

## 《生物》 試題評析

## 曾正老師試題評析

## 一、考題分佈：

範疇	配分	範疇	配分
生物學概論	2 題	分類學	4 題
細胞學	4 題	植物生理學	8 題
生化熱力學	2 題	動物生理學	31 題
遺傳學(細胞+古典)	5 題	演化及生態學	8 題
分子生物學	11 題		

## 二、試題評析：

- 1.此次學士後西醫考試大爆冷門
- 2.異常平實，命題者自行出題，而不大量抄襲題庫大大增加了公平性，  
以往的大重點如演化、生態、分子生物學命題難度下降，而動物生理學則是異軍突起(偏重呼吸、免疫...如考前預測)
- 3.俚俗語用詞極少，題目本身的結構，句意清楚而不會令考生誤判題意

## 三、尚有幾題爭議試題：

- 1.第 16 題：下視丘合成及分泌 oxytocin 貯存至腦下腺後葉貯存及分泌，故(B)選項亦可列入  
[根據]:Silverthorn：Human Physiology (5/E) P.229
- 2.第 53 題：短日照植物可於晚夏、秋天及冬天開花，(A)選項未註明 only，故(E)選項亦可給分。  
[根據]:Campbell Biology (8/E) P.839
- 3.第 55 題：  
[根據]: Silverthorn：Human Physiology (5/E) (2010 合記書局代理) P.615 右半欄  
although we say that the central chemoreceptors monitor  $\text{CO}_2$ ,……  
Note ,however, that pH changes in the plasma do not usually influence the central chemoreceptors directly ( $\cdot\text{H}^+$ 無法通過 BBB)  
故(E)選項亦是錯誤的答案

## 四、總結：

因題目難度下降，故本班極優考生拿 90 分以上應大有人在，而中等程度考生拿到 75~85 分亦不成問題。

## 五、準備方向：

熟知“背多分”是“得分之忌”，唯有確實了解其來龍去脈，方可獲得高分，跳樑小丑式學習頗具危險，與同學共勉！

乙

## 曾正老師詳解及命中事實

題號	回數	頁數	說明
1	第 5 回	P83	Glucagon、melatonin 屬於內分泌激素，非旁泌素或局部調節劑
2	第 10 回	P74	John 基因 DNA 的 microsatellites 為其父及母之組合，故為 6R、9R、6R 及 5R 的連合(最末一行考題的單字打錯)
3	第 3 回	P86	延腦具有心跳血管中樞(cv center)以控制心臟的生理
4	第 12 回	P444	吉貝素(GA)會令種子打破休眠促進種子萌發
5	第 2 回	P259	此 tRNA 的 anticodon 與 mRNA 的 5' AUG 3' 配對，故攜帶 Met 參與蛋白質合成
6	第 4 回	P34	$\beta$ 細胞本身便含有抗體的基因，經過重排而產生為數眾多的不同抗體基因
7	第 11 回	P28	$AA=P^2=4/100$ ∴ $P=0.2$ $q=0.8$ 故正常個體比例為 $(0.8)^2=0.64$
8	第 12 回	P380	Transfer cell 是種伴細胞，會強化溶質由質外體路徑進入共質體路徑累積
9	第 8 回	P66	$Na^+$ 通過失活閘門於下降期及下射早期部分仍維持關閉無法對無極化引發反應而形成不反應期
10	第 1 回	P309	糖質新生原料為 glucogenic aa(Ala···)、glycerol 及 lactate 等化合物
11	第 12 回	P55	$G^+$ 細菌具有厚的肽聚糖層
12	第 12 回	P398	植物是由空氣中獲得碳源，它非生長限制因子(例如 N.P.K 及 $H_2O$ 等)
13	第 12 回	P154	紅藻在深水域呈黑色且可吸收藍光及綠光(可穿透深水)
14	第 8 回	P71	神經元的動作電位主要係由 $Na^+$ 通道開啓所致，此期 $K^+$ 通道屬於關閉狀態
15	第 5 回	P149	短期飢餓，身體的胰臟分泌 glucagon 促使肝糖分解成葡萄糖供細胞利用
16	第 5 回	P141	下視丘分泌 RH 及 IH 以調控腦下腺前葉的激素分泌，本例為 $TRH \rightarrow TSH \rightarrow T_3/T_4$
17	第 1 回	P197	影響膜流動性的因子計有(脂肪酸的飽和度/不飽和度之比例，膽固醇(動物)及溫度)
18	第 3 回	P42	Vit K 係血液凝固所需的重要維生素
19	第 12 回	P275	高等植物是屬於孢子體減數分裂
20	第 1 回	P195	膜上的寡糖鏈與細胞之間的辨識有關
21	第 3 回	P99	原發性高血壓患者之心輸出量正常，但周邊阻力增加所致
22	第 5 回	P164	抗利尿激素(ADH)及催產素(OT)皆屬於短肽激素
23	第 2 回	P285	多肽合成終止需 mRNA 的 stop codon 出現，RF 的出現或是細胞缺少某胺基酸以致於核糖體無法再沿 mRNA 前進
24	第 2 回	P379	淋巴球方面的腫瘤稱為 lymphomas
25	第 2 回	P245	SnRNA 參與 mRNA 成熟的 intron 切除的過程
26	第 5 回	P95.P99.P101	ATP 為能量分子而非 2 <sup>o</sup> messenger
27	第 2 回	P142	蜜蜂、螞蟻及胡蜂的性別決定為 1n-2n 系統
28	第 2 回	P336	染色質中介的基因表現常有的有乙酰化、磷酸化及甲基化
29	第 2 回	P221	Gyrase 為細菌的複製過程的 topoisomerase

