

高雄醫學大學 103 學年度學士後醫學系招生考試試題

科目：普通生物學

考試時間：80 分鐘

說明：一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。  
二、試題及答案卡必須繳回，不得攜出試場。

I. 【單選題】1-60 題，每題 1 分，共計 60 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。

- An unicellular eukaryote with a siliceous shell and heterotrophic nutrition should belong to \_\_\_\_\_.  
(A) dinoflagellate (B) brown algae (C) amoeba  
(D) foraminiferan (E) radiolarian
- The first stable intermediate produced in the Krebs cycle is \_\_\_\_\_.  
(A) pyruvate (B) FAD (C) acetyl CoA  
(D) citrate (E) oxaloacetate
- The tissue makes up most of the wood of a tree is \_\_\_\_\_.  
(A) primary xylem (B) secondary xylem (C) primary phloem  
(D) secondary phloem (E) cork
- A plant produces a guard cell hormone under water-deficit conditions. Most likely the hormone is \_\_\_\_\_.  
(A) 2, 4-D (B) gibberellin (C) IAA  
(D) abscisic acid (E) ethylene
- Which of the following levels of organization is arranged in the correct sequence from most to least inclusive?  
(A) community, ecosystem, individual, population.  
(B) ecosystem, community, population, individual.  
(C) population, ecosystem, individual, community.  
(D) individual, population, community, ecosystem.  
(E) community, individual, population, ecosystem.
- Which of these is NOT considered an amniote?  
(A) amphibians (B) reptiles (C) avians  
(D) mammals (E) all of the above
- The number of legs an insect has, and the number of vertebrae in a vertebral column are all strongly influenced by \_\_\_\_\_ genes.  
(A) haploid (B) introns within (C) heterotic  
(D) Hox (E) SRY
- Lichens are symbiotic associations of fungi and \_\_\_\_\_.  
(A) mosses (B) cyanobacteria+ mosses (C) green algae+ mosses  
(D) cyanobacteria+ green algae (E) all of the above
- What are the sporangia of bread molds?  
(A) asexual structures that produce haploid spores  
(B) asexual structures that produce diploid spores  
(C) sexual structures that produce haploid spores  
(D) sexual structures that produce diploid spores  
(E) asexual structures that produce sporophytes
- A valid clade must be \_\_\_\_\_.  
(A) monophyletic (B) convergent (C) paraphyletic  
(D) polyphyletic (E) divergent
- An African butterfly species exists in two strikingly different color patterns. This is an example of \_\_\_\_\_.  
(A) directional selection (B) stabilizing selection (C) disruptive selection  
(D) sexual selection (E) linkage disequilibrium
- Gene flow is a concept best used to describe an exchange between \_\_\_\_\_.  
(A) species (B) males and females (C) populations  
(D) individuals (E) habitats

