

《生物》 試題評析

曾正老師試題評析

一、各類命題之配分：

1. 生化學：2 題
 2. 細胞學：2 題
 3. 生物能量學：3 題
 4. 遺傳學、分子生物學：15 題
 5. 生物分類學：3 題
 6. 植物生理學：6 題
 7. 動物生理學：22 題
 8. 演化、生態及行為學：26 題
- *部分題目共同屬於兩個不同範圍內容、故重複計題。

二、試題評析：

1. 本年度後醫生物試題較去年試題簡單許多(抄自題庫亦未免太多了)。但配分比重依舊；演化、生態行為學永遠是命題冠軍，接著是動物生理學及遺傳分子生物學，這是考生未來要注意的。
2. 其中有幾題是歷年考題 (3、14、20...)，重複被挑中，這是命題疏忽。
3. 一大堆考題與總複習 2.3.4.5 四本試題演練本，正課講義範例及題庫班教材”一模一樣”，可見題庫領導教學是不變的真理----學生高興死了。
4. 仍然有些超出教本題目，這是必然的，不過仍有些同學刪除不太可能答案仍可猜出。
5. 本般一班考生可得 70~75 左右，優秀考生可拿到 85~90 以上。

曾正老師詳解及命中事實

題號	試解說明	命中事實
1	遺傳工程技術的困難層面便是涉及倫理及隱私的問題，且又涉及法律之層級	總複習
2	核膜上之核糖體一定與蛋白質合成有關，故可合理推測可能是核膜上之蛋白質執行功能所必須	題庫班
3	植物在冷之天候下，膜之不飽和磷脂需增加以強化膜之流體性	題庫班
4	補充 distilled water 會使得紅血球膨脹(因為細胞對體液而言會呈高張)	題庫班
5	將經過正確具功能 ADA 對偶基因植入的骨髓細胞再重新注射回病人體內會回至骨髓處發揮作用	總複習
6	antidiuretic hormone 與腎臟發生作用而避免水分保留(透過水通道，影響水分之重吸收)	正課班講義 排世
7	成體幹細胞之全能性與成體其它細胞的全能性不同，亦即二者所表現的基因數量、種類不同，故二者透過不同型式 DNA 甲基化以展現差別性基因表現	正課班講義 發生遺傳學

題號	試題說明	命中事實
8	有效族群大小(Ne)=breeding males + breeding females=500	正課班講義 生態學
9	DNA 二股無法被 helicase 開啓，故 SSB 無法結合至單股的母股 DNA 上	題庫班
10	轉基因插入基因組的 heterochromatic region 故無法表現(因組蛋白纏繞更緊，轉錄因子無法接近)	正課班講義 分子生物之 真核基因表現調節
11	共價鍵的定義便是電子共享(指二原子的最外層電子而言)	正課班講義 生命之化學鍵
12	Melatonin 是在夜晚分泌，故可用作日夜交替活動(睡眠、季節性症候的紓解)	題庫班
13	Benthic ocean 原本就是陽光少到達之地區，故該地區之生態系會在陽光停止供能後仍能維持一段長時間	正課班講義 生態學之 生態系生產力
14	爬蟲類、哺乳類正確循環系統：腔靜脈→右心房→右心室→肺功能→肺靜脈→左心房→左心室→...	正課班講義 循環生理範例
15	BbTt × BBTT→黑色毛長尾(BBtt Bbtt)之比例為 1/4BBtt+1/4Bbtt=1/2	總複習
16	水溶性激素的擴增現象 必須將激素由細胞外液結合至膜上接受器才可經級聯活化路徑產生最大的作用	總複習
17	10 個單體長具有 9 個化學鍵故需 9 個水分子予以水解	正課班講義 化學平衡
18	不同物種交互作用結果是利益共享此稱為 mutualism	正課班講義 群落之 物種交互作用
19	Dolly sheep 的備製是運用乳房細胞核與去核的羊卵細胞行融合再移至代理孕母	正課班講義 發生遺傳學
20	在 hominin 的演化過程中，有許多的不同 Homo 層會交接共同存在	正課班講義 靈長類演化
21	節肢動物比脊椎動物早入侵陸地不可說節肢動物早脊椎動物演化(除非是在地球出現較早)	正課班講義 地質歷史
22	MHC 基因的對偶基因數極多，但族群中個體是雙套染色體數之生物，故每個個體僅遺傳每個 MHC 基因之 2 份	題庫班
23	壓力時，ACTH 刺激腎上腺皮質分泌 cortisol 及 aldosterone，而交感神經系統的神經元刺激腎上腺髓質分泌 NE、Epi	題庫班
24	同卵雙胞胎之所以可能是因人類卵裂球分離時，調節型發育(即胚胎發育命運很晚才決定)可使得分開的卵裂球可形成完整的胚	正課班講義 發生學範例
25	僅有在抗 DDT 的害蟲尚未擁有對抗 DDT 的基因組時，DDT 才會發揮撲滅害蟲的作用	正課班講義 演化學
26	過量飲酒導致 Cl 進入"common sense"神經元中，導致膜無法去極化	題庫班
27	孟氏提出分配律及自由組定律	正課班講義 孟氏遺傳學
28	糖解方程式：2 分子 ATP 活化，4 分子 ATP 形成，產生 2NADH 亦可說淨得 2ATP+2NADH	正課班講義 細胞呼吸之糖解
29	棕色脂肪粒線體內膜 thermogehin 會瓦解 H ⁺ 濃度梯度，能量不以 ATP 型式而以熱的型式產生	正課班講義 細胞呼吸之 氧化磷酸化
30	病毒含有 protein capsids，而類病毒僅具 RNA	題庫班

