A) growth movements up or down in response to gravity.
(B) folding and unfolding of leaves using muscle-like tissues.
(C) growth movements toward or away from light.
(D) changes in plant growth form in response to wind or touch.
(E) rapid responses using action potentials similar to those found in the nervous tissue of animals.

(D) 43. Which of the following is **NOT** true about estuaries?
(A) Estuaries are often bordered by mudflats and salt marshes.
(B) Estuaries contain waters of varying salinity.
(C) Estuaries support a variety of animal life that humans consume.

(D) Estuaries usually contain no or few producers.
(E) Estuaries support many semiaquatic species.

(B) 44. Carrying capacity is
(A) seldom reached by marine producers and consumers because of the vast resources of the ocean.
(B) the maximum population size that a particular environment can support.
(C) fixed for most species over most of their range most of the time.
(D) determined by density and dispersion data.
(E) the term used to describe the stress a population undergoes due to limited resources.

(A) 45. The emergence of 14 species of Galápagos finches from a common ancestor that finds itself in a new environment is called
(A) adaptive radiation. (B) jumping selection. (C) disruptive selection.
(D) sympatric speciation. (E) hybridization.

(B) 46. The life history strategy of an k-selected species is to
(A) take advantage of human activity, such as clearing woodlots.
(B) allocate energy to their own survival and to the survival of their descendants.
(C) produce thousands of eggs.
(D) become prey.
(E) reproduce at early age.

(A) 47. Which of the following mechanisms is essential for animal navigation?
(A) a time keeping mechanism (B) a color recognition mechanism
(C) a scent recognition mechanism (D) a sound discrimination mechanism
(E) a touch discrimination mechanism

(C) 48. The sexually mature organism retains traits of the juvenile stage of the organism's ancestor. This is called_____.
(A) metamorphosis (B) pesudomorphosis (C) paedomorphosis
(D) premorphosis (E) adultery

(C) 49. Which of the following statements regarding balancing selection is **FALSE**?
(A) The balancing selection maintains genetic diversity in a population.
(B) The balancing selection can create a balanced polymorphism.
(C) Homozygote advantage is usually favored by the balancing selection.
(D) The balancing selection is a type of natural selection which does not always cause the elimination of weaker alleles.
(E) The balancing selection can occur through negative frequency-dependent selection.

(B) 50. Isolated populations will lose a percentage of their original diversity over time, approximately at the rate of 1/(2N) per generation, where N= population size. After 20 generations, the original population of 500 will lose ___ of its original genetic variation.
(A) 20% (B) 2% (C) 4% (D) 8% (E) 16%.

Ⅱ.【單選題】51-75 題，每題 2 分，共計 50 分。答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

(B) 51.Which of the following statements about umbrella species is correct?
(A) Umbrella species are species whose habitat requirements are critical to a certain small area.
(B) The Northern spotted owl (*Strix occidentialis*) is considered to be an important umbrella species.
(C) The gopher tortoises (*Gopherus polyphemus*) is considered to be an important umbrella species.
(D) Umbrella species must be attractive and more readily engendered support from the public for their conservation.
(E) Formosan macaques are considered to be an important umbrella species in Taiwan.

(D) 52.In present populations of Taiwan Hwa-Mei (*Leucodioptron taewanum*) in Taiwan, genetic diversity has been
(A) lost through mutation and restored by natural selection.
(B) lost through stabilizing selection and restored by balancing selection.

(C) lost through directional selection and restored by balancing selection.
(D) lost through hybridization and restored by natural selection.
(E) lost through artificial selection and restored by natural selection.

(B) 53. The Morakot typhoon inflicted catastrophic damages on rivers and wiped out entire population of fishes in the river. This is an example of
(A) a density-dependent effect.
(B) the effects of abiotic factors.
(C) the interaction between density-dependent and abiotic factors.
(D) founder effect.
(E) dispersal effect.