13. Optimal foraging as a form of efficient behavior would be favored by \_\_\_\_\_.  
 (A) mutualism (B) transduction (C) energy expended  
 (D) natural selection (E) none of these choices are correct
14. Why might unrelated individuals engage in altruistic acts?  
 (A) They are trying to mate with each other.  
 (B) It is possible they may mate with each other.  
 (C) The altruism is likely to be reciprocated.  
 (D) Individuals are part of the same large flock.  
 (E) None of these choices are correct.
15. The idea that humans have a love of life or living systems, coined by E.O. Wilson, is known as \_\_\_\_\_.  
 (A) biodiversity (B) the call of the wild (C) the last of the wild  
 (D) biophilia (E) biotheology
16. Which of the followings is a characteristic of species which occur in the early stages of succession?  
 (A) Poor seed dispersal  
 (B) High photosynthetic efficiency in low light  
 (C) Low resource acquisition  
 (D) K-selected  
 (E) Long seed longevity
17. In island biogeography compared to smaller islands, larger islands support \_\_\_\_\_ species.  
 (A) more (B) fewer (C) bigger-size  
 (D) the same (E) smaller
18. How are species-area relationships traditionally plotted?  
 (A) On a bar graph (B) On a log-log plot (C) On a semi-log plot  
 (D) As a regular graph (E) As a pie chart
19. Which of the following properties of a river is the closest to the headwaters?  
 (A) Channel depth (B) Mean flow velocity (C) Bed material grain size  
 (D) Stream discharge volume (E) Volume of stored alluvium
20. If primary production increases in an ecosystem, it would be reasonable to expect that \_\_\_\_\_.  
 (A) nutrients are a limiting factor  
 (B) gross production would not increase  
 (C) cellular respiration would decrease  
 (D) the food web has become more complex  
 (E) the biomass of herbivores would increase
21. If a forested area surrounding a stream is cleared of trees, what might happen?  
 (A) Increased import of nutrients to the soil  
 (B) Decreased rates of soil and rock weathering  
 (C) Increased run-off of water  
 (D) Decreased rates of chemical leaching  
 (E) Increased denitrification
22. Darwin's main conclusions about the origin of species were \_\_\_\_\_.  
 (A) all organisms are descended with modification from common ancestors  
 (B) the mechanism for evolution was natural selection  
 (C) inheritance is generally particulate  
 (D) A and B  
 (E) B and C
23. The Hardy-Weinberg equation states that  $p^2 + 2pq + q^2 = 1$ ; the genotype frequency of heterozygotes is represented by \_\_\_\_\_.  
 (A)  $p^2$  (B)  $2pq$  (C)  $q^2$   
 (D)  $p^2 + q^2$  (E)  $p^2 + 2pq$
24. Populations are best defined as \_\_\_\_\_.  
 (A) all members of a species  
 (B) all organisms found in an environment  
 (C) families  
 (D) metacommunities  
 (E) groups of interbreeding individuals
25. Which is **NOT** a feature of habitat destruction?  
 (A) swamp drainage (B) deforestation (C) strip mining  
 (D) overharvesting (E) river channelization

26. Hamilton's Rule is a calculation of the strength in a population of \_\_\_\_\_.  
 (A) sexual selection (B) group selection (C) natural selection  
 (D) genetic relatedness (E) kin selection
27. What is a major consequence for plants and animals if current predictions of global warming are accurate?  
 (A) Rates of natural selection will increase at the same pace.  
 (B) New continental land masses will appear.  
 (C) Water will be more widely available for plants and animals.  
 (D) Anticipated changes in climate will occur faster than many organisms can move or adapt.  
 (E) Many plants and animals will become smaller.
28. Which type of plants keeps their stomata open at night, but closed in the day?  
 (A) C<sub>3</sub> (B) C<sub>4</sub> (C) CAM  
 (D) C<sub>3</sub> and C<sub>4</sub> (E) C<sub>4</sub> and CAM
29. If  $x$  is the extinction rate of populations in patches per unit time and  $m$  is the rate of movement between patches, then, according to Richard Leurs, the proportion of occupied patches in a metapopulation will stabilize over time to \_\_\_\_\_.  
 (A)  $x/m$  (B)  $1 + (x/m)$  (C)  $1 - (x/m)$   
 (D)  $1/(x/m)$  (E)  $(1+x)/m$
30. Allelopathy is \_\_\_\_\_.  
 (A) interference competition  
 (B) the secretion of toxins into the environment by plant roots  
 (C) intraspecific competition  
 (D) the transmission of viruses from deer to rabbits  
 (E) the death of one species from diseases transferred from a second species
31. What is NOT a hypothesis to explain why seed dispersal is so advantageous to plants?  
 (A) Competition avoidance (B) Predator escape (C) Colonization  
 (D) Indirect dispersal (E) Directed dispersal
32. If fertilization occurs, the hormone\_\_\_\_, which mimics the hormone \_\_\_\_\_, is produced by the\_\_\_\_\_.  
 (A) prolactin, estradiol, anterior pituitary  
 (B) oxytocin, estradiol, anterior pituitary  
 (C) inhibin, progesterone, uterus  
 (D) hCG, FSH, uterus  
 (E) hCG, LH, placenta
33. Which of the following statements concerning excretory system is **FALSE**?  
 (A) Urea can be processed by filtration, reabsorption, and secretion during the process of urine formation.  
 (B) Kidney contributes pH balance in body fluid.  
 (C) Ascend limb of the loop of Henle is the site for reabsorption of water.  
 (D) Proximal tubule is the major site for reabsorption of nutrients.  
 (E) The final concentration of the urine is determined in the collecting duct.
34. The plant hormone that inhibits growth and promotes leaf senescence is \_\_\_\_\_.  
 (A) abscisic acid (B) auxin (C) cytokinin  
 (D) gibberellin (E) strigolactone
35. Which of the following elements is **NOT** macronutrients for plants?  
 (A) potassium (B) phosphorus (C) calcium  
 (D) manganese (E) sulfur
36. Pores on the leaf surface that function in gas exchange are called \_\_\_\_\_.  
 (A) xylem cells (B) stomata (C) phloem cells  
 (D) cuticle (E) upper epidermis
37. The cells which allow us to distinguish different colors are \_\_\_\_\_.  
 (A) cones (B) rods (C) both cones and rods  
 (D) only certain rods (E) none of the above
38. Which function is **NOT** controlled by parasympathetic nervous system?  
 (A) stimulates salivary gland secretion  
 (B) stimulates activity of pancreas  
 (C) stimulates gallbladder  
 (D) stimulates adrenal medulla  
 (E) stimulate activity of intestine

