

高雄醫學大學 101 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. Most of the neurons in the human brain are _____.
(A) sensory neurons (B) motor neurons (C) interneurons (D) auditory neurons (E) olfactory neurons
2. Contact of a sperm with signal molecules in the coat of an egg causes the sperm to undergo _____.
(A) mitosis (B) depolarization (C) apoptosis (D) vitellogenesis
(E) the acrosomal reaction
3. Only certain cells in the body are target cells for the steroid hormone aldosterone. Which of the following is the best explanation for why these are the only cells that respond to this hormone?
(A) Only target cells are exposed to aldosterone.
(B) Only target cells contain receptors for aldosterone.
(C) Aldosterone is unable to enter nontarget cells.
(D) Nontarget cells destroy aldosterone before it can produce its effect.
(E) Nontarget cells convert aldosterone to a hormone to which they do respond.
4. Which of the following is a local regulator responsible for activating an enzyme that relaxes smooth muscle cells?
(A) nitric oxide (B) prostaglandin F (C) epinephrine (D) A and B (E) A, B, and C
5. If a newborn were accidentally given a drug that destroyed the thymus, what would most likely happen?
(A) His cells would lack class I MHC molecules on their surface.
(B) His humoral immunity would be missing.
(C) Genetic rearrangement of antigen receptors would not occur.
(D) His T cells would not mature and differentiate appropriately.
(E) His B cells would be reduced in number and antibodies would not form.
6. A specialized function shared by the many cells lining the lungs and the lumen of the gut is _____.
(A) decreased oxygen demand due to the lack of oxygen in foods
(B) increased exchange surface provided by their membranes
(C) greater numbers of cell organelles contained within their cytoplasm
(D) greater protection due to increased cellular mass
(E) lowered basal metabolic rate due to cooperation between cells
7. What is proteomics?
(A) the linkage of each gene to a particular protein
(B) the study of the full protein set encoded by a genome
(C) the totality of the functional possibilities of a single protein
(D) the study of how amino acids are ordered in a protein
(E) the study of how a single gene activates many proteins
8. What is the difference between a linkage map and a physical map?
(A) For a linkage map, markers are spaced by recombination frequency, whereas for a physical map they are spaced by numbers of base pairs (bp).
(B) For a physical map, the ATCG order and sequence must be achieved, but not for the linkage map.
(C) For a linkage map, it is shown how each gene is linked to every other gene.
(D) For a physical map, the distances must be calculable in units such as nanometers.
(E) There is no difference between the two except in the type of pictorial representation.
9. What does transformation involve in bacteria?
(A) the creation of a strand of DNA from an RNA molecule
(B) the creation of a strand of RNA from a DNA molecule
(C) the infection of cells by a phage DNA molecule
(D) the type of semiconservative replication shown by DNA
(E) assimilation of external DNA into a cell

10. Males are more often affected by sex-linked traits than females because _____.
 (A) males are hemizygous for the X chromosome
 (B) male hormones such as testosterone often alter the effects of mutations on the X chromosome
 (C) female hormones such as estrogen often compensate for the effects of mutations on the X chromosome
 (D) X chromosomes in males generally have more mutations than X chromosomes in females
 (E) mutations on the Y chromosome often worsen the effects of X-linked mutations
11. Paracrine signaling _____.
 (A) involves secreting cells acting on nearby target cells by discharging a local regulator into the extracellular fluid
 (B) requires nerve cells to release a neurotransmitter into the synapse
 (C) occurs only in paracrine yeast cells
 (D) has been found in plants but not animals
 (E) involves mating factors attaching to target cells and causing production of new paracrine cells
12. Which of the following provides the best evidence of a biodiversity crisis?
 (A) the incursion of a non-native species. (B) increasing pollution levels.
 (C) decrease in regional productivity. (D) high rate of extinction. (E) climate change.
13. Which of the following is most likely to contribute to density-dependent regulation of populations?
 (A) the removal of toxic waste by decomposers (B) intraspecific competition for nutrients
 (C) earthquakes (D) floods (E) fires
14. Which of the following statements about the ocean pelagic biome is true?
 (A) The ocean is a vast, deep storehouse that always provides sustenance; it is the next "frontier" for feeding humanity.
