本試題是否可以使用計算機： □可使用 ， ☑不可使用 （請命題老師勾選）

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (每題1分共100分)

1. DNA methylation may be a significant mode of genetic regulation in eukaryotes. Methylation refers to
   A. altering RNA polymerase activity by methylation.
   B. changes in DNA-DNA hydrogen binding.
   C. altering translational activity especially of highly methylated tRNAs.
   D. addition of methyl groups to the cytosine of CG doublets.

2. A mutation in which of the following parts of a gene is likely to be most damaging to a cell?
   A. exon
   B. 3' UTR
   C. 5' UTR
   D. intron

3. A female is heterozygous for the recessive X–linked gene for Lesch–Nyhan syndrome. What proportion of her daughters will be carriers for the trait if their father is not affected?
   A. 0%
   B. 25%
   C. 50%
   D. 75%

4. A single gene may produce two or more different RNAs by the process of_____.
   A. DNA methylation
   B. histone acetylation
   C. RNA interference
   D. alternative splicing

5. In what cellular compartment are introns removed from pre-mRNA to make mature mRNA?
   A. cytoplasm
   B. endoplasmic reticulum
   C. nucleus
   D. golgi apparatus

6. How does a nonsense suppressor mutation prevent amber mutants from terminating their polypeptides prematurely?
   A. The mutation turns the amber codon back into a wild-type codon.
   B. The mutation alters a tRNA so that it reads the amber codon and inserts an amino acid.
   C. The mutation alters the release factors that would halt synthesis.
   D. The mutation results in a wobble that allows synthesis to continue.

7. When an organism gains or loses one or more chromosomes but not a complete haploid set, the condition is known as _____.
   A. polyploidy
   B. euploidy

(背面仍有題目,請繼續作答)

C. aneuploidy
D. D triploidy

8. One of the genes controlling sweat gland in human is located on X chromosome. Two twin sisters show different phenotypes of the sweat gland. One has no sweat gland on her left arm while the other has on her left arm. Which of the following statement is/are true?
(1) The twin cannot be identical twin
(2) They both are heterozygotic of the gene
(3) The reason for the different phenotype is random X inactivation
(4) X inactivation must occur after first division of the zygote
A. 1, 2, 3, 4.
B. 1.
C. 2, 3.
D. 2, 3, 4.

9. What do all human males inherit from their mother?
A. mitochondrial DNA.
B. an X chromosome.
C. the SRY gene.
D. A and B only.

10. When does translation begin in prokaryotic cells?
A. during transcription.
B. after the 5' caps are converted to mRNA.
C. after a transcription initiation complex has been formed.
D. as soon as the DNA introns are removed from the template.

11. The allergy is caused by the interaction among
A. mast cells, IgG, and allergen.
B. phagocytes, IgG, and allergen.
C. mast cells, IgA, and allergen.
D. phagocytes, IgE, and allergen.

12. Which of the following statements concerning the mechanism of killing of extracellular viruses is wrong?
A. B cells and macrophages play major role.
B. Antibodies and macrophages are both important.
C. Cytotoxic T cells are most important.
D. Antibodies are important.

13. Which of the following statements is wrong concerning the virus structure?
A. Virus may use RNA only as genome.
B. Virus may use DNA only as genome.
C. Virus genome is usually haploid except the retrovirus.
D. Viroid particle is enveloped.

14. Which of the following descriptions about plasmid is not suitable?
A. Plasmid is indispensable for bacterial host.
B. Plasmid is an independent replicon in bacterial host.
C. Plasmid is a small, circular, dsDNA.

D. Plasmid may be transferred to recipient bacteria by conjugation.

15. The enhancers are usually located
A. thousands of nucleotides upstream only of a gene.
B. thousands of nucleotides downstream only of a gene.
C. within an intron only.
D. at any of the above three sites.

16. Which of the following factors does not contribute to the control of eukaryotic gene transcription?
A. Histone acetylation.
B. DNA methylation.
C. Transcription factors.
D. RNA splicing.

