高雄醫學大學九十九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】1-50 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。

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

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 microsattelites 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

3. What control the heart rate?
(A) medulla oblongata (B) neocortex (C) pituitary (D) cerebellum (E) thalamus

4. What is the logical treatment to make a seed break dormancy?
(A) IAA (B) CO_2 (C) DTT (D) gibberellins (E) ascorbic acid

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

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.

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%

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

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

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

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

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

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

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 magnitute with space or time
(E) it is transmembrane potential changes that occur in most axons

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

16. Which of the following hormone secreted from hypothalamus?
(A) thyrotropin releasing hormone (B) oxytocin (C) luteinizing hormone
(D) glucagon (E) glucocorticoids

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

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

19. Where do you find the cells undergo meiosis in plants?
(A) shoot apical meristem (B) pollens (C) embryo sacs (D) corolla
(E) ovule

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

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 ouput.
(D) May be caused by kidney dysfunction.
(E) Can be treated with diuretic drug.

22. Which of the following is peptide hormone?
(A) thyroxin (B) epinephrine (C) antidiuretic hormone (D) progesterone
(E) cortisone

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

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.

25. Which of the following RNAs works in RNA splicing?
(A) rRNA (B) tRNA (C) snRNA (D) miRNA (E) mRNA

26. _____ is **NOT** a second messenger.
(A) Ca^{2+} (B) Nitric oxide (C) Phosphatidylinositol 4, 5-bisphosphate (D) Sphingomyelin
(E) ATP

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.

28. Which of the following functional groups participate in chromatin-mediated gene expression?
(A) OH (B) COOH (C) CH_3 (D) NH_2 (E) CO

29. The eukaryotic DNA replication does **NOT** contain
(A) ligase (B) DNA polymerase (C) helicase (D) topoisomerase (E) gyrase

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.

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.

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

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.

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.

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

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

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.

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

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

40. Which of the following is (are) the mechanism(s) of epigenetic varivations?
(A) histone acetylation (B) single nucleotide substitution (C) DNA methylation
(D) both A and C (E) all of A, B, and C

41. The process by which unrelated organisms with similar environment demands evolve superficially similar structures is
(A) natural selection (B) homologous (C) convergent evolution
(D) comparative anatomy (E) adaptation

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%

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

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

45. Which of the following vitamins is **incorrectly** associated with its use?
(A) vitamin B2: component of coenzymes NAD^+ and $NADP^+$
(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

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 (C) ecosystem ecology (D) landscape ecology (E) global ecology

47. What is the target organ for thyrotropin-releasing hormone?
(A) hypothalamus (B) anterior pituitary (C) posterior pituitary (D) thyroid (E) liver

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

49. Phosphatidylinositol 4,5-bisphosphate (PIP_2) is cleaved by phospholipase C into
(A) 1,2-diacylglycerol (DAG) (B) phosphatidylinositol (PI)
(C) inositol 1,4,5-trisphosphate (IP_3) (D) A and C (E) B and C

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。

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.

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

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

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_2.
(D) Sunlight is a type of electromagnetic energy.
(E) Chlorophyll *a* reflects green light.

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_2 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_2 concentration.

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.

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) gylcoproteins
(E) phosphopeptides

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.

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

60. Animals release their nitrogenous waste in different forms. Which of the following statements are true ?
①Urea is excreted by many marine fishes.
②Ammonia is so toxic that it is rarely excreted as nitrogenous waste by any animals.
③The animals in dry environment could excrete uric acid.
④The form of nitrogenous waste is often an adaptation to animal habitats.
(A) ①②③④ (B) ①② (C) ①②④ (D) ②④ (E) ①③④

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

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%

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.

64. Which of the following statements regarding inheritance is ***FALSE***?
(A) “Ture-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.

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

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

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.

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

69. Which of these sequences correctly describes the cell cycle?
(A) G_1, G_2, S, prophase, metaphase, anaphase, telophase
(B) G_1, G_2, S, prophase, metaphase, telophase, anaphase
(C) S, G_2, prophase, metaphase, anaphase, telophase, G_1
(D) G_1, S, G_2, metaphase, prophase, anaphase, telophase
(E) G_2, S, prophase, metaphase, anaphase, telophase, G_1

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.

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

72. In the absence of recombination, what ratio of phenotypes is expected in the progeny of the cross aB/Ab × 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

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

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.

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