 (B) Because it is so immense, the pelagic ocean biome is globally uniform.
 (C) Globally, more photosynthesis occurs in the ocean neritic biome than in the pelagic biome.
 (D) Pelagic ocean photosynthetic activity is disproportionately low in relation to the size of the biome.
 (E) The most abundant animals are vertebrate fishes.
15. A salmon returns to its home stream to spawn. What term best applies to this behavior?
 (A) sign stimulus (B) cognition (C) imprinting (D) classical conditioning
 (E) operant conditioning
16. Skeletal muscle contraction begins when calcium ions bind to _____.
 (A) energized cross-bridges (B) myosin (C) actin (D) tropomyosin
 (E) troponin
17. Short-term memory information processing usually causes changes in the _____.
 (A) brainstem (B) medulla (C) hypothalamus (D) hippocampus (E) cranial nerves
18. The blood-brain barrier _____.
 (A) is formed by tight junctions (B) is formed by oligodendrocytes
 (C) tightly regulates the intracellular environment of the CNS
 (D) uses chemical signals to communicate with the spinal cord
 (E) provides support to the brain tissue
19. An inhibitory postsynaptic potential (IPSP) occurs in a membrane made more permeable to _____.
 (A) potassium ions (B) sodium ions (C) calcium ions (D) ATP
 (E) all neurotransmitter molecules
20. From earliest to latest, the overall sequence of early development proceeds in which of the following sequences?
 (A) gastrulation → organogenesis → cleavage (B) ovulation → gastrulation → fertilization
 (C) cleavage → gastrulation → organogenesis (D) gastrulation → blastulation → neurulation
 (E) preformation → morphogenesis → neurulation
21. In humans, the follicular cells that remain behind in the ovary following ovulation become _____.
 (A) the ovarian endometrium that is shed at the time of the menses
 (B) a steroid-hormone synthesizing structure called the corpus luteum
 (C) the thickened portion of the uterine wall
 (D) swept into the fallopian tube
 (E) the placenta, which secretes cervical mucus
22. Oxytocin and antidiuretic hormone are synthesized in the _____.
 (A) hypothalamus (B) adenohypophysis (C) anterior pituitary (D) adrenal cortex (E) posterior pituitary
23. The cell-mediated immunity that destroys virally infected cells involves _____.
 (A) cytotoxic T cells (B) natural killer cells (C) helper T cells (D) macrophages (E) B cells

24. The Bohr shift on the oxygen-hemoglobin dissociation curve is produced by changes in _____.
 (A) the partial pressure of oxygen (B) the partial pressure of carbon monoxide
 (C) hemoglobin concentration (D) temperature (E) pH
25. Hypoglycemia, or low levels of glucose in the blood of a healthy human, is "corrected" by a(n) _____.
 (A) increase in the secretion of insulin
 (B) increase in the secretion of glucagon
 (C) increase in the secretion of both insulin and glucagon
 (D) decrease in the secretion of both insulin and glucagon
 (E) increase in the secretion of thyroid hormones
26. Standard metabolic rate (SMR) and basal metabolic rate (BMR) are _____.
 (A) used differently: SMR is measured during exercise, whereas BMR is measured at rest
 (B) used to compare metabolic rate between hibernating and nonhibernating states
 (C) both measured across a wide range of temperatures for a given species
 (D) both standard measurements of fat metabolism in mammals
 (E) both measured in animals in a resting and fasting state
27. The transduction pathway that activates systemic acquired resistance in plants is initially signaled by _____.
 (A) antisense RNA (B) Pfr phytochrome (C) salicylic acid (D) abscisic acid
 (E) red, but not far-red, light
28. The asexual production of seeds from a diploid cell, allow hybrid plants to pass on their desirable genomes intact to their offspring is called _____.