30	第 5 回	P107	訊息轉導中, 訊息的接受器亦可存在於細胞內(cytosol or nucleus)
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題號	回數	頁數	說明
31	第 3 回	P14	最常見的人體結締組織為疏松結締組織
32	第 9 回	P225	胰臟為別屬於消化外分泌腺體及內分泌腺體而非屬於淋巴系統
33	第 8 回	P20	嚴格說, Schwann cell 是一種 glial cell, 構成阻絕性髓鞘, 而包圍 PSN 的神經元軸突
34	第 3 回	P48	蚯蚓屬於環節動物為閉鎖式循環系統
35	第 2 回	P262	真核細胞 RNAPIII 轉 tRNA 及 5s rRNA 的基因
36	第 12 回	P441	植物的細胞分裂素(CK)會延遲花及葉的老化
37	第 1 回	P168, P175	微管的次單位為 tubulin 而微絲的次單位為 actin
38	第 9 回	P305	Fe 是所有生命形式所需的微量元素
39	第 1 回	P112	蛋白質分子之橫接是藉雙硫健(由半胱胺酸之硫氫基提供)所形成
40	第 2 回	P337	表觀變異的代表例為 histone acetylation 及 DNA 的 methylation
41	第 11 回	P11	不來自相同祖先而因相似的環境需求而演化出相似的結構稱為同功器官, 係因趨同演化的過程所致
42	第 5 回	P35	尿液約由 1~2% 之過濾液所形成, 其餘的濾液皆被重吸收
43	第 11 回	P170	生物潛能非屬於族群大小的密度依恃調空因子
44	第 4 回	P156	呼吸控制速率的因子為 $PCO_2 \uparrow$ 、 $PO_2 \downarrow \downarrow$ 、 $PH \uparrow$ 其中氧分壓要極端下降才可刺激呼吸速率增加
45	第 9 回	P300	Vit B2(riboflavin)是構成 FAD 及 FMN 的輔酶型式
46	第 11 回	P250	生態係生態學著眼於能量流與化學物質循環於生物與環境之間
47	第 5 回	P130	TRH(下視丘合成)作用於腦下腺前葉使其分泌 TSH
48	第 3 回	P42	$\text{Prothrombin} \rightarrow \text{thrombin}$ $\downarrow$ $\text{Fibrinogen} \rightarrow \text{fibrin}$
49	第 5 回	P101	$\text{PIP}_2 \xrightarrow{\text{phospholipase C}} \text{IP}_3 + \text{DAG}$
50	第 1 回	P16	生物分類等級大小為 domain → kingdom → phylum → class → order → family → genus → species
51	第 12 回	P263	花為植物的生殖器官, 缺少雄蕊或心皮的花稱為 imperfect flower
52	第 11 回	P241	狗至少為 2 消費者, 故此蠅類之幼體棲息在狗的體表且以狗皮膚作為食物來源, 應為 3 <sup>o</sup> 消費者
53	第 12 回	P465	短日照植物於晚夏、秋天及冬天開花, 而於夜晚長於臨界夜長時才開花
54	第 1 回	P322	光反應於類囊體膜上進行, 而固碳反應則是在基質中發生
55	第 4 回	P152	控制呼吸係位於橋腦及延腦, 而小腦不具有控制呼吸的中樞
56	第 11 回	P69	不需地理隔離的物種形成, 稱為同域物種形成
57	第 4 回	P9	TRL <sub>3</sub> 是與病毒的雙股 RNA 進行辨認
58	第 4 回	P148	PH 下降, 血紅素會將 O <sub>2</sub> 釋放提供組織所需
59	第 2 回	P324	有乳糖存在, 無葡萄糖存在 → CAMP ↑ 與 CAP 結合形成複合體結合於 CAP 部位以促進 RNAP 結合至 promoter 上使得 a、y、z 三基因表現

題號	回數	頁數	說明
60	第 5 回	P6	軟骨魚，二生類幼體會排世 $\text{NH}_3$
61	第 4 回	P34	抗體多樣性的原因在於 (1) 多對 V.D.J 基因 (2) V-D 及 D-J 基因接合的不精密性 (3) 體基因突變 (4) 重鏈與輕鏈的結合
62	第 2 回	P132	親代 1 : ab → 40% 親代 2 : ab → 10% → aabb = 4%
63	第 11 回	P37	透過自體受精或字體授粉，可使有利的基因變得固定，而異體授精或異體授粉則會引入較大的變異，則不利於基因的固定
64	第 2 回	P77	單性雜種雜交親代不同的是 trait 而非 characters
65			$f(aa) = 0.09 = q^2 \therefore q = 0.3$ → $p = 0.7 \therefore Aa = 2 \times 0.3 \times 0.7 = 0.42$
66	第 2 回	P337	表觀遺傳學的重心便是不涉及 DNA 序列變化的遺傳
67	第 2 回	P265	Streptomycin 僅影響真細菌的生長
68	第 12 回	P365	水分或礦物質以水平運輸的方式進入植物的木質部之路徑為：根毛 → 表皮 → 皮層 → 內皮 → 中柱 → 木質部
69	第 2 回	P8	正確 cell cycle 的順序 $G_1 \rightarrow S \rightarrow G_2 \rightarrow \text{prophase} \rightarrow \text{metaphase} \rightarrow \text{anaphase} \rightarrow \text{telophase}$
70	第 4 回	P63	初級免疫反應所產生的抗體為 IgM
71	第 2 回	P102	9 : 3 : 4 屬於上位現象的附加基因遺傳
72	第 2 回	P77	aB ; Ab × AB ; ab → AaBB , AABb , aaBb , Aabb → 1 aaBb : 2(A_B_) : 1Aabb
73	第 5 回	P55. P56	ADH 無法合成及水通道缺乏導致無法進行水的重吸收而導致尿崩症
74	第 1 回	P13	分娩過程及乳汁噴出皆屬於正回饋
75	第 6 回	P35	當 $E_2 \downarrow$ 、 $P_4 \downarrow$ 則無法抑制 FSH 及 LH 則月經又再度開始

