生　物

曾正(曾蘇賢)老師提供

I.【單選題】每題 1 分，共計 30 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。
1~15 題為普通生物學，16~30 題為生化概論。

(B) 1. If a long-day plant has a critical night length of 10 hours, which of the 24-hour cycles would prevent flowering?
(A) 16 hours light/8 hours dark
(B) 13 hours light/11 hours dark
(C) 15 hours light/9 hours dark
(D) 4 hours light/8 hours dark/4 hours light/8 hours dark
(E) 8 hours light/8 hours dark/light flash/8 hours dark

(B) 2. Which of the following species is most likely to be a candidate for geographical isolation?
(A) bat (B) land snail (C) squirrel (D) salt-water fish (E) sparrow

(A) 3. Which of the following characteristics adds most to vertebrate success in terrestrial environments?
(A) the amniotic egg (B) the ability to maintain a constant body temperature
(C) two pairs of appendages (D) claws
(E) a four-chambered heart

(C) 4. Which of the following statements is **not** true for the prophase I of meiosis?
(A) Homologous chromosomes are pairing.
(B) Each homologous chromosome consists of two sister chromatids.
(C) Each chromosome consists of single strand of DNA.
(D) The pairing homologs are joined by the synaptonemal complex.
(E) Chiasmata occur between non-sister chromatids.

(D) 5. Which cells in a plant root form a protective barrier to the vascular system where all materials must move through the symplast?
(A) Cortex (B) Pericycle (C) Epidermis (D) Endodermis (E) Exodermis

(A) 6. What are the wavelengths of light that chlorophyll absorbs most strongly?
(A) Blue and red (B) Blue and green (C) Green and yellow
(D) UV and infrared (E) UV and blue

(C) 7. Which statement about human reproduction is **correct**?
(A) Fertilization occurs in the uterus.
(B) In humans, spermatogenesis and oogenesis function best at normal, core body temperatures.
(C) A human oocyte completes meiosis after a sperm penetrates it.
(D) The earliest stages of spermatogenesis are found closest to the lumen of the seminiferous tubule.
(E) Sertoli cells produce testosterone under FSH stimulation.

(B) 8. Which of the following hormones is the most useful for promoting the growth of the root after plant cuttings?
(A) Abscisic acid (B) Auxins (C) Cytokinins (D) Gibberellins (E) Oligosaccharins

(C) 9. Given the parents TTEECc × TteeCc, assume simple dominance for each trait and independent assortment. What proportion of the progeny will be expected to phenotypically resemble the first parent (TTEECc)?
(A) 1/4 (B) 1/8 (C) 3/4 (D) 3/8 (E) 1

(D) 10. A genetic change that caused a certain Hox gene to be expressed along the tip of a vertebrate limb bud instead of further back made possible the evolution of the tetrapod limb. This type of change is an illustration of _____.
(A) heterochrony, a change in the timing of developmental events
(B) allopolyploidy, an increase in chromosome number
(C) paedomorphosis, or retention of ancestral juvenile structures in an adult organism
(D) a change in a homeotic developmental gene that altered the spatial organization of body parts
(E) allopatric speciation

(C) 11. The conversion of fibrinogen to fibrin _____.
(A) occurs when fibrinogen is released from broken platelets
(B) occurs within red blood cells
(C) is linked with hypertension and may damage artery walls
(D) is likely to occur too often in an individual with hemophilia
(E) is the final step of a clotting process that involves multiple clotting factors

(D) 12. Which of the following type of leukocyte would play a role as "antigen presenting cells" and trigger the MHC class II mediated immune response?
(A) Basophils (B) Eosinophils (C) T lymphocytes
(D) Macrophages (E) Neutrophils

(E) 13. The components of the endomembrane system of cells **don't** include _____.
(A) nuclear envelope (B) endoplasmic reticulum (C) vacuoles
(D) plasma membrane (E) mitochondrion

(D) 14. Which area of the human brain contains the rhythmic breathing control center?
(A) Neocortex (B) Hippocampus (C) Thalamus
(D) Medulla (E) Cerebellum

(E) 15. _____ absorb products of photosynthesis from living host plants.
(A) Epiphytes (B) Carnivorous plants (C) Xerophytes
(D) Halophytes (E) Parasitic plants