 (A) apomixis (B) dioecious (C) etiolation (D) phyllotaxy (E) statoliths
29. A flowering plant with a deleterious mutation in microsporogenesis would most likely _____.
 (A) fail to produce sepals (B) fail to produce petals
 (C) fail to produce anthers (D) fail to produce pollen
 (E) fail to produce ovules
30. In which vertebrates is fertilization exclusively internal?
 (A) chondrichthyans, osteichthyans, and mammals
 (B) amphibians, mammals, and reptiles
 (C) chondrichthyans, osteichthyans, and reptiles
 (D) reptiles and mammals
 (E) reptiles and amphibians
31. The term *homoplasy* is most applicable to which of the following features?
 (A) the legless condition found in various lineages of extant lizards
 (B) the five-digit condition of human hands and bat wings
 (C) the β hemoglobin genes of mice and of humans
 (D) the fur that covers Australian moles and North American moles
 (E) the bones of bat forelimbs and the bones of bird forelimbs
32. Telomerase is an enzyme can solve the problem of replication at the ends of linear chromosomes. How does it work?
 (A) Repetitive sections of DNA can range from a single nucleotide to hundreds of nucleotides. Three nucleotides of smaller is a microsatellite.
 (B) It adds 5' cap and 3' polyA on chromosome that resists degradation by nucleases.
 (C) It works like regular DNA polymerase (3'-5') except does not need DNA template strand to direct synthesis. Uses intrinsic RNA strand to synthesize GGGTTA sequence.
 (D) It causes specific double-strand DNA breaks and rejoins the blunt ends on both strands.
 (E) It adds numerous methylated GC pairs which resist hydrolysis and maintain chromosome integrity.
33. Taxol is an anticancer drug extracted from the bark of the Pacific yew tree. It disrupts microtubule formation by binding to microtubules and accelerating their assembly from tubulin. Taxol must affect _____.
 (A) the formation of the chromatid assembly (B) the anaphase of the cell cycle
 (C) the formation of the centrioles (D) the S phase of the cell cycle
 (E) the formation of the mitotic spindle
34. Which of the following statements about plant hormones differing from hormones in animals is correct?
 (A) Plant hormones are synthesized from two or more different molecules.
 (B) Animal hormones are primarily for mating and embryonic development.
 (C) Plant hormones interact primarily with intracellular receptors.
 (D) Animal hormones are found in much greater concentration.
 (E) Plant hormones may travel in air or through vascular systems.

35. Which of the following statements about photosynthesis is correct?
 (A) The splitting of water yields molecular carbon dioxide as a by-product.
 (B) The electron vacancies in P680⁺ are filled by electrons derived from water.
 (C) The ATP required for the Calvin cycle comes from reactions initiated in photosystem I.
 (D) Photosystem I passes electrons to the thylakoid membrane electron transport chain.
 (E) Cyclic electron flow also supplements the supply of ATP and NADPH.
36. Which of the following techniques uses the amino acid sequences of polypeptides to predict a protein's three-dimensional structure?
 (A) X-ray crystallography (B) two-dimensional electrophoresis
 (C) bioinformatics (D) gas chromatography mass spectrometry
 (E) NMR spectroscopy
37. Which one is the correct description of community ecology?
 (A) Testing both biotic and abiotic factors.
 (B) The study of interactions between organisms and their environment.
 (C) All members of a species in same habitat.
 (D) The study of how behavior contributes to the differential survival and reproduction of organisms.
 (E) Patterns of species change and succession.
38. In muscular-skeletal systems, which one is the correct description?
 (A) Arthropod exoskeletons are composed primarily of calcium carbonate.
 (B) A skeleton that relies on muscular force exerted against water is termed an endoskeleton.
 (C) Skeletal muscles are striated, voluntary, and have unbranched fibers.
 (D) Each skeletal muscle cell constitutes a single motor unit.
 (E) The thick filament is composed almost entirely of actin molecules.
39. In fungi, which one is the correct description?
 (A) Wildlife benefit from endophytes because the endophytes cause more luxuriant plant growth.
 (B) All materials passing from one hyphal cell to another must diffuse across the septal wall.
 (C) Lichens are monophyletic.