## 楊老師試題評析

## 一.所謂計畫趕不上變化：

1. 義守後中要加考生理學，結果考的全是純生物的生理學；  
中國後中的考科是生物但考的有些都是超過純生物的生理學。
2. 後醫以往生態出最多，去年後中走後醫的路，出一大堆生態學，今年後醫返回走後中的路，生理學出快要一半。
3. 讓大家最傷心的是，題目很少抄自題庫，答案背了半天，結果都沒考，考生看到題目較無熟悉感，∴會認為很難。

## 二、不以題庫觀點看，今年應該比去年及前年簡單。

1. 大部份題目還是基本送分題，例如：
  - (1) 第 3 題：What control the heart rate?(A) medulla oblongata
  - (2) 第 16 題：hormone secreted from hypothalamus?→thyrotropin releasing hormone
2. 許多綜合考題：選對或選錯，雖然綜合許多觀念，但答案都是非常明顯，不用全會，用刪去法或肯定法均很容易得分，如
  - (1) 第 24 題：選錯誤，Cancer types can be classified according to the origin of cells or tissues.  
→(A) Cancers of the leukemia cells are called lymphomas  
→一看就是明顯錯誤
  - (2) 第 15 題：選正確，Which of the following statements regarding cytoskeleton is true?  
→(C) The subunit of intermediate filaments can be keratin.
3. 題目很活，有些要推理：如
  - (1) 第 1 題：1. Which of the following belongs to paracrine?  
→只要能區別是激素與否就可得分

## 三、遺傳考 3 題，分生 10 題，共佔 18%，比去年低（去年 24%）（前年 21%）

## 四、生理考 32 題，佔 42%，比去年多一倍（去年 21%）（前年 30%）

## 五、分類、演化考約 12%（去年 12%）（前年 4%）

## 六、植物學，佔 8%（去年 6%）（前年 10%）

## 七、生態學下降，佔 6%（去年 22%）（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。

## 九、爭議試題：

## 第 55 題

[根據]:campbell 8<sup>th</sup>

- (1) uP928 右邊 34 行：Sensors in the medulla detect changes in the pH of the blood and cerebrospinal fluid bathing the surface of the brain.
- (2) Appendix-35:concept check46.2:  
An increase in blood CO<sub>2</sub> concentration causes an increase in the rate of CO<sub>2</sub> diffusion into the cerebrospinal fluid, where the CO<sub>2</sub> combines with water to form carbonic acid. Dissociation of carbonic acid releases hydrogen ions, decreasing the pH of the cerebrospinal fluid.

[得知]:Medulla 直接偵測 CSF 的 pH，間接地接收到  $PCO_2$  的訊息，而非直接。

[建議]:故(E) Medullary breathing centers **directly** sense and respond to blood pH and CO<sub>2</sub> oncentration.似乎不妥，答案除了 A 要選，E 似乎也要選。

### 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	P151→ 第 2→1→1→3 分支	39	總複習 1	生態學 P6→ 第 4→3→3→1→1 分支
2	總複習 1	P34→ 第 1→→3→分支 觀念	40	總複習 1	P36→ 第 1→3 分支 考古題，題庫也有
3	總複習 2	P4→ 第 3→→4→1→1 分支 觀念	41	總複習 2	P24→ 第 4→3→2 分支
4	總複習 2	P68→ 第 3→→2→4 分支 敘述一樣	42	第 8 回	P119→ 第 19 行
5	總複習 1	P26→ 第 1→→4→1 分支 觀念	43	總複習 1	生態學 P61→ 第 1→3→2 分支 敘述一樣 (題庫題)
6	總複習 1	生理學 P93→ 第 3→第 2 分支觀念	44	總複習 1	P98→ 第 4 分支
7	總複習 2	P28→ 第 2 分支 哈溫定律簡單計算觀念	45	總複習 1	P4→ 第 5→1→1 分支 (私醫考古題)
8	總複習 2	P59→ 第 3→2→2 分支	46	總複習 1	生態學 P55→ 第 2→3→2→3 分支
9	總複習 2	P2→ 第 2→3→2→1 分支 敘述一樣	47	總複習 2	P19→ 第 2→1 小分支
10	總複習 1	P14→ 第 6 分支	48	總複習 1	P90→ 第 3 分支
11	總複習 2	P37→ 第 3→4 分支	49	總複習 2	生理學 P18→ 第 2→2→1→2→4 小分支
12	總複習 2	P63→ 第 1→2→1 分支	50	總複習 1	P1→ 第 2→3→2 小分支
13	總複習 2	P41→ 第 3→1 分支 衍生概念	51	總複習 2	P59→ 第 3→3→2 分支
14	總複習 2	P2→ 第 2 分支	52	總複習 2	P67→ 第 1 分支
15	總複習 2	P19→ 第 1→2 分支	53	總複習 2	P70→ 第 3 小分支
16	總複習 2	P20→ 第 2 分支	54	總複習 1	P16
17	總複習 1	P7→ 第 2 分支	55	總複習 1	P98→ 第 4 小分支
18	總複習 1	P90→ 第 3→4→1→2 分支	56	總複習 2	P30→ 第 2→1 小分支
19	總複習 2	P66	57	總複習 2	P92→ 第 2→1→6→3 小分支 完全一樣 (題庫有)
20	總複習 1	P7→ 第 2→32 分支	58	總複習 1	P97→ 第 3→2 小分支
21	總複習 1	P87→ 第 1 分支	59	總複習 1	P31→ 第 3→1 小分支
22	總複習 2	P18→ 第 2→1 分支	60	總複習 2	P100→ 第 2 小分支
23	總複習 1	P28→ 第 1 分支	61	總複習 2	P93→ 第 3→2 小分支
24	第 7 回	P182: 第 19 行	62	講義第 四回	P160 表格 第二列有類似題