題號	試卷說明	命中事實
31	減數分裂不分離會導致染色體數改變(產生非整倍體)	正課班講義 分子生物學
32	遺傳變化導致 Hox gene 沿脊椎動物肢的位置改變可能因改變發育基因或基因表現調節改變而導致體部空間架構的變化	題庫班
33	陽光的可利用性，食性階層的能量轉移及大災難皆會影響食物網的鍵長度	總複習
34	群落或生態系在面臨潛在的擾動時仍能維持其結構的能力稱為抗性(resistance)	其他字眼皆是表 可塑性、彈性、 柔軟性及回縮性 極易猜對答案
35	在熱泉中生活的細菌，表示他的酵素有極高的溫度適應性	總複習
36	The Shannon diversity index 是群落中不同的物種數及相對豐富度(均勻度)的測定	第三次模考
37	物種間競爭可藉由型態分歧而避免稱為 character displacement	總複習
38	此稱為一妻多夫的交配系統	正課班講義 行為學
39	生產力計劃聯合生命表是無法用來決定分散(散佈)速率	正課班講義 族群生長
40	基本的生態位是指一物種不與其它物種發生交互作用時的物理狀態	正課班講義 生態位定義
41	群落的定義是棲息在某個範圍區域的相交相互作用的物種之集合	正課班講義 群落定義
42	關鍵物種的生物量不大，但因其生態位會對群落發揮重大的影響力	總複習
43	島嶼生物地理的平衡模式是解釋物種在島嶼上的多樣性是與大陸距離的遷入與小型島嶼滅絕二者間之探討	第三次模考
44	研究氣候與生態事件發生時間的學問稱為生物氣候學(phenology)	
45	一般而言爬蟲類為外溫動物或變溫動物	題庫班
46	聖嬰現象是指南美洲太平洋暖流出現的現象	正課班講義 生態學一模一樣 圖形
47	菌根關係中，真菌吸收土壤礦物質給被子植物根部	總複習
48	$dN/dT = rN \times (K-N/K)$ 是 logistic 族群成長方程式	總複習
49	海水硬骨魚喝海水補充失去的水分子及鰓泌單價鹽(Na^+ , Cl^-)	題庫班
50	姊妹染色體間的 cohesions，在後期進行時必須被 APC 活化的 Separase 分解	題庫班
51	種內競爭強導致特徵替換及資源分配時二競爭者才可互存，且一定要強於與它種的競爭，否則該種便不存在了	正課班講義 生態學種競爭
52	本題語句上頗耐人尋味，若人為了活化 leptin-R 故會增加 leptin 在血液中的濃度，就好比口服降血糖藥物使 insulin 釋放更多，使 insulin-R 的反應性上升。若單純問肥胖原因顯然是 leptin-R 失去功能，亦即 db gene 突變所致	題庫班
53	懷孕婦女的免疫系統與其在未懷孕時相較之下是較為不活動的，如此，較不會對胎兒發動免疫反應	題庫班
54	壓制型操縱子的調節基因失活，無法與 corepressor 結合而抑制基因轉錄，故結構基因持續轉錄	題庫班
55	C_4 植物及 CAM 植物可以空間分隔及時間分隔來抗光呼吸而使糖產量不致減半	總複習
56	merabolite 結合 repressor 而活化 repressor 故可關閉 repressible operon	題庫班
57	根據重組頻率計算：b 與 rb 之距離要較 b 與 vg 之距離要近：故 b-rb-cn-vg	總複習

題號	試卷說明	命中事實
58	化學性突觸的傳遞次序為：軸突末梢去極化→Ca ²⁺ 進入→小泡釋放神經傳遞物質→神經傳遞物質與接受器結合→配基門控通道開啓	總複習
59	端粒的複製係因 DNA 須游離之 3' -OH(故需 primer)才可進行複製，而延滯股的 5' end 因 primer 移除留下的空隙所致 	題庫班
60	任何一種表型的適應皆必須妥協，cross-eyed 情況是適應不良但 coat pattern 與 crossed eye 結合卻導致高度適應，此便是妥協的結果	正課班講義 演化學-天擇
61	演化順序：原核→(早於)真核 粒線體→(早於)葉綠體	總複習
62	此即前適應所致	總複習
63	有孔蟲可藉由共生生物來補足養分廢物的交換，或絲狀偽足增加 A/V 比值，但碳酸鈣的殼提供更大的重量則無任何效應	正課班講義 原生生物學
64	苔蘚植物萌發：原絲體→配子梗→配子→胚→孢子體	正課班講義 植物學範例
65	雄性松樹世代交替(大→小) 孢子體→花粉球果→小孢子囊→小孢子→花粉粒	正課班講義 植物學範例
66	早前期帶可建立分裂平面	正課班講義 植物發生遺傳
67	有 O ₂ 呼吸提供更大的運動、運輸功能，而以神經系統及肌肉系統(紅肌)含大量粒線體	總複習
68	呼吸控制中樞-延腦對血液中 CO ₂ 量，腦脊髓液中的 H ⁺ 敏感而控制呼吸	總複習
69	ADH 藉影響水之重吸收 而 RAAS 則刺激 Na ⁺ 重吸收 而相輔相成 維持適當之滲透度	總複習
70	受精作用順序：穿孔體反應→皮質反應→DNA 合成→首次細胞分裂	總複習
71	肌肉收縮順序運動神經元釋放 ACh，使肌細胞去極化→T 小管使 SR 去極化→Ca ²⁺ 釋出而結合至 troponin complex→ tropomyosin 側移暴露→cross-bridge binding sites→粗細肌絲滑動	總複習
72	果蠅 maternal effect gene 產物作為轉錄因子控制合子體節基因及同源異型基因，故 maternal effect gene 突變則下游合子體節基因及同源異型基因表現會受到影響	總複習
73	此即外來種引入	正課班講義 生態學之 生物多樣性破壞
74	初級消長發生於不毛之地(無土壤形成)	總複習
75	γ 細胞進行 DNA 複製的時間較 β 細胞久可推得 γ 細胞的 DNA 較 β 細胞要多	題庫班

楊老師試題評析

- 一、此份試題比去年簡單，主要以 campbell 為出題藍本
- 二、講義幾乎都有，總複習三講義薄薄幾頁，就 8 題完全相同。大概看了一下全部約有 25 題與講義題目一字不差完全相同。不好高騖遠，腳踏實地的同學應該可以考到理想的分數。
- 三、仍有考古題：約 3 題完全相同
- 四、遺傳考 8 題，分生 11 題，佔 24%，比去年多（去年 21%）（前年 30%）
- 五、生理考 15 題，佔 21%（去年 30%）（前年 26%）
- 六、分類、演化考增加約 12%（去年 4%）
- 七、植物學有下降趨勢，佔 6%（去年 10%）
- 八、生態學異軍突起，佔 22%（去年 10%）
- 九、後醫考題分佈平均，在遺傳分生、生理、及生態這三部分要多注意，應該會有不錯的成績
- 十、第 52 題試題：

Mouse mutations can affect an animal's appetite and eating habits. The *ob* gene produces a satiety factor (the hormone leptin). The *db* gene product is required to respond to the satiety factor (the leptin receptor). Most obese humans produce normal or increased levels of leptin without satiety. Which might provide an answer to at least some human obesity if a means to do so is found?