39. The particular sequence in the template strand of DNA is 5' AGTAAT 3'. The corresponding sequence for the mRNA transcribed is \_\_\_\_\_.  
 (A) 3' AUUACU 5' (B) 3' UGAUUA 5' (C) 3' AGUAAU 5'  
 (D) 3' UAAUGA 5' (E) 3' UCAUUA 5'
40. At which phase is centrioles beginning to duplicate in animal cells?  
 (A) interphase (B) prophase (C) metaphase  
 (D) anaphase (E) telophase
41. During strenuous exercise, lactic acid is produced by human muscles because of an insufficiency of \_\_\_\_\_.  
 (A) NADH (B) NAD (C) ADP  
 (D) oxygen (E) glucose
42. In \_\_\_\_\_, a cell engulfs a particle by wrapping pseudopodia.  
 (A) receptor-mediated endocytosis (B) phagocytosis (C) pinocytosis  
 (D) exocytosis (E) osmosis
43. If one parent has the blood genotype A<sub>i</sub> and the other parent has the blood genotype B<sub>i</sub>, what (is, are) all the possible blood type(s) of their children?  
 (A) A, O (B) B, O (C) A, B  
 (D) A, B, O (E) A, B, AB, O
44. The emigration or immigration of fertile individuals from or to a small population may alter the gene pool of the population. This example of a change in allele frequency is best characterized as \_\_\_\_\_.  
 (A) natural selection (B) population bottleneck (C) founder effect  
 (D) gene flow (E) convergent evolution
45. Which of the following structures does **NOT** develop from ectoderm of vertebrates?  
 (A) epidermis of skin (B) nervous system (C) adrenal cortex  
 (D) teeth (E) germ cells
46. A given bird has 24 chromosomes in its body cells. How many chromatids will be present in each prospective gamete cell during metaphase II of meiosis?  
 (A) 6 (B) 12 (C) 24  
 (D) 48 (E) 96
47. Which of the followings is **NOT** a neurotransmitter?  
 (A) nitric oxide (B) substance P (C) cAMP  
 (D) serotonin (E) carbon monoxide
48. Renin is a(n) \_\_\_\_\_. Its secretion is stimulated by \_\_\_\_\_.  
 (A) hormone, high osmolality  
 (B) hormone, low blood pressure  
 (C) hormone, low pH  
 (D) enzyme, high osmolality  
 (E) enzyme, low blood pressure
49. Carbon dioxide is transported in the blood \_\_\_\_\_.  
 (A) dissolved in the plasma (B) attachment to hemoglobin (C) as bicarbonate ion  
 (D) both A and C (E) all of A, B, and C
50. During photosynthesis, carbon dioxide is incorporated into glucose in \_\_\_\_\_.; water is broken down and oxygen gas produced in \_\_\_\_\_.  
 (A) photosystem I; photosystem II (B) Calvin cycle; photosystem II (C) photosystem II; Calvin cycle  
 (D) Calvin cycle; photosystem I (E) photosystem I; Calvin cycle
51. A nitrogen-containing carbohydrate is \_\_\_\_\_.  
 (A) chitin (B) glucose (C) starch  
 (D) cellulose (E) glycogen
52. Which method **CANNOT** detect the gene expression levels?  
 (A) Northern blotting (B) RT-PCR (C) DNA microarray assay  
 (D) *in situ* hybridization (E) SNP
53. In eukaryotic cell, a mature mRNA does **NOT** contain \_\_\_\_\_.  
 (A) promoter (B) 5' CAP (C) 5' UTR  
 (D) 3' UTR (E) poly-A tail