題號	回數	頁數	題號	回數	頁數
25	總複習1	P27→ 第1→3→3分支	63	總複習2	P30 簡單觀念，在線蟲有說
26	總複習2	P14→ 第3→3分支	64	總複習1	P20 基本觀念
27	總複習1	P22→ 第3→1分支	65	總複習2	P28→ 第2分支 哈溫定律簡單計算觀念
28	總複習1	P36→ 第1→1→1→1分支	66	總複習1	P36→ 第1→3分支
29	總複習1	P26→ 第2→2→1→2分支 完全相同	67	總複習2	P38→ 第1小分支
30	總複習2	P16	68	總複習2	P61→ 第2→1→2小分支
31	總複習1	P74→ 第1→2→1→1→1→1分支 完全相同	69	總複習1	P17→ 第2→1小分支
32	第5回	P148：第1題 →題目幾乎完全相同	70	總複習1	P93→ 第3→2→3→2小分支
33	總複習2	P1→ 第1→3→1→2→3分支	71	總複習1	P21→ 第4→2→1→1小分支
34	總複習1	P86→ 第3分支	72	總複習1	遺傳學簡單計算
35	總複習1	P26→ 第2→2→2→3→3→1分支 完全相同	73	總複習1	P102→ 第3→4小分支
36	總複習2	P68→ 第3→1分支	74	總複習1	P2→ 第3→1→1小分支
37	總複習1	P9→ 第4分支	75	總複習1	P25
38	總複習1	P3→ 第1→1→3→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。

- (C) 1. Which of the following belongs to paracrine?  
 ① prostaglandin    ② NO    ③ cytokine    ④ glucagon    ⑤ melatonin  
 (A) ③④    (B) ③⑤    (C) ①②③    (D) ③④⑤    (E) ①③⑤
- (B) 2. Microsatellites DNA is various number of short nucleotide repeat presence in our genomic DNA. If John's father has microsatellites of 9 repeats and 6 repeats, his mother has 6 repeats and 5 repeats. What could be the combination of microsatellites in John's genomic DNA?  
 ① 9 repeats and 6 repeats    ② 15 repeats and 12 repeats  
 ③ 6 repeats and 6 repeats    ④ 9 repeats and 5 repeats  
 ⑤ 12 repeats and 14 repeats  
 (A) ①②    (B) ①③④    (C) ②④    (D) ③④⑤    (E) ④⑤
- (A) 3. What control the heart rate?  
 (A) medulla oblongata    (B) neocortex    (C) pituitary  
 (D) cerebellum    (E) thalamus
- (D) 4. What is the logical treatment to make a seed break dormancy?  
 (A) IAA    (B) CO<sub>2</sub>    (C) DTT    (D) gibberellins    (E) ascorbic acid
- (A) 5. What will be the amino acid carried by a tRNA whose anticodon sequence is 5'-CAU-3' ?  
 (AUG: Met; CAU: His; UAC: Tyr; GUA: Val; CGU: Arg)  
 (A) Met    (B) His    (C) Tyr    (D) Val    (E) Arg
- (A) 6. Which of the following statement is **NOT** correct about immunoglobulin producing B cells?  
 (A) B cell does not express its immunoglobulin gene unless primed by antigen.  
 (B) B cells rearrange their immunoglobulin gene during their development.  
 (C) The VDJ rearrangement creates the diversity of immunoglobulin produced by B cells.  
 (D) Somatic mutation of immunoglobulin gene is one way to produce high affinity antibody.  
 (E) B cell anergy is one way to induce tolerance.
- (C) 7. Huntington disease (HD) is inherited dominantly. If homozygote patient of HD is about 4% in a population, what will be the percentage of normal individuals in this population?  
 (A) 96%    (B) 81%    (C) 64%    (D) 49%    (E) 20%
- (B) 8. In plant leave, products of photosynthesis is collected in which of the following leave cells?  
 (A) collecting cell    (B) transfer cell    (C) tracheid  
 (D) boundle sheath cell    (E) endodermal cell
- (A) 9. Which of the following ion channel causes the reflectory period when neuron cannot response to another stimulus shortly after an action potential?  
 (A) sodium ion channel    (B) potassium ion channel    (C) proton channel  
 (D) chloride channel    (E) calcium ion channel
- (E) 10. Glucose in human hepatocyte can be synthesized from which combination of the following non-sugar sources?