- (A) overexpression of the leptin receptor gene
- (B) activation of receptors for leptin
- (C) supplementary leptin
- (D) inactivation of leptin
- (E) inhibition of leptin receptors (原文題庫之命題)

經高醫修改後之命題→ mutation of the leptin receptor gene

Mutation 是指基因而不是蛋白質；故此題不具爭議性。

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 3	遺傳工程 P88：第 61 題 → 題目完全相同	39	總複習 1	生態學 P151 → 第 2 → 1 → 1 分支
2	考題補充 Q3	細胞學 P5：第 27 題 → 題目完全相同	40	總複習 1	生態學 P154-2 → 第 1 → 2 → 2 → 2 分支
3	考題補充 Q3	細胞學 P15：第 16 題 → 完全相同	41	總複習 1	生態學 P154-1 群集基本定義
4	考題補充 Q3	細胞學 P19：第 36 題 → 題目完全相同	42	總複習 1	生態學 P154-2 → 第 3 分支 → 第 2 小分支
5	總複習 3	遺傳工程 P87：第 56 題 → 題目完全相同	43	總複習 1	生態學 P154-1 → 第 4 分支
6	總複習 1	生理學 P66 → 第 2 分支 → 第 1 分支內	44	總複習 1	生態學
7	總複習 3	遺傳工程 P86：第 48 題 → 題目完全相同	45	總複習 1	生理學 Poikilotherm (變溫動物)
8	總複習 1	生態學 P161 → 第 1 → 第 3 → 第 5 小分支 第 13 回講義 P340 有類似題	46	總複習 1	生態學 P159 → 第 4 分支 → 第 4 小分支
9	總複習 3	分生 P19：第 27 題 → 題目完全相同	47	總複習 1	演化學 P135 → 第 4 分支 → 第 2 小分支
10	總複習 3	分生 P63：第 28 題 → 題目完全相同	48	總複習 1	生態學 P150 → 第 3 → 第 2 → 1 小分支 類似題目
11	實力測驗 T2	分生 P63：第 28 題 → 題目完全相同	49	總複習 1	生理學 (排泄) P65 → 第 3 → 第 2 → 5 → 第 1 → 3 小分支
12	總複習 1	生理學 P88 → 第 8 → 第 1 分支	50	考題補 充 Q4	遺傳學 有類似題
13	總複習 1	生態學 P148 ~ 149：簡單基本概念	51	總複習 1	生態學 P154-2 → 第 1 分支 → 第 2 小分支
14	總複習 1	生理學 P53 → 第 4 分支：簡單基本概念	52	總複習 1	生理學 (消化) P51 → 第 4 → 1 分支
15	考題補充 Q4	遺傳學 P85：第 25 題 → 題目完全相同	53	總複習 1	生理學 P3 → 第 7 分支 → 第 3 小分支
16	總複習 1	生理學 P89 → 第 2 分支：簡單基本概念	54	總複習 3	分生 P59：第 8 題 → 題目完全相同
17	總複習 1	概論 P2 → 第 2 → 2 → 2 分支：簡單基本 概念	55	總複習 1	能量學 P1 → 第 1 → 1 → 2 小分支
18	總複習 1	生態學 P154-2 → 第 1 → 4 → 1 分支：簡單 基本概念	56	總複習 3	分生 P58：第 2 題 → 題目完全相同

題號	回數	頁數	題號	回數	頁數
19	總複習 3	遺傳工程 P85：第 45 題 → 題目完全相同	57	考題補充 Q4	遺傳學 P99：第 17 題 → 題目完全相同
20	第 11 回	分類學 P238：第 1 題 → 題目完全相同	58	第 11 回	生理學 P243：第 1 題 → 題目完全相同
21	總複習 1	分類學 P121 → 第 2 分支 稍難推理題	59	總複習 3	分生 P20：第 31 題 → 題目完全相同
22	總複習 1	生理學 免疫學（稍難）	60	總複習 1	演化學 P99 → 第 3 分支 → 第 5 小 → 2 分支
23	總複習 1	生理學 P88 → 第 6 分支	61	第 10 回	演化學 P4：第 1 題 → 題目完全相同
24	第 5 回	胚胎學 P268：第 3 題 → 題目完全相同	62	總複習 1	演化學 P102 → 第 1 分支 → 第 1 小支
25	總複習 1	演化 天擇：簡單基本概念	63	總複習 1	演化學 P102: 思考及應用題
26	總複習 1	生理學 過級化：簡單基本概念	64	總複習 1	植物學 P128: 第 2 → 2 → 1 → 1 → 3 → 2 分支 → 答案完全相同
27	總複習 1	遺傳：基本送分題	65	總複習 1	植物學 P128: 第 2 → 2 → 2 → 3 → 3 小分支
28	考題補充 Q4	遺傳學 P24：第 29 題 → 題目完全相同	66	總複習 1	植物學
29	考題補充 Q4	遺傳學 有類似題	67	考題補充 Q4	遺傳學 第 60 題 → 題目完全相同
30	總複習 1	分生 病毒：簡單基本概念	68	總複習 1	生理學 P63: 第 4 → 1 分支
31	總複習 1	遺傳學 簡單基本概念	69	總複習 1	生理學 P66: 第 2 → 1 及 2
32	第 9 回	分類學 P137：第 6 題 → 題目完全相同	70	第 5 回	胚胎學 P219：第 16 題 → 題目完全相同
33	總複習 1	生態學 基本概念	71	第 7 回	生理學 P187：第 2 題 → 題目完全相同
34	總複習 1	生態學	72	總複習 1	胚胎學 P38 → 第 4 分支 → 第 1 小分支
35	第 2 回	能量學 P35：第 8 題 → 題目完全相同	73	總複習 1	演化學 P160: 第 2 分支 思考及應用題
36	第 13 回	生態學 P238：Shannon diversity 專論	74	總複習 1	生態學 P154-1 → 第 3 → 3 → 3 → 1 小分支
37	總複習 1	生態學 P154-2 → 第 1 → 2 → 3 → 1	75	考題補充 Q4	遺傳學 P56：第 19 題 → 題目完全相同
38	總複習 1	行為學 P144 → 第 4 → 2 → 1 → 1 → 2 → 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。