(B) 54. Which of the following mating systems does the Pheasant-tailed Jacana (*Hydrophasianus chirurgus*) exhibit in paddy fields in Tainan?
(A) monogamy (B) polyandry (C) polygyny
(D) promiscuity (E) none of the above

(A) 55. When Thomas Hunt Morgan crossed his red-eyed F1 generation flies to each other, the F2 generation included both redand white-eyed flies. Remarkably, all the white-eyed flies were male. What was the explanation for this result?
(A) The gene involved is on the X chromosome.
(B) The gene involved is on the Y chromosome.
(C) The gene involved is on an autosome.
(D) Other male-specific factors influence eye color in flies.
(E) Other female-specific factors influence eye color in flies.

(D) 56. Sequencing an entire genome, such as that of *Caenorhabditis elegans*, a nematode, is most important because
(A) it allows researchers to use the sequence to build a "better" nematode, resistant to disease.
(B) it allows research on a group of organisms we do not usually care much about.
(C) the nematode is a good animal model for trying out cures for viral illness.
(D) a sequence that is found to have a particular function in the nematode is likely to have a closely related function in vertebrates.
(E) a sequence that is found to have no introns in the nematode genome is likely to have acquired the introns from higher organisms.

(C) 57. Countercurrent exchange in the fish gill helps to maximize which of the following?
(A) endocytosis (B) blood pressure (C) diffusion (D) active transport (E) osmosis

(B) 58. Sexual reproduction
(A) allows animals to conserve resources and reproduce only during optimal conditions.
(B) can produce diverse phenotypes that may enhance survival of a population in a changing environment.
(C) yields more numerous offspring more rapidly than is possible with asexual reproduction.
(D) enables males and females to remain isolated from each other while rapidly colonizing habitats.
(E) guarantees that both parents will provide care for each offspring.

(B) 59. Members of two different species possess a similar-looking structure that they use in a similar fashion to perform the same function. Which information would best help distinguish between an explanation based on homology versus one based on convergent evolution?
(A) The two species live at great distance from each other.
(B) The two species share many proteins in common, and the nucleotide sequences that code for these proteins are almost identical.
(C) The sizes of the structures in adult members of both species are similar in size.
(D) Both species are well adapted to their particular environments.
(E) Both species reproduce sexually.

(C) 60. The recessive allele that causes phenylketonuria (PKU) is harmful, except when an infant's diet lacks the amino acid, phenylalanine. What maintains the presence of this harmful allele in a population's gene pool?
(A) heterozygote advantage (B) stabilizing selection (C) diploidy

(D) balancing selection (E) kin selection

(B) 61. Bagworm moth caterpillars feed on evergreens and carry a silken case or bag around with them in which they eventually pupate. Adult female bagworm moths are larval in appearance; they lack the wings and other structures of the adult male and instead retain the appearance of a caterpillar even though they are sexually mature and can lay eggs within the bag.
This is a good example of
(A) allometric growth. (B) paedomorphosis. (C) sympatric speciation.
(D) adaptive radiation. (E) changes in homeotic genes.

(D) 62. Hypothetical mutation in a squirrel population produces organisms with eight legs rather than four. Further, these mutant squirrels survive, successfully invade new habitats, and eventually give rise to a new species. The initial event, giving rise to extra legs, would be a good example of
(A) punctuated equilibrium. (B) species selection. (C) habitat selection.
(D) changes in homeotic genes. (E) allometry.

(E) 63. Species that are not closely related and that do not share many anatomical similarities can still be placed together on the same phylogenetic tree by comparing their
(A) plasmids.
(B) chloroplast genomes.
(C) mitochondrial genomes.
(D) homologous genes that are poorly conserved.
(E) homologous genes that are highly conserved.

(E) 64. Animal communication involves what type of sensory information?
(A) visual (B) auditory (C) chemical (D) A and C only (E) A, B, and C

(D) 65. Which of the following statements about histone acetylation is **WRONG**?
(A) Histone acetylation usually occurs within the tail region.
(B) Histone acetylation decreases the positive charge of histones.
(C) Histone acetylation reduces the histone-DNA affinity.
(D) Histone acetylation promotes the 30-nm fiber formation.
(E) Histone acetylation is usually associated with activation of gene expression.