- ① adenine                      ② alanine                      ③ lactate                      ④ palmitate                      ⑤ glycerol  
 (A) ①②③                      (B) ①④                      (C) ②③④⑤                      (D) ④⑤                      (E) ②③⑤

- (B) 11. Acne is caused by infection of the sebaceous glands by *Propionibacterium acne*, which is Gram-positive bacterium whose cell wall composed of which of the following?  
 (A) thick lipopolysaccharide layer  
 (B) thick peptidoglycan layer  
 (C) thin lipopolysaccharide layer over a thick peptidoglycan layer  
 (D) thick lipopolysaccharide layer over a thin peptidoglycan layer  
 (E) thick lipopolysaccharide layer over a thick peptidoglycan layer
- (B) 12. Which of the following is the **least** possible growth limitation factor for a plant community?  
 (A) nitrogen source                      (B) carbon source                      (C) phosphorus source  
 (D) potassium source                      (E) water source
- (A) 13. According to their pigmentation, which algal group would be most likely to perform photosynthesis in the deepest sea?  
 (A) red algae                      (B) green algae                      (C) brown algae  
 (D) golden algae                      (E) blue-green algae
- (A) 14. An action potential of neuron is characterized by the following, **except** \_\_\_\_\_.  
 (A) it is initiated by opening of voltage-gated potassium channels  
 (B) it is regarded as a regenerative response  
 (C) it is regarded as a all-or-none response  
 (D) it does not degrade in magnitude with space or time  
 (E) it is transmembrane potential changes that occur in most axons
- (B) 15. What is hormone most active in a person who is subjective to short-term starvation?  
 (A) insulin                      (B) glucagon                      (C) epinephrine                      (D) oxytocin                      (E) glucocorticoids
- (A) 16. Which of the following hormone secreted from hypothalamus?  
 (A) thyrotropin releasing hormone                      (B) oxytocin  
 (C) luteinizing hormone                      (D) glucagon                      (E) glucocorticoids
- (C) 17. Which of the following is **NOT** a factor influencing membrane fluidity?  
 (A) number of double bond in lipids (B) temperature (C) flip-flop move of lipids (D) cholesterol (E) none of the above
- (B) 18. Which of the following is required for synthesis of prothrombin and blood coagulation factors in hepatocyte?  
 (A) folic acid                      (B) vitamin K                      (C) vitamin B12                      (D) vitamin A                      (E) vitamin B1
- (E) 19. Where do you find the cells undergo meiosis in plants?  
 (A) shoot apical meristem                      (B) pollens                      (C) embryo sacs  
 (D) corolla                      (E) ovule
- (B) 20. When animal cell loss its extra-membranous oligosaccharides, it will be deficient in which of the following function?  
 (A) the aggregation of cytoskeleton  
 (B) the intercellular recognition  
 (C) the exchange of proton across the membrane  
 (D) the change of membrane action potential  
 (E) the calcium influx or efflux

- (C) 21. About high blood pressure, which of the following statement is **NOT** correct?  
 (A) Blood pressure is always high.  
 (B) Systolic pressure above 144 mmHg and diastolic pressure over 90 mmHg.  
 (C) It is caused by long term raise of cardiac output.  
 (D) May be caused by kidney dysfunction.  
 (E) Can be treated with diuretic drug.
- (C) 22. Which of the following is peptide hormone?  
 (A) thyroxin (B) epinephrine (C) antidiuretic hormone  
 (D) progesterone (E) cortisone
- (E) 23. The translation terminates in which of the following condition?  
 ① ribosome reaches the end of mRNA ② ribosome reaches the stop codon  
 ③ deficient in certain amino acid ④ no aminoacyl-tRNA enters ribosome  
 ⑤ polypeptide folds into protein  
 (A) ①③ (B) ②④ (C) ①②③ (D) ③④ (E) ②③④
- (A) 24. Cancer types can be classified according to the origin of cells or tissues. Which of the following statements is **FALSE**?  
 (A) Cancers of the leukemia cells are called lymphomas.  
 (B) Cancers of the epithelial cells are called carcinomas.  
 (C) Cancers of the glandular cells are called adenocarcinoma.  
 (D) Cancers of the connective tissue are called sarcomas.  
 (E) Cancers of the glial cells are called gliomas.
- (C) 25. Which of the following RNAs works in RNA splicing?  
 (A) rRNA (B) tRNA (C) snRNA (D) miRNA (E) mRNA
- (E) 26. \_\_\_\_\_ is **NOT** a second messenger.  
 (A)  $\text{Ca}^{2+}$  (B) Nitric oxide (C) Phosphatidylinositol 4, 5-bisphosphate  
 (D) Sphingomyelin (E) ATP
- (A) 27. Which of the following statements is **FALSE**?  
 (A) The sex determined in most ants and bees is by the Z-W system.  
 (B) Any gene located on a sex chromosome is called a sex-linked gene.  
 (C) Nondisjunction occurs when members of a chromosome pair fail to separate.  
 (D) The impact of a single gene on more than one character is called pleiotropy.  
 (E) Linked genes generally do not follow the laws of independent assortment.
- (C) 28. Which of the following functional groups participate in chromatin-mediated gene expression?  
 (A) OH (B) COOH (C)  $\text{CH}_3$  (D)  $\text{NH}_2$  (E) CO
- (E) 29. The eukaryotic DNA replication does **NOT** contain  
 (A) ligase (B) DNA polymerase (C) helicase (D) topoisomerase (E) gyrase
- (A) 30. Which of the following statements about signal transduction is **FALSE**?  
 (A) Signal transduction only can start with a signal to a membrane receptor, and ends with a change in cell function.  
 (B) The signal must be amplified in a cascade manner within the cells.  
 (C) Signal transduction can link with all cellular responses respond to external stimuli.  
 (D) Signal transduction closely links with gene expression to alter metabolism.  
 (E) Signal transduction is largely carried out by second messenger molecules.
- (D) 31. Which of the following statements is **FALSE**?