- (D) 1. As genetic technology makes testing for a wide variety of genotypes possible, which of the following is likely to be an increasingly troublesome issue?
- (A) using technology to identify genes that cause criminal behaviors.
 - (B) discrimination against certain racial groups because of major genetic differences.
 - (C) alteration of human phenotypes to prevent early disease.
 - (D) the need to legislate for the protection of the privacy of genetic information.
 - (E) use of genotype information to provide positive identification of criminals.
- (C) 2. The fact that the outer membrane of the nuclear envelope has bound ribosomes allows one to most reliably conclude that
- (A) the nuclear envelope is physically continuous with the endoplasmic reticulum.
 - (B) the nuclear envelope is not part of the endomembrane system.
 - (C) at least some of the proteins that function in the nuclear envelope are made by the ribosomes on the nuclear envelope.
 - (D) nuclear pore complexes contain proteins.
 - (E) small vesicles from the Golgi fuse with the nuclear envelope.
- (E) 3. Which of the following is one of the ways that the membranes of winter wheat are able to remain fluid when it is extremely cold?
- (A) by increasing the percentage of cholesterol molecules in the membrane.
 - (B) by co-transport of glucose and hydrogen.
 - (C) by decreasing the number of hydrophobic proteins in the membrane.
 - (D) by increasing the percentage of saturated phospholipids in the membrane.
 - (E) by increasing the percentage of unsaturated phospholipids in the membrane.
- (B) 4. A patient has had a serious accident and lost a lot of blood. In an attempt to replenish body fluids, distilled water, equal to the volume of blood lost, is transferred directly into one of his veins. What will be the most probable result of this transfusion?
- (A) The patient's red blood cells will swell because the blood fluid is hypertonic compared to the cells.
 - (B) The patient's red blood cells will swell because the blood fluid is hypotonic compared to the cells.
 - (C) The patient's red blood cells will shrivel up because the blood fluid is hypertonic compared to the cells.
 - (D) The patient's red blood cells will burst because the blood fluid is hypertonic compared to the cells.
 - (E) It will have no unfavorable effect as long as the water is free of viruses and bacteria.
- (B) 5. One successful form of gene therapy has involved delivery of an allele for the enzyme adenosine deaminase (ADA) to bone marrow cells of a child with SCID, and delivery of these engineered cells back to the bone marrow of the affected child. What is one major reason for the success of this procedure as opposed to many other efforts at gene therapy?
- (A) The ADA introduced allele causes all other ADA-negative cells to die.
 - (B) The engineered cells, when reintroduced into the patient, find their way back to the bone marrow.
 - (C) No vector is required to introduce the allele into ADA-negative cells.

- (D) The immune system fails to recognize cells with the variant gene.
(E) The engineered bone marrow cells from this patient can be used for any other SCID patient.
- (D) 6. If a person drinks a large amount of water in a short period of time, he or she may die from water toxicity. Antidiuretic hormone can help to prevent water retention through interaction with target cells in the
(A) bladder. (B) urethra.
(C) adrenal gland. (D) kidney.
(E) anterior pituitary.
- (D) 7. A researcher is using adult stem cells and comparing them to other adult cells from the same tissue. Which of the following is a likely finding?
(A) The two kinds of cells have virtually identical gene expression patterns in microarrays.
(B) The non-stem cells have fewer repressed genes.
(C) The non-stem cells have lost the promoters for more genes.
(D) The cells from the two sources exhibit different patterns of DNA methylation.
(E) Adult stem cells have more DNA nucleotides than their counterparts.
- (C) 8. Imagine a population of 1,000 small rodents. Of these, 250 are breeding females, 250 are breeding males, and 500 are nonbreeding juveniles. What is the effective population size?
(A) 1,500 (B) 1,000 (C) 500 (D) 300 (E) 250
- (A) 9. In *E. coli*, there is a mutation in a gene called *dnaB* that alters the helicase that normally acts at the origin. Which of the following would you expect as a result of this mutation?
(A) Single-strand binding protein could not bind to the unwound parental strands.
(B) Replication fork will be formed.
(C) The DNA will supercoil.
(D) Replication will occur via RNA polymerase alone.
(E) Replication will require a DNA template from another source.
- (C) 10. A geneticist introduces a transgene into human cells and isolates five independent cell lines in which the transgene has integrated into the human genome. In four of the lines, the transgene is expressed strongly, but in the fifth there is no expression at all. Which is a likely explanation for the lack of transgene expression in the fifth cell line?
(A) The transgene was mutated during the process of integration into the host cell genome.
(B) A transgene integrated into a euchromatic region of the genome.
(C) A transgene integrated into a heterochromatic region of the genome.
(D) The host cell lacks the enzymes necessary to express the transgene.
(E) A transgene integrated into a region of the genome characterized by high histone acetylation.
- (E) 11. A covalent chemical bond is one in which
(A) electrons are removed from one atom and transferred to another atom so that the two atoms become oppositely charged.
(B) protons and neutrons are shared by two atoms so as to satisfy the requirements of both atoms.
(C) the inner-shell electrons of one atom are transferred to the outer shell of another atom.
(D) outer-shell electrons of one atom are transferred to the inner electron shells of another atom.
(E) outer-shell electrons of two atoms are shared so as to satisfactorily fill the outer electron shells of both atoms.
- (E) 12. Melatonin is a hormone produced in the pineal gland. It can be used to treat symptoms of sleep disorders and seasonal affective disorder because
(A) it decreases production of serotonin.
(B) it increases production of serotonin.