Ⅱ.【單選題】每題 2 分，共計 120 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。
31~60 題為普通生物學，61~90 題為生化概論。

(D) 31. Phenylketonuria is an autosomal recessive inheritable disease. If the incidence of the disease is about 1/10000, what is the frequency of the phenylketonuria recessive disease allele (a) and the (Aa) genotype frequency of the person carrying the recessive gene in the population?
(A) 0.1% and 0.99% (B) 0.1% and 1.98% (C) 1% and 3.96%
(D) 1% and 1.98% (E) 0.1% and 3.198%

(D) 32. Which of the following features belong to the coral?
1. a gastrovascular cavity
2. a polyp stage
3. a medusa stage
4. cnidocytes
5. a pseudocoelom
(A) 1 and 4 (B) 2 and 3 (C) 2, 3, and 4 (D) 1, 2, 3, and 4 (E) all five of these

(B) 33. What is the **correct** sequence of the following steps during the human excretory system?
(A) excretion → filtration → secretion → reabsorption
(B) filtration → reabsorption → secretion → excretion
(C) excretion → filtration → reabsorption → secretion
(D) excretion → filtration → secretion
(E) filtration → excretion → reabsorption → secretion

(E) 34. In which of the following conditions, asexual reproduction results in greater reproductive success than does sexual reproduction?
(A) When pathogens are rapidly diversifying.
(B) When a species has accumulated numerous deleterious mutations.
(C) When there is some potential for rapid overpopulation.
(D) When a species is expanding into diverse geographic settings.
(E) When a species is in stable and favorable environments.

(B) 35. Which of the following does **not** tend to promote speciation?
(A) The founder effect (B) Gene flow (C) Natural selection
(D) Polyploidy (E) Disruptive selection

(C) 36. What is the response a plant would react to an attack from herbivores?
(A) Leaf abscission to prevent further loss of tissue.
(B) Early flowering to reproduce before being eaten.
(C) Production of chemical compounds for defense or to attract predators of the herbivores.
(D) Production of physical defenses, such as thorns.
(E) Production of thicker bark and cuticle to make it more difficult to eat.

(C) 37. A healthy young man ingests a large volume of distilled water and 50 min later a study is undertaken. In which of the following parts in his kidneys would the liquid with the greatest osmolarity be found?
(A) Proximal tubule
(B) The bottom of the loop of Henle of the cortical nephron
(C) The bottom of the loop of Henle of the juxtamedullary nephron
(D) Distal tubule of the juxtamedullary nephron
(E) The innermost medullary collecting duct

(A) 38. Which of following statements about human digestive function is **incorrect**?
(A) When food bolus enters the stomach, gastrin is secreted into the gastric lumen.
(B) Secretin released from duodenum inhibits the secretion of gastric juice.
(C) CCK released from duodenum stimulates the secretion of pancreatic enzymes.
(D) The vagus nerve activates the parietal cells of stomach when a bite of food enters the mouth.
(E) Increased sympathetic activity would slow down the motility of digestive tract.

(E) 39. Which of the following statements about human respiration is **true**?
(A) Most of the carbon dioxide in the blood is bound to hemoglobin.
(B) Increased pH level decreases affinity of hemoglobin for O_2 and improves the unloading reaction.
(C) At normal systemic venous P_{O2}, about 25% of the hemoglobin is in the form of oxyhemoglobin.
(D) Surfactants can increase the surface tension of the lungs.
(E) During an unforced exhalation, alveolar pressure is greater than atmospheric pressure.

(B) 40. Which event occurs after the first heart sound and before the second heart sound in human cardiac cycle?
(A) Ventricular relaxation (B) Aortic systolic pressure (C) AV valves open
(D) P wave of the ECG (E) Blood volume in ventricle increases

(B) 41. In a neuroscience lab, a student increased the concentration of K^+ outside a neuron from 5 mM to 10 mM, while maintaining other ion concentrations as they were. What would happen to the neuron's membrane potential?
(A) The membrane potential would become more negative.
(B) The membrane potential would become less negative.
(C) The membrane potential would remain the same.
(D) The membrane potential would be closer to the K^+ equilibrium potential.
(E) There would be no potential difference across the membrane.