- (A) The cells of the mucous membrane lining human air tubes carry cilia that sweep mucus up and out of the respiratory system.  
 (B) Adipose tissue is a type of connective tissue.  
 (C) Epithelial tissues cover both external and internal body surfaces.  
 (D) The most common type of connective tissue in the human body is fibrous connective tissue.  
 (E) Connective tissue is different from the other major tissue types in that the cells are sparsely scattered through a nonliving matrix.
- (C) 32. Which of the following structures does **NOT** belong to the human lymphatic system?  
 (A) tonsils (B) thymus (C) pancreas (D) appendix (E) bone marrow
- (A) 33. Which of the following statements regarding the nervous system is **FALSE**?  
 (A) Schwann cell is also a kind of nerve cell and found in the peripheral nervous system (PNS).  
 (B) The functional unit of the nervous system is the neuron.  
 (C) Sensory neurons convey signal from sensory receptors into the central nervous system (CNS).  
 (D) Motor neurons convey signals from the CNS to effector cells.  
 (E) PNS has ganglia, clusters of neuron cell bodies.
- (A) 34. Which of the following statements about circulatory systems is **FALSE**?  
 (A) Arthropods and earthworms have open circulatory system.  
 (B) The pulmonary circuit carries blood between the heart and gas exchange tissues in the lungs.  
 (C) The systemic circuit carries blood between the heart and the rest of the body.  
 (D) Salmon has a single circuit of blood flow and two heart chambers.  
 (E) Mammals have two atria and two ventricles in their hearts.
- (C) 35. In eukaryotic cells, 5S rRNA gene is transcribed by \_\_\_\_\_.  
 (A) RNA polymerase I (B) RNA polymerase II (C) RNA polymerase III  
 (D) RNA polymerase IV (E) RNA polymerase V
- (D) 36. \_\_\_\_\_ is produced in the roots of plants. It promotes cell division and growth, and retards the aging of flowers and leaves?  
 (A) Ethylene (B) Abscisic acid (C) Karrikins (D) Cytokinins (E) Gibberellins
- (C) 37. Which of the following statements regarding cytoskeleton is true?  
 (A) The subunit of microfilaments is tubulin.  
 (B) The subunit of intermediate filaments can be dyneins.  
 (C) The subunit of intermediate filaments can be keratin.  
 (D) The subunit of intermediate filaments can be kinesins.  
 (E) Microtubules are polymers of alpha and beta actin.
- (B) 38. Trace elements are those required by an organism in only minute quantities. Which of the following is a trace element that is needed by all forms of life?  
 (A) calcium (B) iron (C) iodine (D) sodium (E) potassium
- (C) 39. Which is a functional group that helps stabilize proteins by forming covalent cross-links within or between protein molecules?  
 (A) amino group (B) carboxyl group (C) sulfhydryl group (D) carbonyl group (E) phosphate group
- (D) 40. Which of the following is (are) the mechanism(s) of epigenetic variations?  
 (A) histone acetylation (B) single nucleotide substitution  
 (C) DNA methylation (D) both A and C (E) all of A, B, and C
- (C) 41. The process by which unrelated organisms with similar environment demands evolve superficially similar structures is

- (A) natural selection (B) homologous (E) adaptation  
(C) convergent evolution (D) comparative anatomy
- (E) 42. On a daily basis, the amount of urine produced is approximately \_\_\_ of the amount of filtrate.  
(A) 80% - 90% (B) 50% - 60% (C) 30% - 40% (D) 10% - 20% (E) 1% - 2%
- (D) 43. Which of the following is **NOT** a density-dependent regulation of population size?  
(A) competition (B) disease (C) predation (D) biotic potential (E) toxic waste
- (D) 44. Breathing rate increases because of  
(A) insufficient oxygen in the blood  
(B) excess carbon dioxide in the blood  
(C) the accumulation of metabolites in the blood  
(D) both A and B  
(E) all of A, B, and C
- (A) 45. Which of the following vitamins is **incorrectly** associated with its use?  
(A) vitamin B2: component of coenzymes NAD<sup>+</sup> and NADP<sup>+</sup>  
(B) folic acid: coenzyme in nucleic acid and amino acid metabolism  
(C) vitamin C: used in collagen synthesis  
(D) vitamin A: component of visual pigments  
(E) vitamin K: important in blood clotting
- (C) 46. Which of the following areas of study examines energy flow and chemical cycling between organisms and the environment?  
(A) population ecology (B) community ecology (E) global ecology  
(C) ecosystem ecology (D) landscape ecology
- (B) 47. What is the target organ for thyrotropin-releasing hormone?  
(A) hypothalamus (B) anterior pituitary (E) liver  
(C) posterior pituitary (D) thyroid
- (C) 48. In the formation of a blood clot, damaged cells and platelets release substances which catalyze the conversion of  
(A) fibrinogen to fibrin (B) fibrin to fibrinogen  
(C) prothrombin to thrombin (D) thrombin to prothrombin  
(E) thrombin to fibrin
- (D) 49. Phosphatidylinositol 4,5-bisphosphate (PIP<sub>2</sub>) is cleaved by phospholipase C into  
(A) 1,2-diacylglycerol (DAG) (B) phosphatidylinositol (PI)  
(C) inositol 1,4,5-trisphosphate (IP<sub>3</sub>) (D) A and C (E) B and C
- (B) 50. The correct sequence, from the most to the least comprehensive, of the taxonomic levels listed here is  
(A) kingdom, domain, phylum, class, order, and family  
(B) domain, kingdom, phylum, class, order, and family  
(C) kingdom, domain, phylum, class, family, and order  
(D) kingdom, phylum, domain, class, family, and order  
(E) kingdom, phylum, domain, class, family, and order