 (D) Many kinds of ascomycetes and basidiomycetes have lost the ability to reproduce sexually.
 (E) Conidia are sexual spores produced by mushrooms.
40. In Taiwan, farmers harvest banana when the fruit is green. Then, it is shipped to other countries. Before marketing, with what kind of plant hormone is the fruit treated?
 (A) Abscisic acid (B) Ethylene (C) Auxins (D) Gibberellins (E) Cytokinins
41. In octopus, what kind of respiratory pigment can be found?
 (A) Hemocyanin (B) Hemoglobin (C) Hemophilia (D) Hemochromatosis (E) Ferritin
42. Why does the S-type strain of *Streptococcus pneumoniae* cause pneumonia?
 (A) Unable to defend the immune system
 (B) Surrounded by a polysaccharide capsule
 (C) Able to grow and move
 (D) Inactivated by the immune system
 (E) Unable to form colony
43. In monohybrid crosses, the phenotype ratio 1:2:1 indicates _____.
 (A) linkage disequilibrium (B) pleiotropy (C) incomplete dominance
 (D) three alleles for each trait (E) epistatic effect
44. In *E. coli* mating system, Hfr type could be a genetic donor and F⁻ could be a genetic recipient. After the mating between Hfr and F⁻ type cells, the F⁻ recipient _____.
 (A) becomes Hfr (B) becomes H⁺ (C) becomes F⁻ (D) gets episome (E) remains F⁻
45. In the lactose operon of *E. coli*, which one is the description of the product of the *lacI* gene?
 (A) Transcriptional activator protein (B) β -Galactosidase (C) Induces lac operon transcription
 (D) Binds to the RNA polymerase (E) Binds to the operator
46. In DNA cloning experiments, which vectors can be keeping the largest DNA fragments?
 (A) Plasmid (B) Bacteriophage lambda (C) Ti plasmid
 (D) YACs (E) Cosmids
47. The mountain area of the Central Taiwan was deforested by the 921 earthquake in 2000 and has been recovered today. It is an example of _____.
 (A) secondary succession (B) primary succession (C) climax succession
 (D) arrival and speciation (E) seral accumulation

48. In human endocrine systems, which one is **NOT** correct description?
 (A) Metamorphosis in flatfishes and in amphibians is controlled by growth hormone.
 (B) Vitamin D is a hormone produced in part by exposure to sunlight.
 (C) If blood sodium levels rise sharply above normal limits the heart will release more atrial natriuretic peptide.
 (D) Insulin's effects on reducing blood glucose levels are counteracted by glucagon's actions, which increase blood glucose.
 (E) It would be reasonable to assume that environmental cues such as photoperiod and temperature might regulate animal reproduction.
49. In flowering plant, which one of the following is true characteristic of the gametophyte stage?
 (A) It is the obvious stage such as an oak tree. (B) Megasporangium (C) Seed embryo (D) Gamete producing
 (E) Diploid
50. In eukaryotes there are several different types of RNA polymerase. Which type is involved in transcription of mRNA for a globin protein?
 (A) ligase (B) RNA polymerase I
 (C) RNA polymerase II (D) RNA polymerase III (E) primase

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. In many ways, the regulation of the genes of a particular group of viruses will be similar to the regulation of the host genes. Therefore, which of the following would you expect of the genes of the bacteriophage?
 (A) regulation via acetylation of histones (B) positive control mechanisms rather than negative
 (C) control of more than one gene in an operon (D) reliance on transcription activators
 (E) utilization of eukaryotic polymerases
52. A researcher found a method she could use to manipulate and quantify phosphorylation and methylation in embryonic cells in culture. One of her colleagues suggested she try increased methylation of C nucleotides in a mammalian system. Which of the following results would she most likely see?
 (A) increased chromatin condensation (B) decreased chromatin concentration
 (C) abnormalities of mouse embryos (D) decreased binding of transcription factors
 (E) inactivation of the selected genes
53. During splicing, which molecular component of the spliceosome catalyzes the excision reaction?
 (A) protein (B) DNA (C) RNA (D) lipid (E) sugar
54. A cross between homozygous purple-flowered and homozygous white-flowered pea plants results in offspring with purple flowers. This demonstrates _____.