54. Which of the following statements about human immunodeficiency virus (HIV) is **FALSE**?
- (A) HIV is double-stranded RNA virus.
  - (B) HIV is equipped with reverse transcriptase.
  - (C) It can infect T lymphocytes and cause AIDS.
  - (D) Its genome serves as template for DNA synthesis and the newly made viral DNA can integrate into the host's chromosome as provirus.
  - (E) The host's RNA polymerase transcribes the proviral DNA into mRNAs and viral genomes.
55. Which of the following statements concerning "genomic imprinting" is **FALSE**?
- (A) It is an exception to standard Mendelian inheritance.
  - (B) In many cases, methylation of cytosine involves in genomic imprint during embryo formation.
  - (C) A given allele will have different effect that depends on father or mother passed along the allele.
  - (D) Most of the known imprinted genes are critical for embryonic development in mammal.
  - (E) In heterozygous of normal and recessive mutant *Igf2* gene, the dwarf phenotype can be seen.
56. Which statement about DNA replication is true?
- (A) Helicase breaks, swivels, and rejoins the parental DNA.
  - (B) Topoisomerase unwinds and separates the parental DNA strands.
  - (C) Primase synthesizes DNA primers, using the parental DNA as a template.
  - (D) In *E. coli*, DNA polymerase I and II are the main enzymes in synthesis of new DNA.
  - (E) Okazaki fragments are found both in *E. coli* and eukaryotes.
57. Which of the followings is an extending Mendelian genetics for two or more genes?
- (A) pleiotropy
  - (B) epistasis
  - (C) multiple alleles
  - (D) incomplete dominance
  - (E) codominance
58. If there are 24 chromatids in a mammalian skin cell, how many kinetochores are there?
- (A) 6
  - (B) 12
  - (C) 24
  - (D) 36
  - (E) 48
59. Which of the following statements concerning mitochondria are correct, **EXCEPT** \_\_\_\_\_.
- (A) mitochondrion is a double membrane organelle
  - (B) both pyruvate oxidation and Krebs cycle are carried out in mitochondria matrix
  - (C) chemiosmosis can promote ATP hydrolysis
  - (D) most mitochondria genes are maternal inheritance in human
  - (E) leber's hereditary optic neuropathy is a mitochondria disorder
60. The bundle branches and Purkinje fibers conduct impulses from the\_\_\_\_\_.
- (A) AV node to the ventricles
  - (B) AV node to the SA node
  - (C) SA node to the atria
  - (D) SA node to the AV node
  - (E) atria to the SA node