(C) 42. Which of the following is **not** true about helper T cells?
(A) They function in both cell-mediated and humoral immune responses.
(B) They bear surface CD4 molecules.
(C) They recognize polysaccharide fragments presented by infected cells.
(D) They are subject to infection by HIV.
(E) When activated, they secrete cytokines that stimulate other lymphocytes.

(D) 43. Which of the following statements about vision is **not** true?
(A) Rods are more light-sensitive than cones and are responsible for night vision.
(B) Color vision results from the presence of three subclasses of cones in the retina.
(C) Perception of visual information takes place in the cerebral cortex.
(D) All information from the left eye goes to the right visual cortex and all information from the right eye goes to the left visual brain.
(E) The ciliary muscles relax if you look away from this page and focus your eyes on a distant object and the lens is flattened.

(B) 44. Which of the following sensory receptors is **incorrectly** paired with its category?
(A) Photoreceptor — rod cell in retina
(B) Nociceptor — muscle spindle
(C) Chemoreceptor — taste receptor in tongue
(D) Mechanoreceptor — hair cell in cochlea
(E) Electroreceptor — hair cell in ampulla of Lorenzini

(D) 45. Within a few weeks of treatment with the drug 3TC, a patient's HIV population consists entirely of 3TC-resistant viruses. What is the best explanation?
(A) HIV has the ability to change its surface proteins and resist vaccines.
(B) The patient must have become reinfected with 3TC-resistant viruses.
(C) HIV began making drug-resistant versions of reverse transcriptase in response to the drug.
(D) A few drug-resistant viruses were present at the start of treatment, and natural selection increased their frequency.

(B) 46. A founder event favors microevolution in the founding population mainly because _____.
(A) mutations are more common in a new environment
(B) a small founding population is subject to extensive sampling error in the composition of its gene pool
(C) the new environment is likely to be patchy, favoring diversifying selection
(D) gene flow increases
(E) members of a small population tend to migrate

(D) 47. Which of the following descriptions are **correct**?
1. Green algae — closest relative of green plants
2. Brown algae — includes the largest seaweeds
3. Diatoms — examples of stramenopiles
4. Dinoflagellates — glass, two-part shells
5. Red algae — has no flagellated stages in life cycle
(A) 1234 (B) 2345 (C) 1245 (D) 1235 (E) 2345

(D) 48. Which of the following is an example of an opportunistic pathogen that can cause a mycosis?
(A) *Claviceps pururea*, which produces ergots on rye that can cause serious symptoms in humans if milled into flour
(B) *Ophiostoma ulmi*, which causes Dutch elin disease
(C) the ascomycetes that causes ringworm
(D) *Candida albicans*, which causes vaginal yeast infections
(E) the mold Penicillium, an ascomycete that is now grown in liquid culture to produce antibiotics

(D) 49. Which of the following hormones is produced by adipose cells that helps to control appetite?
(A) Insulin (B) Neuropeptide Y (C) Glucagon
(D) Leptin (E) Ghrelin

(C) 50. The high osmolarity of the renal medulla is maintained by all of the following **except** _____.
(A) diffusion of salt from the ascending limb of the loop of Henle
(B) active transport of salt from the upper region of the ascending limb
(C) the spatial arrangement of juxtamedullary nephrons
(D) diffusion of urea from the collecting duct
(E) diffusion of salt from the descending limb of the loop of Henle

(C) 51. When light strikes the pigment rhodopsin in a rod cell, retinal dissociates from opsin, initiating a signal-transduction pathway that _____.
(A) depolarizes the neighboring bipolar cells and initiates an action potential in a ganglion cell
(B) depolarizes the rod cell, causing it to release the neurotransmitter glutamate, which excites bipolar cells
(C) hyperpolarizes the rod cell, reducing its release of glutamate, which excites some bipolarcells and inhibits others
(D) hyperpolarizes the rod cell, reducing its release of glutamate, which excites amacrine cells but inhibits horizontal cells
(E) converts cGMP to GMP, opening sodium channels and hyperpolarizing the membrane, causing the rhodopsin to become bleached