- (C) it increases production of tryptophan.
 (D) it activates the brainstem.
 (E) its peak production is normally at night.
- (D) 13. If the Sun were to suddenly stop providing energy to the Earth, most ecosystems would vanish. Which of the following ecosystems would likely survive the longest after this hypothetical disaster?
 (A) desert (B) tropical rainforest (C) tundra
 (D) benthic ocean (E) grassland
- (B) 14. Which sequence of blood flow can be observed in either a reptile or a mammal?
 (A) left ventricle → aorta → lungs → systemic circulation
 (B) vena cava → right atrium → ventricle → pulmonary circuit
 (C) right ventricle → pulmonary vein → pulmocutaneous circulation
 (D) pulmonary vein → left atrium → ventricle → pulmonary circuit
 (E) right atrium → pulmonary artery → left atrium → ventricle
- (E) 15. Black fur in mice (*B*) is dominant to brown fur (*b*). Short tails (*T*) are dominant to long tails (*t*). What fraction of the progeny of the cross *BbTt* × *BBtt* will have black fur and long tails?
 (A) 1/16 (B) 1/4 (C) 3/8 (D) 1/3 (E) 1/2
- (C) 16. Hormone X produces its effect in its target cells via the cAMP second messenger system. Which of the following will produce the greatest effect in the cell?
 (A) A molecule of cAMP applied to the extracellular fluid surrounding the cell.
 (B) A molecule of cAMP injected into the cytoplasm of the cell.
 (C) A molecule of hormone X applied to the extracellular fluid surrounding the cell.
 (D) A molecule of hormone X injected into the cytoplasm of the cell
 (E) A molecule of activated, cAMP-dependent protein kinase injected into the cytoplasm of the cell.
- (D) 17. How many molecules of water are needed to completely hydrolyze a polymer that is 10 monomers long?
 (A) 12 (B) 11 (C) 10 (D) 9 (E) 8
- (D) 18. An interaction between individuals of different species that benefit both partners is called
 (A) commensalism. (B) predation. (C) exploitation.
 (D) mutualism. (E) ammensalism.
- (B) 19. In 1997, Dolly the sheep was cloned. Which of the following processes was used?
 (A) use of mitochondrial DNA from adult female cells of another ewe.
 (B) fusion of an adult cell's nucleus with an enucleated sheep egg, followed by incubation in a surrogate.
 (C) separation of an early stage sheep blastula into separate cells, one of which was incubated in a surrogate ewe.
 (D) isolation of stem cells from a lamb embryo and production of a zygote equivalent.
 (E) replication and dedifferentiation of adult stem cells from sheep bone marrow.
- (A) 20. Which of these statements about human evolution is **CORRECT**?
 (A) Different species of the genus *Homo* have coexisted at various times throughout hominin evolution
 (B) Mitochondrial DNA analysis indicates that modern humans are genetically very similar to Neanderthals.
 (C) The evolution of upright posture and enlarged brain occurred simultaneously.
 (D) Human evolution has proceeded in an orderly fashion from an ancestral anthropoid to *Homo*

- sapiens.
- (E) The ancestors of Homo sapiens were chimpanzees.
- (D) 21. Arthropods invaded land about 100 million years before vertebrates did so. This most clearly implies that
- (A) extant terrestrial arthropods are better adapted to terrestrial life than are extant terrestrial vertebrates.
 - (B) arthropods evolved before vertebrates did.
 - (C) vertebrates evolved from arthropods.
 - (D) arthropods have had more time to co-evolve with land plants than have vertebrates
 - (E) ancestral arthropods must have been poorly adapted to aquatic life, thus experienced a selective pressure to invade land.
- (E) 22. The number of MHC protein combinations possible in a given population is enormous. However, an individual in that population has only a couple of MHC possibilities. Why?
- (A) Once a B cell has matured in the bone marrow, it is limited to two MHC response categories.
 - (B) Once a T cell has matured in the thymus, it can only respond to two MHC categories.
 - (C) MHC proteins from one individual can only be of class I or class II.
 - (D) The MHC proteins are made from several different gene regions that are capable of rearranging in a number of ways.
 - (E) Each of the MHC genes has a large number of alleles, but each individual only inherits 2 for each gene.
- (A) 23. Which of the following statements about the adrenal gland is **CORRECT**?
- (A) During stress, ACTH stimulates the adrenal cortex, and neurons of the sympathetic nervous system stimulate the adrenal medulla.
 - (B) At all times, the anterior portion secretes ACTH, while the posterior portion secretes oxytocin.
 - (C) At all times, the adrenal gland monitors calcium levels in the blood and regulates calcium by secreting the two antagonistic hormones, epinephrine and norepinephrine.
 - (D) During stress, the alpha cells of islets secrete insulin and simultaneously the beta cells of the islets secrete glucagon.
 - (E) During stress, TSH stimulates the adrenal cortex and medulla to secrete acetylcholine.
- (E) 24. In humans, identical twins are possible because
- (A) of convergent extension.
 - (B) of the heterogeneous distribution of cytoplasmic determinants in unfertilized eggs.
 - (C) of interactions between extraembryonic cells and the zygote nucleus.
 - (D) the gray crescent divides the dorsal-ventral axis into new cells.
 - (E) early blastomeres can form a complete embryo if isolated.
- (B) 25. DDT was once considered a "silver bullet" that would permanently eradicate insect pests. Today, instead, DDT is largely useless against many insects. Which of these would have been required for this pest eradication effort to be successful in the long run?
- (A) The frequency of DDT application should have been higher.
 - (B) None of the individual insects should have possessed genomes that made them resistant to DT.
 - (C) DDT application should have been continual.
 - (D) All habitats should have received applications of DDT at about the same time.
 - (E) Larger doses of DDT should have been applied.
- (C) 26. Assume that excessive consumption of ethanol increases the influx of negative chloride ions into "common sense" neurons whose action potentials are needed for you to act appropriately and not harm yourself or others. Thus, any resulting poor decisions associated with ethanol ingestion are likely due to

- (A) increased membrane depolarization of "common sense" neurons.
(B) more action potentials in your "common sense" neurons.
(C) decreased membrane depolarization of "common sense" neurons.
(D) fewer IPSPs in your "common sense" neurons.
(E) more EPSPs in your "common sense" neurons.
- (B) 27. Which is one of the two laws of inheritance identified by Mendel?
(A) The law of priority. (B) The law of independent assortment.
(C) The law of neutralism. (D) The law of paternity.
(E) The law of polarity.
- (C) 28. In glycolysis, for each molecule of glucose oxidized to pyruvate
(A) 4 molecules of ATP are used and 2 molecules of ATP and 4 molecules of NADH are produced.
(B) 2 molecules of ATP are used and 4 molecules of ATP and 2 molecules of NAD are produced.
(C) 2 molecules of ATP are used and 4 molecules of ATP and 2 molecules of NADH are produced.
(D) 2 molecules of ATP are used and 4 molecules of ATP and 1 molecules of NADH are produced.
(E) 2 molecules of ATP are used and 2 molecules of ATP and 2 molecules of NADH are produced.
- (D) 29. In vertebrate animals, brown fat tissue's color is due to abundant mitochondria. White fat tissue, on the other hand, is specialized for fat storage and contains relatively few mitochondria. Brown fat cells have a specialized protein that dissipates the proton-motive force across the mitochondrial membranes. Which of the following might be the function of the brown fat tissue?
(A) to allow other membranes of the cell to perform mitochondrial function.
(B) to increase the rate of oxidative phosphorylation from its few mitochondria.
(C) to allow the animals to regulate their metabolic rate when it is especially hot.
(D) to regulate temperature by converting energy from NADH oxidation to heat.
(E) to increase the production of ATP synthase.
- (D) 30. Which of the following represents a difference between viruses and viroids?
(A) Viruses contain introns; viroids have only exons.
(B) Viruses infect many types of cells, whereas viroids infect only prokaryotic cells.
(C) Viruses always have genomes composed of DNA, whereas viroids always have genomes composed of RNA.
(D) Viruses have capsids composed of protein, whereas viroids have no capsids.
(E) Viruses cannot pass through plasmodesmata; viroids can.
- (A) 31. What may lead to alternations of chromosome number?
(A) nondisjunction during meiosis. (B) hybridization.
(C) chromosome breakage. (D) genetic recombination.
(E) genetic exchange.
- (C) 32. A genetic change that caused a certain Hox gene to be expressed along the tip of a vertebrate limb bud instead of farther back helped make possible the evolution of the tetrapod limb. This type of change is illustrative of
(A) the influence of environment on development.
(B) paedomorphosis.
(C) a change in a developmental gene or in its regulation that altered the spatial organization of body parts.
(D) heterochrony
(E) gene duplication.
- (D) 33. The chain lengths in food webs are limited by
(A) the amount of energy such as sunlight available in an ecosystem.