(B)(D) 66. Which of the following statements is true?
(A) miRNAs are made from long dsRNAs, whereas siRNAs are made from large hairpin precursors.
(B) miRNAs are made from large hairpin precursors, whereas siRNAs are made from long dsRNAs.
(C) Both miRNAs and siRNAs are made from long dsRNAs.
(D) Both miRNAs and siRNAs are made from large hairpin precursors.
(E) none of the above

(C) 67. Attaching the activation domain of Gal4 to the Tet (tetracycline) repressor creates a hybrid protein that will
(A) bind to the Gal4 binding site in response to galactose.
(B) bind to the Gal4 binding site in response to tetracycline.
(C) bind to the tet operator in response to tetracycline.
(D) bind to the tet operator in response to galactose.
(E) all of the above

(D) 68. In a neuron at rest, which of the following is true?
(A) Leakage of sodium ions into the neuron is greater than leakage of potassium ions out of the neuron.
(B) Leakage of sodium ions out of the neuron is greater than leakage of potassium ions into the neuron.
(C) Leakage of potassium ions into the neuron is greater than leakage of sodium ions out of the neuron.
(D) Leakage of potassium ions out of the neuron is greater than leakage of sodium ions into the neuron.
(E) Leakage of potassium ions out of the neuron is equivalent to leakage of sodium ions into the neuron.

(E) 69. Which is **NOT** involved in RNA editing?
(A) site-specific deamination of adenines (B) site-specific deamination of cytosines
(C) guide RNA-directed uridine insertion (D) guide RNA-directed uridine deletion
(E) snoRNA-directed 2'-OH methylation

(C) 70. The effect of 5-Azacytosine on gene expression is to
(A) prevent chromatin remodeling. (B) prevent RNA editing.
(C) remove DNA methylation. (D) enhance DNA recombination.
(E) remove histone acetylation.

(C) 71. Influenza virus has pH-sensitive, acidic fusogenic proteins. Based on this, influenza virus would be expected to fuse with
(A) plasma membrane. (B) membrane of trans-Golgi network.
(C) membrane of late endosomes. (D) membrane of mitochondria.
(E) membrane of peroxisomes.

(B) 72. Which of the following statements best compares a pseudocoelom and a coelom?
(A) A pseudocoelom is completely enclosed by mesoderm whereas a coelom has an outer covering of mesoderm and an inner one of endoderm.
(B) A coelom is completely enclosed by mesoderm whereas a pseudocoelom has an outer covering of mesoderm and an inner one of endoderm.
(C) The coelom is enclosed by ectoderm and the pseudocoelom is enclosed by endoderm.
(D) The pseudocoelom is enclosed by ectoderm and the coelom is enclosed by endoderm.
(E) The coelom is enclosed by ectoderm and the pseudocoelom is enclosed by mesoderm.

(D) 73. A partial diploid E. coli with which of the following genotypes would turn blue on the plate containing X-Gal in the presence or absence of the inducer IPTG?
(A) $I^{+}O^{+}lacZ^{+}$ / $I^{+}O+lacZ^{-}$ (B) $I^{-}O^{+}lacZ^{+}$ / $I^{+}O^{+}lacZ-$
(C) $I^{+}OclacZ^{-}$ / $I^{+}O+lacZ^{+}$ (D) $I^{+}OclacZ^{+}$ / $I+O^{+}lacZ+$
(E) $I^{+}OclacZ^{-}$ / $I^{-}O+lacZ^{+}$

(D) 74. A mutant cell does not have mannose 6-phosphate receptor. Lysosomal enzymes in this cell will
(A) not be synthesized. (B) be in the cytosol. (C) be in the ER.
(D) be secreted. (E) be in the lysosome.

(C) 75. Place the following events of mitosis in the correct order.
I. Sister chromatids align on the metaphase plate. II. The cleavage furrow forms.
III. The nuclear membrane breaks up. IV. Sister chromatids condense.
V. Sister chromatids separate.
(A) I, II, III, IV, V (B) III, IV, I, V, II (C) IV, III, I, V, II (D) III, II, I, IV, V (E) IV, I, III, V, II