(D) 52. The transduction of sound waves to action potentials takes place _____.
(A) within the tectorial membrane as it is stimulated by the hair cells
(B) when hair cells are bent against the tectorial membrane, causing them to depolarized and release neurotransmitter molecules that stimulate sensory neurons
(C) as the basilar membrane becomes more and depolarizes, initiating an action potential in a sensory neuron
(D) as the basilar membrane vibrates at different frequencies in response to the varying volume of sounds
(E) within the middle ear as the vibrations are amplified by the malleus, incus, and stapes

(C) 53. Which one of the following hormones could raise the level of basal metabolic rate (BMR)?
(A) Calcitonin (B) Thyrocalcitonin (C) Triiodothyronine
(D) Dexamethasone (E) Parathyroid hormone

(E) 54. Which of the following amino acid and the derivative is **not** proved to be a neurotransmitter?
(A) Glycine (B) Glutamic acid (C) Aspartic acid
(D) Gamma-aminobutyric acid (E) Histamine

(B) 55. Which of the following chemicals from plants has been using as an indicator to measure the glomerular filtration rate (GFR) in clinical, because it cannot be re-absorbed and secreted in nephron tubules.
(A) Creatinin (B) Inulin (C) Digitalis
(D) Colchicine (E) Alkaloids

(B) 56. Which of the following statements is **true**?
(A) In Crassulacean acid metabolism (CAM) plants, carbon fixation and the Calvin cycle occur in the same cells at different times. The Calvin cycle of CAM plants occurs during the night, so that the Calvin cycle is also named the dark reaction.
(B) Pineapples are CAM plants.
(C) For C_4 plants, the Calvin cycle is mainly carried out in the mesophyll cells.
(D) C_3 plants are more resistant to drought than C_4 plants.
(E) Photorespiration occurs when stomata of C_3 plants are fully open during the day.

(D) 57. Which of the following traits is shared by charophytes and land plants?
(A) Alternation of generations
(B) Walled spores produced in sporangia
(C) Multicellular gametangia
(D) Formation of phragmoplast
(E) Apical meristems

(D) 58. Which of the following statements for characteristics of monocots and eudicots is **not** true?
(A) Veins of monocots are usually parallel; veins of eudicots are usually netlike.
(B) Stem vascular tissues of monocots are usually scattered; stem vascular tissues of eudicots are usually arranged in ring.
(C) The root system of monocots are usually fibrous (no main root); taproots are usually present in the root system of eudicots.
(D) There are three openings on every pollen grain of monocots; there is one opening on every pollen grain of eudicots.
(E) Floral organs of monocots are usually in multiples of three; floral organs of eudicots are usually in multiples of four or five.

(B) 59. In the process of double fertilization, one sperm nucleus undergoes fusion with the egg nucleus and the other with the _____nuclei.
(A) integument (B) polar (C) endosperm
(D) funiculus (E) nucellus

(D) 60. Which of the following statements for cellular respiration and photorespiration is **false**?
(A) Both of these two reactions consume O_2.
(B) CO_2 is among the final products of these two reactions.
(C) Adenosine triphosphates (ATPs) are consumed in the processes of these two reactions.
(D) ATP is among the final products of these two reactions.
(E) All vascular plants are able to conduct cellular respiration, while photorespiration mainly happen to C_3 plants.

學士後西醫生物解答

曾正解

1. 題目指出長日照植物(亦即短夜植物)臨界夜長為10小時，故黑暗長於10小時者不會開花，故(B)為正確

總復習(二)回，P.0.8上課補充

2 受到地理隔離阻礙意指物種難通過地理分界(陸域或水域阻隔)，故本題之最佳候選物種為陸生蝸牛，其物種可藉飛行或洋流通過

總復習(一)回，P.19

3. 脊椎動物在陸生環境成功之主要因素為羊膜卵的演化，可防止胚胎之乾涸

總復習(一)回，P.6

4. 減數分裂前期I時
(1) 同源染色体配对(各個同源染色体存由二條姐妹染色分体組成
(2) 聯會發生
(3) 交叉便出現

選項(C)為錯誤：各條染色体存由四股DNA組成
總復習(一)回，P14

5. 控之維管系統的內皮层有卡氏帶(Casparian Strip)－是种对水及溶解物质無法通透的蠟性物质
總復習(一)回，P9.8上課補充

6. 葉綠素最佳吸收光線為紅光及紫-藍光
總復習(一)回，P12

7. 人類多精發生在輸卵管，精子形成在核心体溫下是不利進行的，精子形成早期是好於曲細精管管壁，LH刺激Leydig cells產生睪丸酮
總復習(一)回，P61

8. 植物組織 "cutting" 用於無性生殖，其中施加生長素(auxin)有助於發根(rooting)