- (B) the efficiency of energy transfers that occur between trophic levels.
 (C) catastrophes.
 (D) all of the above.
 (E) A and B only.
- (C) 34. _____ is the ability of a community or ecosystem to maintain structure in the face of potential disturbance.
 (A) Resilience (B) Elasticity (C) Resistance (D) Plasticity (E) Flexibility
- (C) 35. Some bacteria are metabolically active in hot springs because
 (A) they are able to maintain a cooler internal temperature.
 (B) high temperatures make catalysis unnecessary.
 (C) their enzymes have high optimal temperatures.
 (D) their enzymes are completely insensitive to temperature.
 (E) they use molecules other than proteins or RNAs as their main catalysts.
- (D) 36. The Shannon diversity index is a measure of
 (A) the number of different species in a community.
 (B) the abundance of a species in a community.
 (C) the types of species found in a typical climate.
 (D) the number of different species and their relative abundance in a community.
 (E) the distribution of members of a species in a community.
- (C) 37. Divergence in morphology that is a result of competition between species is termed
 (A) competitive exclusion. (B) resource partitioning.
 (C) character displacement. (D) amensalism.
 (E) mutualism.
- (B) 38. When each female in the population mates with several males, but each male mates with only one female, the mating system is referred to as
 (A) polygamy. (B) polyandry. (C) polygyny.
 (D) monogamy. (E) harem mating.
- (D) 39. Which of the following cannot be determined using a fecundity schedule combined with a life table?
 (A) per capita rate of increase. (B) net reproductive rate.
 (C) mean generation time. (D) dispersal rates.
 (E) geometric rate of increase.
- (D) 40. The _____ defines the physical conditions under which a species might live, in the absence of interaction with other species.
 (A) functional niche (B) realized niche
 (C) principle niche (D) fundamental niche
 (E) primary niche
- (E) 41. A community is defined as
 (A) a group of organisms that all make their living in a similar way.
 (B) a group of individuals of a single species inhabiting a defined area.
 (C) the portion of a defined area that supports life.
 (D) a group of subpopulations living in separate locations with active exchange of individuals among subpopulations.
 (E) an association of interacting species inhabiting a defined area.
- (A) 42. _____ species are those that, despite low biomass, exert strong effects on community structure.

- (A) Keystone (B) Cornerstone (C) Dominant
(D) Prominent (E) Foundational
- (B) 43. The equilibrium model of island biogeography explains diversity on islands as a balance between
(A) speciation and extinction. (B) immigration and extinction.
(C) speciation and emigration. (D) immigration and emigration.
(E) speciation and immigration.
- (B) 44. The study of the relationship between climate and the timing of ecological events is called
(A) ecology. (B) phenology. (C) succession.
(D) climatology. (E) life history theory.
- (A) 45. In general, reptiles are considered to be a/an .
(A) poikilotherm (B) homeotherm (C) endotherm
(D) heterotherm (E) A and D are correct
- (C) 46. El Niño events
(A) occur when the Southern Oscillation index is high.
(B) occur when barometric pressure is lower in the western Pacific than in the eastern Pacific.
(C) include the appearance of warm currents on the Pacific coast of South America.
(D) are always accompanied by La Niña events at the same time.
(E) are accompanied by westward movement of the location of storm generation in the Pacific.
- (D) 47. Mycorrhizal fungi (directly) help their plant partners acquire
(A) sugars. (B) sunlight. (C) seed dispersal. (D) soil nutrients (E) pollination.
- (D) 48. $dN/dt = r_{\max}N [(K - N)/K]$ represents
(A) annual growth rate. (B) geometric population growth.
(C) exponential growth rate. (D) logistic growth.
(E) none of the choices are correct.
- (D) 49. Bony marine fish
(A) drink sea water.
(B) secrete Na^+ into the surrounding water.
(C) are hyperosmotic compared to the surrounding water.
(D) both drink sea water and secrete Na^+ into the surrounding water.
(E) drink sea water, secrete Na^+ into the surrounding water, and are hyperosmotic compared to the surrounding water.
- (B) 50. Whether during mitosis or meiosis, sister chromatids are held together by proteins referred to as cohesions. Such molecules must have which of the following properties?
(A) They must reattach to chromosomes during G1.
(B) They must be removed before anaphase can occur.
(C) They must be intact for nuclear envelope reformation.
(D) They must be removed before meiosis can begin.
(E) They must persist throughout the cell cycle.
- 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. Analysis of the Lotka-Volterra competition model implies that two competitors can coexist only when
(A) interspecific competition is stronger than intraspecific competition.