 (A) the blending model of genetics (B) true-breeding (C) dominance (D) a dihybrid cross
 (E) the mistakes made by Mendel
55. If cells in the process of dividing are subjected to colchicine, a drug that interferes with the functioning of the spindle apparatus, at which stage will mitosis be arrested?
 (A) anaphase (B) prophase (C) telophase (D) metaphase (E) interphase
56. Testosterone functions inside a cell by _____.
 (A) acting as a signal receptor that activates ion-channel proteins
 (B) binding with a receptor protein that enters the nucleus and activates specific genes
 (C) acting as a steroid signal receptor that activates ion-channel proteins
 (D) becoming a second messenger that inhibits adenylyl cyclase
 (E) coordinating a phosphorylation cascade that increases glycogen metabolism
57. Tay-Sachs disease is a human genetic abnormality that results in cells accumulating and becoming clogged with very large and complex lipids. Which cellular organelle must be involved in this condition?
 (A) the endoplasmic reticulum (B) the Golgi apparatus (C) the lysosome
 (D) mitochondria (E) membrane-bound ribosomes
58. Which of the following is an example of Batesian mimicry?
 (A) an insect that resembles a twig
 (B) a butterfly that resembles a leaf
 (C) a nonvenomous snake that looks like a venomous snake
 (D) a fawn with fur coloring that camouflages it in the forest environment
 (E) a snapping turtle that uses its tongue to mimic a worm, thus attracting fish

59. A patient who has a parasitic worm infection and another patient responding to an allergen such as ragweed pollen have which of the following in common?
- (A) an increase in cytotoxic T cell number
 - (B) suffering from anaphylactic shock
 - (C) risking development of an autoimmune disease
 - (D) suffering from a decreased level of innate immunity
 - (E) an increase in the levels of IgE
60. Endothermy is _____.
- (A) a characteristic of most animals found in tropical zones
 - (B) a characteristic of animals that have a fairly constant body temperature
 - (C) a term equivalent to cold-blooded
 - (D) a characteristic of mammals but not of birds
 - (E) seen only in insects and in certain predatory fishes
61. In a Hardy-Weinberg population with two alleles, A and a , that are in equilibrium, the frequency of the allele a is 0.3. What is the percentage of the population that is homozygous for this allele?
- (A) 0.09
 - (B) 0.49
 - (C) 0.9
 - (D) 9.0
 - (E) 49.0
62. By karyotype analysis, a woman is found to have 47 chromosomes, including one extra X chromosome. What kind of phenotype for her is expected?
- (A) normal female
 - (B) sterile female
 - (C) enlarged genital structures
 - (D) albino
 - (E) color blindness
63. Which one of following statements is **FALSE**?
- (A) In a species that has a chromosome number of $2n = 16$, each cell has eight homologous pairs.
 - (B) An error in either egg or sperm meiotic anaphase might result in a human zygote with 45 chromosomes.
 - (C) Single, haploid (n) sets of chromosomes in ovum and sperm unite during fertilization, forming a diploid ($2n$), single-celled zygote.
 - (D) At sexual maturity, ovaries and testes produce diploid gametes by meiosis.
 - (E) If a cell of a usually diploid species with 42 chromosomes per cell is triploid, this cell would be expected to have 63 chromosomes in 21 sets of 3.
64. Which of the following structures is primarily involved in the detoxification of many poisons and drugs in liver and therefore abundant in liver cells?
- (A) Golgi apparatus
 - (B) smooth ER
 - (C) chemical
 - (D) rough ER
 - (E) transport vesicles
65. In systematics and phylogeny, which one is the correct description?
- (A) A phylogenetic tree is actually a theory that depicts the evolutionary relationships among species.
 - (B) A paraphyletic group contains groups of species with different common ancestors.
 - (C) Morphology is a term that refers to similarities among various species that occur because the species are derived from a common ancestor.