II. 【單選題】 61-80 題，每題 2 分，共計 40 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。

61. Which of the following statements is **FALSE**?
- (A) The presence of scaffolding proteins can increase the efficiency of signal transduction.
  - (B) Enzyme cascades amplify the cell's response to a signal.
  - (C) Inositol triphosphate and diacylglycerol are produced by phospholipase A cleavage of certain kind of phospholipid.
  - (D) Phosphodiesterase converting cAMP to AMP is one of the ways to terminate the signal.
  - (E) The activation of cell surface receptors of growth factors may regulate the activity of a specific gene.
62. Regarding photosynthesis, which statement is **INCORRECT**?
- (A) Light-harvesting complex may consist of chlorophyll *a*, chlorophyll *b* and carotenoids.
  - (B) RuBp carboxylase-oxygenase is thought to be the most abundant protein on Earth.
  - (C) In  $C_4$  pathway, PEP carboxylase promotes  $CO_2$  to be added to malate.
  - (D) Sugarcane is a kind of  $C_4$  plant.
  - (E)  $C_4$  plants contain  $C_4$  and  $C_3$  pathways.
63. In a dark environment, plants will grow toward light in a response called phototropism. Which of the followings is an **INCORRECT** statement regarding phototropism?
- (A) Phototropism is caused by a chemical signal.
  - (B) One chemical involved is auxin.
  - (C) Auxin causes an increase in growth on one side of the stem.
  - (D) Auxin causes a decrease in growth on the side of the stem exposed to light.
  - (E) Removing the apical meristem prevents phototropism.

64. The result of double fertilization in angiosperms leads to \_\_\_\_\_.  
 (A) formation of both a diploid embryo and triploid endosperm  
 (B) the endosperm developing into a diploid nutrient tissue  
 (C) formation of a triploid zygote  
 (D) two embryos in every seed  
 (E) the fertilized antipodal cells developing into the seed coat
65. Which type of biome would most likely occur in a climate with mild, rainy winters and hot, dry summers?  
 (A) desert (B) taiga (C) temperate grassland  
 (D) temperate broadleaf forest (E) chaparral
66. Which statement is **FALSE**?  
 (A) Succession is predictable.  
 (B) Pioneer species have wide ranges of tolerances.  
 (C) Pioneer plant species are usually small annuals with an abundance of easily dispersed seeds.  
 (D) The succession that occurs in an abandoned field is primary succession.  
 (E) Climax species are those that are best adapted to the specific climate where the succession occurs.
67. Which of the followings is a trend in the evolution of land plants?  
 (A) Decrease in the size of the leaf  
 (B) Reduction of the gametophyte phase of the life cycle  
 (C) Elimination of sperm cells or sperm nuclei  
 (D) Increasing reliance on water to bring sperm and egg together  
 (E) Increasing spore size
68. Prokaryotic organisms have recently been divided into two domains, Bacteria and Archaea. This division is based on characteristics such as \_\_\_\_\_.  
 (A) circular genome  
 (B) no nucleus or membrane-bound organelles  
 (C) presence or absence of histones  
 (D) no introns  
 (E) all of the above
69. Assuming complete dominance, crosses between two dihybrid F1 plants, which are offspring from a cross AABB x aabb, result in F2 phenotype ratios of \_\_\_\_\_.  
 (A) 1:2:1 (B) 3:1 (C) 1:1:1:1  
 (D) 9:3:3:1 (E) 9:1
70. Inbreeding and small population size of a threatened species can combine to form a downward spiral for the species known as a(n) \_\_\_\_\_.  
 (A) extinction vortex  
 (B) random change of allele frequencies attributable to chance  
 (C) random mutation  
 (D) accelerated evolution of new traits  
 (E) none of the possibilities are correct
71. Which is **NOT** a recognized hypothesis to account for the strong competitive ability of invasives?  
 (A) Enemy release  
 (B) Superior competition  
 (C) Lack of environmental constraints  
 (D) Propagule pressure  
 (E) Climate pre-adaptation
72. If a community exhibits lognormal rank abundance, we may conclude there are \_\_\_\_\_.  
 (A) a large number of rare species, a large number of common species, and a few species of intermediate rank  
 (B) a few rare species, a few common species, and a large number of species of intermediate rank  
 (C) a few rare species and a large number of very common species  
 (D) a few common species and a large number of rare species  
 (E) rare species are very common
73. A new menstrual cycle begins with the production of \_\_\_\_\_, following the removal of inhibition by combination of \_\_\_\_\_.  
 (A) GnRH, FSH and LH  
 (B) GnRH, estradiol and progesterone  
 (C) LH, estradiol and progesterone  
 (D) estradiol, FSH and LH  
 (E) estradiol, GnRH and LH