- (B) intraspecific competition is stronger than interspecific competition.
(C) intraspecific and interspecific competition are equally strong.
(D) predation or parasitism is stronger than interspecific competition.
(E) actually, the model implies that two competitors can never coexist.
- (B) 52. Mouse mutations can affect an animal's appetite and eating habits. The *ob* gene produces a satiety factor (the hormone leptin). The *db* gene product is required to respond to the satiety factor (the leptin receptor). Most obese humans produce normal or increased levels of leptin without satiety. Which might provide an answer to at least some human obesity if a means to do so is found?
(A) overexpression of the leptin receptor gene
(B) activation of receptors for leptin
(C) supplementary leptin
(D) inactivation of leptin
(E) mutation of the leptin receptor gene
- (E) 53. The "immunotolerance" of a pregnant woman toward her unborn child is the result of
(A) the complete physical separation from her cells and those of the unborn child.
(B) the tenacity with which the unborn child's immune system counteracts the woman's immune system.
(C) the unborn child having enough of the woman's identity so as to escape detection as foreign.
(D) modern medical intervention during every pregnancy.
(E) the relative quiescence of a pregnant woman's immune system compared to when she was not pregnant.
- (B) 54. A mutation that inactivates the regulatory gene of a repressible operon in an *E. coli* cell would result in
(A) complete inhibition of transcription of the structural gene controlled by that regulator.
(B) continuous transcription of the structural gene controlled by that regulator.
(C) irreversible binding of the repressor to the operator.
(D) inactivation of RNA polymerase by alteration of its active site.
(E) continuous translation of the mRNA because of alteration of its structure.
- (C) 55. The alternative pathways of photosynthesis using the C₄ or CAM systems are said to be compromises. What is the reason?
(A) CAM plants allow more water loss, while C₄ plants allow less CO₂ into the plant.
(B) C₄ plants allow less water loss but CAM plants allow more water loss.
(C) C₄ and CAM plants both minimize photorespiration and optimizes the Calvin cycle.
(D) C₄ and CAM plants minimize both water loss and rate of photosynthesis.
(E) C₄ plants compromises on water loss and CAM compromises on photorespiration.
- (B) 56. The role of a metabolite that controls a repressible operon is to
(A) increase the production of inactive repressor proteins.
(B) bind to the repressor protein and activate it.
(C) bind to the repressor protein and inactivate it.
(D) bind to the operator region and block the attachment of RNA polymerase to the promoter.
(E) bind to the promoter region and decrease the affinity of RNA polymerase for the promoter.
- (B) 57.

<i>b</i>	0			
<i>cn</i>	9	0		
<i>rb</i>	3.5	6.5	0	
<i>vg</i>	19	9.0	16	0
	<i>b</i>	<i>cn</i>	<i>rb</i>	<i>vg</i>

The numbers in the boxes are the recombination frequencies in between the genes (in percent).

In a series of mapping experiments, the recombination frequencies for four different linked genes of *Drosophila* were determined as shown in the figure. What is the order of these genes on a chromosome map?

- (A) *cn-rb-b-vg* (B) *b-rb-cn-vg* (C) *rb-cn-vg-b* (D) *vg-b-rb-cn* (E) *vg-cn-b-rb*

(B) 58. The steps below refer to various stages in transmission at a chemical synapse:

1. The synaptic vesicles release neurotransmitter into the synaptic cleft.
2. The ligand-gated ion channels open.
3. An action potential depolarizes the membrane of the axon terminal.
4. Calcium ions rush into neuron's cytoplasm.
5. Neurotransmitter binds with receptors associated with the postsynaptic membrane.

Which sequence of events is **CORRECT**?

- (A) 1 → 2 → 3 → 4 → 5 (B) 3 → 4 → 1 → 5 → 2
 (C) 3 → 1 → 5 → 4 → 2 (D) 4 → 3 → 1 → 2 → 5
 (E) 5 → 1 → 2 → 4 → 3

(E) 59. Eukaryotic telomeres replicate differently than the rest of the chromosome. Which of the following is the cause?

- (A) DNA polymerase that cannot replicate the leading strand template to its 5' end.
 (B) The evolution of telomerase enzyme.
 (C) Gaps left at the 3' end of the lagging strand because of the need for a 5' onto which nucleotides can attach.
 (D) Gaps left at the 3' end of the lagging strand because of the need for a primer.
 (E) Gaps left at the 5' end of the lagging strand because of the need for a 3' onto which nucleotides can attach.

(C) 60. The same gene that causes various coat patterns in wild and domesticated cats also causes the cross-eyed condition in these cats, the cross-eyed condition being slightly maladaptive. In a hypothetical environment, the coat pattern that is associated with crossed eyes is highly adaptive, with the result that both the coat pattern and the cross-eyed condition increase in a feline population over time. Which statement is supported by these observations?

- (A) Natural selection reduces the frequency of maladaptive genes in populations over the course of time.
 (B) Polygenic inheritance is generally maladaptive, and should become less common in future generations.
 (C) Phenotype is often the result of compromise.
 (D) In all environments, coat pattern is a more important survival factor than is eye-muscle tone.
 (E) Evolution is progressive and tends toward a more perfect population.

(D) 61. What is thought to be the correct sequence of these events, from earliest to most recent, in the evolution of life on Earth?

1. origin of mitochondria. 2. origin of chloroplasts.
 3. origin of multicellular eukaryotes. 4. origin of cyanobacteria.
 5. origin of fungal-plant symbioses.
 (A) 4, 3, 2, 1, 5 (B) 4, 2, 1, 3, 5 (C) 4, 2, 3, 1, 5 (D) 4, 1, 2, 3, 5 (E) 4, 1, 3, 2, 5
- (D) 62. Fossil evidence indicates that several kinds of flightless dinosaurs possessed feathers. If some of these feather-bearing dinosaurs incubated clutches of eggs in carefully constructed nests, this might be evidence supporting the claim that
 (A) the earliest reptiles could fly, and the feathers of flightless dinosaurs were vestigial flight surfaces.
 (B) all fossils with feathers are actually some kind of bird.
 (C) the feathers were plucked from the bodies of other adults to provide nest-building materials.
 (D) their feathers originally served as insulation, and only later became flight surfaces.
 (E) dinosaurs were as fully endothermal (warm-blooded) as modern birds and mammals.
- (A) 63. Typically as cells grow, their increase in volume outpaces their increase in surface area, and continued survival requires undergoing asexual reproduction to reestablish a healthy surface area to volume ratio. Thus, which of these is **LEAST** likely to contribute to the ability of a single-celled foraminiferan to grow to a diameter of several centimeters?
 (A) Its calcium carbonate test contributes extra mass.
 (B) Its symbiotic algae provide glucose to the cytoplasm.
 (C) Its symbiotic algae absorb metabolic waste products from the cytoplasm.
 (D) Its symbiotic algae provide oxygen to the cytoplasm.
 (E) Its threadlike pseudopods dramatically increase its surface area to volume ratio.
- (D) 64. Beginning with the germination of a moss spore, what is the sequence of structures that develop after germination?
 1. embryo 2. sporophyte 3. gametes 4. protonema 5. gametophore
 (A) 4 → 3 → 5 → 2 → 1 (B) 4 → 1 → 3 → 5 → 2
 (C) 4 → 5 → 2 → 1 → 3 (D) 4 → 5 → 3 → 1 → 2
 (E) 4 → 5 → 1 → 2 → 3
- (B) 65. Arrange the following structures, which can be found on male pine trees, from the largest structure to the smallest structure (or from most inclusive to least inclusive).
 1. sporophyte 2. microsporangia 3. microspores 4. pollen cone 5. pollen nuclei
 (A) 1, 4, 3, 2, 5 (B) 1, 4, 2, 3, 5 (C) 1, 2, 3, 5, 4 (D) 4, 3, 2, 1, 5 (E) 1, 4, 2, 5, 3
- (D) 66. How does the *fass* mutation in *Arabidopsis* result in a stubby plant rather than a normal elongated one?
 (A) Meristem identity genes produce defective transcription factors, resulting in a stubby shoot.
 (B) Juvenile nodes retain their juvenile status and elongated cells do not develop.
 (C) The cell's pattern of migration in the apical meristem is disrupted.
 (D) Lack of formation of the preprophase band results in random planes of cell division.
 (E) Cellulose microfibrils in the cell wall do not form, resulting in a shorter plant.
- (C) 67. Mitochondrial DNA is primarily involved in coding for proteins needed for electron transport. Therefore in which body systems would you expect most mitochondrial gene mutations to be exhibited?
 (A) Circulation. (B) The skin and senses.
 (C) Nervous and muscular systems. (D) Excretory and respiratory systems.
 (E) The immune system and the blood.
- (E) 68. Blood carbon dioxide levels determine the pH of other body fluids as well as blood, including the