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。

- (E) 51. Which of the following statement about plant flower is correct?

- (A) A flower is the vegetative organ of a plant.  
 (B) A flower lacking any of sepal, petal, stamen or carpel is an imperfect flower.  
 (C) Most grasses have imperfect flowers.  
 (D) Floral parts in all angiosperm are arranged as four whorls.  
 (E) Floral parts are sequentially initiated at the floral meristem.
- (C) 52. A larvae of certain fly lives on body surface of a dog feeding on host's skin. What will be the ecological position of this creature?  
 (A) primary consumer (B) secondary consumer  
 (C) tertiary consumer (D) producer (E) decomposer
- (D) 53. When we refer to a plant as a "short-day plant", we mean that .  
 (A) the plant flowers in winter  
 (B) the plant flowers when day is shorter than 12 hours  
 (C) the plant flowers only in the equator area  
 (D) the plant flowers when the night is longer than its own critical night length  
 (E) both A and D
- (B) 54. Which of the following statements regarding photosynthesis is **FALSE**?  
 (A) The principal electron carrier in photosynthesis is NADPH; the principal electron carrier in respiration is NADH.  
 (B) The light reactions occur in the stroma, while the Calvin cycle occurs in the thylakoid membranes.  
 (C) The light reactions of photosynthesis can produce ATP, NADPH and O<sub>2</sub>.  
 (D) Sunlight is a type of electromagnetic energy.  
 (E) Chlorophyll *a* reflects green light.
- (A) 55. Which of the following statements about gas exchange is **FALSE**?  
 (A) Breathing control centers are located in parts of the brain called the cerebellum and medulla oblongata.  
 (B) The control center regulates breathing rate in response to changes in the CO<sub>2</sub> level of the blood.  
 (C) Gills are unsuitable for animals living on land because the large surface area of gills would allow dehydration of the animal.  
 (D) Unlike the tracheal system of insects, vertebrate lungs are restricted to one location in the body.  
 (E) Medullary breathing centers directly sense and respond to blood pH and CO<sub>2</sub> concentration.
- (C) 56. Which of the following statements is **FALSE**?  
 (A) Speciation, or the formation of new species, is the bridge between microevolution and macroevolution.  
 (B) The likelihood of allopatric speciation increases when a splinter population is small and isolated from the broader range of the species.  
 (C) Speciation without geographic isolation is called allopatric speciation.  
 (D) Organisms carry more than two complete sets of chromosomes in are called as polyploid.  
 (E) Most polyploid species arise from the hybridization of two parent species and subsequent chromosome duplications.
- (C) 57. Mammalian Toll-like receptors (TLRs) recognize macromolecules present on certain groups of pathogens. Which of the following is most likely to be recognized by TLR that defends against certain viruses?  
 (A) lipopolysaccharides (B) double-stranded peptide  
 (C) double-stranded RNA (D) glycoproteins  
 (E) phosphopeptides

- (A) 58. Hemoglobin is responsible for transporting oxygen from lung to tissues. Bohr shift is one of the most important properties of hemoglobin. Which of the following is **NOT** true about Bohr shift?  
 (A) Additional oxygen is bound by hemoglobin in lung when pH decreases.  
 (B) Additional oxygen is released from hemoglobin at a lower pH.  
 (C) Carbon dioxide is involved in Bohr shift.  
 (D) Bohr shift helps tissues to obtain more oxygen in exercise.  
 (E) None of the above.
- (C) 59. Which of the following can maintain gene expression from lac operon?  
 (A) High level of glucose from the breakdown of lactose (B) Lactose must binds to the operator  
 (C) High level of cAMP in the presence of lactose (D) Repressor must binds to operator  
 (E) Stop producing repressor
- (E) 60. Animals release their nitrogenous waste in different forms. Which of the following statements are true ?  
 ① Urea is excreted by many marine fishes.  
 ② Ammonia is so toxic that it is rarely excreted as nitrogenous waste by any animals.  
 ③ The animals in dry environment could excrete uric acid.  
 ④ The form of nitrogenous waste is often an adaptation to animal habitats.  
 (A) ①②③④ (B) ①② (C) ①②④ (D) ②④ (E) ①③④
- (E) 61. Diversity of antibodies arises from which of the following?  
 (A) Assortment of V, D, J gene segments (B) Junctional variation upon V-D or D-J joining  
 (C) Somatic mutation (D) Assortment of heavy and light chain genes  
 (E) All of the above
- (D) 62. Genes A and B are linked on the same chromosome with recombination frequency of 20%. What will be the frequency of offspring with recessive phenotype from a cross between individuals with AB/ab and Ab/aB genotypes?  
 (A) 20% (B) 10% (C) 6% (D) 4% (E) 2%
- (C) 63. How does the occurrence of self-fertilization relative to cross-fertilization affect the fixation of an advantageous and recessive allele that newly arose in population by mutation?  
 (A) The relative occurrence of self-fertilization does not affect the fixation of the allele.  
 (B) The relative occurrence of self-fertilization affects the fixation of the allele only when the population is very small.  
 (C) The allele will be fixed more quickly when the occurrence of self-fertilization is higher.  
 (D) The allele will be fixed more quickly when the occurrence of self-fertilization is lower.  
 (E) The allele will be fixed more quickly when the occurrence of cross-fertilization is higher.
- (C) 64. Which of the following statements regarding inheritance is **FALSE**?  
 (A) "True-breeding" means varieties for each self-fertilization produced offspring all identical to the parent.  
 (B) The offspring of two different varieties are called hybrids.  
 (C) A monohybrid cross is a breeding experiment in which the parental varieties differ in some characters.  
 (D) The hybrid offspring of an F1 cross are the F2 generation.  
 (E) The hybrid offspring of a cross are the F1 generation.
- (D) 65. In a Hardy-Weinberg population with two alleles, *A* and *a*, that are in equilibrium. The frequency of *aa* individuals in the population is about 0.09. What is the frequency of individuals with *Aa* genotype?  
 (A) 0.18 (B) 0.21 (C) 0.36 (D) 0.42 (E) 0.91