 - (D) Where a branching point in a phylogenetic tree is called a clade.
 - (E) A phylogenetic tree is then being used as a cladogram.
66. In animal circulatory systems, which one is the correct description?
- (A) Hemophilia results from a deficiency in platelets.
 - (B) The meshwork that forms the fabric of a blood clot mostly consists of fibrinogen.
 - (C) Reduced levels of hemoglobin in the blood result in the condition of anemia.
 - (D) During cellular maturation, mammalian erythrocytes lose their plasma membrane.
 - (E) The primary function served by erythrocytes is defense against pathogens.
67. In animal digestion and absorption, which one is the correct description?
- (A) The small intestine releases the hormone secretin in response to acid.
 - (B) Fats packaged in chylomicrons pass directly from epithelial cells to the bloodstream.
 - (C) In the stomach, proteins are cleaved into amino acids by aminopeptidases.
 - (D) All sugars are absorbed via secondary active transport.
 - (E) In omnivores, including humans, the cecum is an important organ for digestion of cellulose.
68. In the cells of the nervous system, which one is the correct description?
- (A) Ionotropic receptors act by activating G proteins in target cells.
 - (B) Metabotropic receptors act by initiating changes in second messenger systems in target cells.
 - (C) Action potentials are typically also graded potentials.
 - (D) Electrical synapses transmit signals using neurotransmitters.
 - (E) Most of the cells in your brain are neurons.

69. Which one is the correct description of the invertebrates?
- (A) The two body forms of some *Radiata* is an example of alternation of generations.
 - (B) The nervous system of a cnidarian consists of a central ganglion leading into a nerve net.
 - (C) Scorpions do not lay eggs but rather give birth to live young.
 - (D) All Platyhelminthes are parasitic.
 - (E) Millipedes have a thousand legs whereas centipedes have only a hundred legs.
70. Between two genes in same chromosome, recombination frequency is 0.025. What is the distance between two genes on the linkage map?
- (A) 0.025 cM
 - (B) 0.25 cM
 - (C) 1.25 cM
 - (D) 2.50 cM
 - (E) 5.00 cM
71. Which one is the correct description of salt and water balance in animal?
- (A) Sodium and potassium ions can easily diffuse through the lipid bilayer of plasma membranes.
 - (B) Sweat has a higher salt concentration than the blood does in humans.
 - (C) Animals that do not control internal water concentration also typically do not control the concentrations of ions like sodium and potassium.
 - (D) Transport of salts against their concentration gradients is energetically expensive.
 - (E) The filtrate that leaves the proximal convoluted tubule is much more concentrated than the blood in humans.
72. In species interaction, which one is the correct description of allelopathy?
- (A) Amensalism
 - (B) The secretion of toxins into the environment by plant roots or leaves
 - (C) Commensalism
 - (D) Mutualism
 - (E) The movement of genes from one species to another
73. In biodiversity, which one is the correct description of ecosystem diversity?
- (A) The amount of genetic variation that occurs within and between populations.
 - (B) Only the amount of genetic variation that occurs between species.
 - (C) Includes trophic diversity and process diversity.
 - (D) Defines the species diversity and morphology of an ecosystem.
 - (E) Refers to the structure and function within an ecosystem.
74. In the cross $Aa Bb CC Dd Ee \times Aa Bb Cc Dd EE$, in which all genes undergo independent assortment, what proportion of offspring are expected to be homozygous dominant for all five genes?
- (A) $(1/4)$
 - (B) $(1/4)^2$
 - (C) $(1/4)^3$
 - (D) $(1/4)^4$
 - (E) 0
75. In gymnosperms and angiosperms, which one is the correct description?
- (A) All gymnosperms are wind-pollinated.
 - (B) The fossil record shows that angiosperms evolved directly from the Gnetophytes.
 - (C) Horizontal gene transfer is restricted to prokaryotes and protists.
 - (D) The fossil record shows that pollen cones of conifers have become increasingly complex through their evolutionary history.
 - (E) Stamens and carpals are, in fact, modified sporangia-bearing leaves.