- pH of cerebrospinal fluid. How does this enable the organism to control breathing?
- (A) The brain alters the pH of the cerebrospinal fluid to force the animal to retain more or less carbon dioxide.
- (B) The medulla is able to control the concentration of bicarbonate ions in the blood.
- (C) The brain directly measures and monitors carbon dioxide and causes breathing changes accordingly.
- (D) Stretch receptors in the lungs cause the medulla to speed up or slow breathing.
- (E) The medulla, which is in contact with cerebrospinal fluid, monitors pH and uses this measure to control breathing.
- (D) 69. How do ADH and RAAS work together in maintaining osmoregulatory homeostasis?
- (A) ADH monitors appropriate osmolarity by reabsorption of water, and RAAS maintains osmolarity by stimulating K^+ reabsorption.
- (B) ADH monitors appropriate osmolarity by reabsorption of water, and RAAS maintains osmolarity by stimulating Cl^- reabsorption.
- (C) Only when they are together in the receptor sites of proximal tubule cells, will reabsorption of essential nutrients back into the blood take place.
- (D) ADH monitors appropriate osmolarity by reabsorption of water, and RAAS maintains osmolarity by stimulating Na^+ reabsorption.
- (E) ADH and RAAS work antagonistically; ADH stimulates water reabsorption during dehydration and RAAS removes water when it is in excess in body fluids.
- (C) 70. From earliest to latest, the overall sequence of early development proceeds as follows:
- (A) first cell division → synthesis of embryo's DNA begins → acrosomal reaction → cortical reaction.
- (B) first cell division → cortical reaction → acrosomal reaction → synthesis of embryo's DNA begins.
- (C) acrosomal reaction → cortical reaction → synthesis of embryo's DNA begins → first cell division.
- (D) cortical reaction → synthesis of embryo's DNA begins → acrosomal reaction → first cell division.
- (E) cortical reaction → acrosomal reaction → first cell division → synthesis of embryo's DNA begins.
- (D) 71. Which of the following is the **CORRECT** sequence that occurs during the excitation and contraction of a muscle cell?
1. Calcium is released and binds to the troponin complex.
 2. Tropomyosin shifts and unblocks the cross-bridge binding sites.
 3. Transverse tubules depolarize the sarcoplasmic reticulum.
 4. The thin filaments are ratcheted across the thick filaments by the heads of the myosin molecules using energy from ATP.
 5. An action potential in a motor neuron causes the axon to release acetylcholine, which depolarizes the muscle cell membrane.
- (A) 2, 1, 3, 5, 4 (B) 2, 1, 3, 4, 5 (C) 5, 3, 2, 4, 1 (D) 5, 3, 1, 2, 4 (E) 5, 3, 2, 1, 4
- (C) 72. If a *Drosophila* female has a homozygous mutation for a maternal effect gene,
- (A) only her male offspring will show the mutant phenotype.
- (B) her offspring will show the mutant phenotype only if they are also homozygous for the mutation.
- (C) all of her offspring will show the mutant phenotype, regardless of their genotype.
- (D) only her female offspring will show the mutant phenotype.
- (E) she will not develop past the early embryonic stage.
- (C) 73. Which of the following poses the greatest potential threat to biodiversity?

- (A) replanting after a clear cut, a monoculture of Douglas fir trees on land that consisted of old growth Douglas fir, western cedar, and western hemlock.
- (B) trapping and relocating large predators, such as mountain lions, that pose a threat as they move into areas of relatively dense human populations.
- (C) importing an Asian insect into the United States to control a weed that competes with staple crops.
- (D) allowing previously used farmland go fallow and begin to fill in with weeds and then shrubs and saplings.
- (E) releasing sterilized rainbow trout to boost the sport fishing of a river system that contains native brook trout.
- (C) 74. "Primary" succession is succession that
- (A) involves establishment of primary producers.
- (B) leads to establishment of a climax community dominated by primary producers.
- (C) occurs on newly exposed geologic substrates, not organic soil.
- (D) occurs where organic soils have been exposed but not destroyed by disturbance.
- (E) occurs after fire or agricultural abandonment.
- (E) 75. The data were obtained from a study of the length of time spent in each phase of the cell cycle by cells of three eukaryotic organisms designated beta, delta, and gamma.

Cell Type	G ₁	S	G ₂	M
Beta	18	24	12	16
Delta	100	0	0	0
Gamma	18	48	14	20

Table : Minutes Spent in Cell Cycle Phases

- Of the following, the best conclusion concerning the difference between the S phases for beta and gamma is that
- (A) gamma contains 48 times more DNA than beta.
- (B) beta and gamma contain the same amount of DNA.
- (C) beta contains more RNA than gamma.
- (D) beta is a plant cell and gamma is an animal cell.
- (E) gamma contains more DNA than beta.