- (A) 66. Which of the following statements regarding epigenetics is **FALSE**?
- (A) The study of inherited changes in genotype, especially in gene expression caused by the changes of DNA sequence.
  - (B) Specific epigenetic processes include imprinting, gene silencing, X chromosome inactivation, and position effect.
  - (C) Some regulation can be associated with microRNA.
  - (D) Some regulation can be associated with DNA methylation.
  - (E) Some regulation can be associated with histone modification
- (C) 67. The difference between bacteria and archaea is
- (A) Membrane-enclosed organelles are present or not.
  - (B) Circular chromosome.
  - (C) Streptomycin inhibits growth.
  - (D) Both A and C.
  - (E) All of A, B, and C.
- (D) 68. Which of the following pathways best summarizes the route of a mineral that is absorbed by a plant?
- (A) root hair, epidermis, cortex, stele, endodermis, xylem
  - (B) root hair, cortex, epidermis, stele, endodermis, xylem
  - (C) root hair, cortex, epidermis, endodermis, stele, xylem
  - (D) root hair, epidermis, cortex, endodermis, stele, xylem
  - (E) root hair, epidermis, stele, cortex, endodermis, xylem
- (C) 69. Which of these sequences correctly describes the cell cycle?
- (A) G1, G2, S, prophase, metaphase, anaphase, telophase
  - (B) G1, G2, S, prophase, metaphase, telophase, anaphase
  - (C) S, G2, prophase, metaphase, anaphase, telophase, G1
  - (D) G1, S, G2, metaphase, prophase, anaphase, telophase
  - (E) G2, S, prophase, metaphase, anaphase, telophase, G1
- (D) 70. Which of the following statements about immunoglobulin is **FALSE**?
- (A) IgG is the most abundant immunoglobulin in serum.
  - (B) IgM can activate classical complement pathway.
  - (C) IgE can induce mast cell degranulation.
  - (D) IgG is the first immunoglobulin class produced in a primary response to an antigen.
  - (E) IgA is the predominant immunoglobulin class in external secretions such as breast milk, saliva and tears.
- (C) 71. One of the typical ratios resulting from epistatic interactions in dihybrid crosses would be
- (A) 9:3:3:1      (B) 1:1:1:1      (C) 9:3:4      (D) 1:2:1      (E) 3:1
- (B) 72. In the absence of recombination, what ratio of phenotypes is expected in the progeny of the cross  $aB/Ab \times AB/ab$ ?
- (A) 3 A-B- : 1 aabb      (B) 1 aaB- : 2 A-B- : 1A-bb
  - (C) 9 A-B- : 3 A-bb : 3 aaB- : 1 aabb      (D) 1 A-B- : 1 A-bb : 1 aaB- : 1 aabb
  - (E) 1 aB : 1 Ab : 1 AB : 1 ab
- (D) 73. Diabetes insipidus is a disorder marked by production of abnormally large in volume and very dilute urine. It can cause severe dehydration. The mechanism(s) attributing the disorder can be
- (A) mutations that prevent ADH production
  - (B) mutations that inactivate aquaporin
  - (C) mutations that inactivate insulin receptor

- (D) both A and B
- (E) all of the A, B, and C

- (D) 74. Which of the following statements is (are) positive feedback?
- (A) The hormones stimulate uterus contraction when child-birth occurs in mammals.
  - (B) A nursing infant's sucking increases the secretion of a milk-releasing hormone in the mother.
  - (C) An increase in calcium concentration increases the secretion of a hormone that stores calcium in bone.
  - (D) Both A and B.
  - (E) All of A, B, and C.
- (E) 75. The beginning of a new menstrual cycle is initiated by the production and release of \_\_\_\_\_, which occurs when inhibition by \_\_\_\_\_ ceases.
- (A) FSH and LH; GnRH
  - (B) GnRH; FSH and LH
  - (C) estrogen and progesterone; GnRH
  - (D) GnRH; estrogen and progesterone
  - (E) FSH and LH; estrogen and progesterone