總複習(一)回，P43

9. 利用叉線法計算

$\frac{1}{2}TT \times Ee \times$ ↖ $\frac{1}{4}CC = \frac{1}{8}TTEeCC$ (V)
$\frac{1}{2}Cc = \frac{1}{4}TTEeCc$ (V)
$\frac{1}{4}cc = \frac{1}{8}TTEecc$

$\frac{1}{2}Tt \times Ee \times$ ↖ $\frac{1}{4}CC = \frac{1}{8}TtEeCC$ (V)
$\frac{1}{2}Cc = \frac{1}{4}TtEeCc$ (V)
$\frac{1}{4}cc = \frac{1}{8}TtEecc$

$\therefore$ 親代 TTEECc 表型相同計有：$\frac{1}{8}+\frac{1}{4}+\frac{1}{8}+\frac{1}{4} = \frac{3}{4}$

總複習(一)回，P14

10. 某种 Homeotic gene 的 product - Hox gene
提供动物肢的的位置讯息，因此涉及了
压演化，故合理推测该基因突变
导致体部的空间细胞未发生改变
而造成上述脊椎动物 limb bud 的变化

總復習(一)回. P44

11. prothrombin → thrombin 才会造成 fibrinogen →
fibrin，血液凝固涉及血小板，而右病病人
的凝血机制失常(因於之凝血因子). fibrinogen →
fibrin 並未涉及凝血因子参与.(而在 fibrin polymer
→ cross-linked fibrin ~~polymer~~ polymer 需 XIII 因子参与.)

總復習(一)回，P32，上课補充

12 作为 APC，且作为 MHC II 中介免疫反应
的 "trigger" 在各选项中仅有巨噬体符合

總復習(一)回. P35.

13. 不屬於內膜系統的細胞在本題中只有 mitochondria 符合

總複習(一)回，P5

14. 人體節律的呼吸中樞為延腦（medulla）

總複習(一)回，P39

15. 按題意，會以寄生在主植物為合作用產物為寄生植物（parasitic plants），而附生植物（epiphytes）則會自行行使光合作用，故正確選項為 E，而 halophytes（鹽土植物）及 carnivorous plant（食肉植物）未不屬注意題目所指的範圍

總複習(二)回，P108

二. 命題比重

範圍	題號
1. 基礎生物化學	
2 細胞學	13
3. 生物統計學	6. 56. 60
4. 細胞遺傳學	4
5 古典遺傳學	9
6 分子生物學	
7. 動物生理學	3. 7. 11. 12. 14, 33. 34. 37. 38. 39. 40. 41. 42. 43. 44. 45. 49. 50. 51. 52. 53. 54. 55
8. 重組DNA技術、醫生遺傳學	

9. 演化論 2.10.31.35.46

10. 生態学

11. 生物分類学(含植物生理学) 1.5.8.15.32.36.47.48.57.58.59.

12. 行為学

二. 命題評析

1. 本年度的学士後西醫的生物学試題，真是大改造，題目簡易，而且考點全部集中於幾個重點

2. 與往年的重点面向有所差異，顯然是出題教授的專長便所致

3. 許多分子級的題目未出現在考題中，課外題也幾乎沒有

4. 整份試卷除了幾題答案公佈有誤之外，另外大部份的題意尚好，不致於引起答題爭議。

5. 全部試題均在老師的教材中可以舉出，甚至於教材的例題一模一樣。

6. 本班優秀同學可獲高分，以生物綜分來計算，可九千百時所有題目，中等生亦可拿到近9成的分數

7. 今年的生物試題應該會很多同學可以提早交卷