74. Which of the followings is **NOT** true of G protein-coupled receptors (GPCRs)?  
 (A) GPCRs are cell-surface transmembrane receptors that work with the help of monomer G proteins.  
 (B) GPCRs have similar structure in which a single polypeptide has seven transmembrane helices.  
 (C) Epinephrine can target the same type of GPCR in liver cell and skeletal muscle blood vessel.  
 (D) G protein systems are involved in cholera and pertussis diseases.  
 (E) G protein functions as a molecular switch that is either on or off depending on GTP or GDP is attached.
75. Which of the following statements about genome is **FALSE**?  
 (A) Usually, the gene density of archaea genome is higher than eukaryotes.  
 (B) Usually, the number of genes of archaea genome is more than eukaryotes genome.  
 (C) The genome size of archaea is less than eukaryotes.  
 (D) The number of genes of fruit fly genome is less than *Arabidopsis thaliana* genome.  
 (E) The number of genes of fruit fly genome is less than *C. elegans* genome.
76. Which of the following statements concerning human embryonic development is correct?  
 (A) Inner cell mass is a group of cells that cluster at one end of the gastrula.  
 (B) The trophoblast, the outer epithelium of the gastrula, supports embryo growth.  
 (C) The trophoblast continues to expand into the endometrium, and four new extraembryonic membranes appear.  
 (D) By the end of blastocyst, three embryonic germ layers have formed.  
 (E) By the end of gastrulation, the extraembryonic ectoderm and extraembryonic membranes surround the embryo.
77. Which of the following descriptions about muscle and skeletal system is **NOT** true?  
 (A) The strength of a muscular contraction is determined by the number of neurons delivering action potentials.  
 (B) Skeletal, cardiac, and smooth muscle all have transverse tubules.  
 (C) A hydrostatic skeleton consists of fluid held under pressure in a closed body compartment.  
 (D) Gap junctions provide direct electrical coupling between the cardiac muscle cells.  
 (E) Calcium ions cause smooth muscle contraction by binding to calmodulin.
78. The correct sequence of the cardiac cycle in a healthy adult human is \_\_\_\_\_.  
 (1. atrial systole and ventricular diastole 2. ventricular systole and atrial diastole 3. atrial and ventricular systole 4.atrial and ventricular diastole)  
 (A) 1 → 3 → 2 (B) 4 → 1 → 2 (C) 4 → 2 → 1  
 (D) 2 → 4 → 3 (E) 1 → 4 → 3
79. Which of the following statements concerning hormonal control of digestion is **FALSE**?  
 (A) Secretin stimulates the pancreas to release bicarbonate.  
 (B) Cholecystokinin (CCK) stimulates the release of digestive enzymes form the pancreas and of bile from the gallbladder.  
 (C) Both secretin and CCK act on the stomach to promote secretion of gastric juices.  
 (D) Secretin and CCK are released from duodenum.  
 (E) Gastrin is released from stomach and regulates production of gastric juices.
80. Which of the following statements concerning regulation of eukaryotic gene expression is **FALSE**?  
 (A) DNA methylation can activate or inactivate gene expression.  
 (B) Acetylation of histone tails promotes condensation of the chromatin.  
 (C) Enhancers are segments of DNA that may be within an intron.  
 (D) Unlike operons in *E. coli*, dispersed genes can be coordinately controlled by transcription activators or repressors in eukaryotes.  
 (E) Alternative RNA splicing can produce different mRNA molecules from the same primary transcript.