17. Which is the best choice of DNA source for cloning and determining the original sequence of eukaryotic gene?
A. Chromosomal DNAs.
B. cDNAs.
C. The products of RT-PCR of mRNA.
D. None of the above.

18. Colony hybridization assay is mostly suitable for
A. the direct assay of PCR product.
B. identifying and picking up the recombinant bacteria directly from the growth plate.
C. identifying the recombinant viral vector in cell culture.
D. identifying the DNA band in the Southern blot.

19. The hydrogen atoms of a water molecule are bonded to the oxygen atom by _____ bonds, whereas neighboring water molecules are held together by _____ bonds.
A. hydrogen .....ionic
B. hydrogen .....polar covalent
C. polar covalent ..... hydrogen
D. ionic .....covalent

20. One way to convert oil into a substance that is solid at room temperature is to
A. add hydrogen, decreasing the number of double bonds in the molecules
B. remove water, causing a dehydration synthesis reaction to occur
C. remove hydrogens, increasing the number of double bonds
D. put in the refrigerator: when unsaturated fats cool, double bonds form and the fats solidify

21. Heating inactivates enzymes by
A. breaking the covalent bonds that hold the molecule together
B. remove phosphate groups from the enzyme
C. causing enzyme molecules to stick together
D. breaking the hydrogen bonds that give the molecule its three-dimensional shape

22. Bacterial production of the enzymes needed for the synthesis of the amino acid tryptophan declines with increasing levels of tryptophan and increases as tryptophan levels decline. This is an example of

(背面仍有題目,請繼續作答)

A. competitive inhibition
B. noncompetitive inhibition
C. negative feedback
D. irreversible inhibition

23. High-flying birds are able to obtain enough oxygen even when the air is very thin for all of the following reasons ***except*** that
A. they have more efficient lungs than other vertebrates
B. they have hemoglobin with a higher affinity for oxygen than other vertebrates
C. their mitochondria are more efficient than those of other vertebrates
D. their flight muscles have myoglobin

24. Gas exchange in animals always involves
A. cellular respiration
B. breathing movements
C. active transport of gases
D. diffusion

25. Which of the following is **NOT** an adaptation to the effects of gravity on the human circulatory system?
A. strong heart
B. muscle contractions in the legs
C. one-way valves in veins
D. muscle contraction in the head

26. Which of the following is not a capability of the heart's pacemaker?
A. responding to a frightening sight
B. increasing the heartbeat
C. initiating the heartbeat
D. contraction

27. The great white shark is endothermic because
A. all sharks are endothermic
B. its eats only endotherms
C. it has a countercurrent heat exchanger that minimizes the loss of heat
D. it has a thick layer of insulation just under its skin

28. Which of the following is **NOT** a function of the excretory system?
A. elimination of nitrogenous wastes
B. maintenance of salt balance
C. elimination of undigested food
D. maintenance of water balance

29. How does the stomach defense against self-digestion?
A. The protease is secreted in an inactive form called pepsinogen.
B. A coating of mucus is secreted by the epithelial cells of the stomach lining.
C. The epithelium is constantly eroded and mitosis generates enough cells to completely replace the stomach lining every three days.
D. All of the above.

30. Regarding the evolutionary adaptations of vertebrate digestive systems, which is (are)

correct?
A. Dental adaptation reveals that Carnivores generally have pointed incisors and canines.
B. Intestinal adaptation reveals that Herbivore generally have longer G-I tract of animals of equivalent size.
C. Symbiotic adaptation allows animal to digest cellulose to make nutrients essential to animals.
D. All of the above.

31. In vertebrates animals, spermatogenesis differs from oogenesis in the following major ways.
A. The cells from which sperm develop continue to divide by mitosis throughout the male's life.
B. During the meiotic divisions of spermatogenesis, almost all the cytoplasm monopolized by a single daughter cell
C. Spermatogenesis has long "resting" periods compared to the uninterrupted sequence of oogenesis.
D. None of the above

32. Regarding the reproductive cycle of the human female, which is (are) correct?
A. The FSH stimulates follicle growth which induces estrogen production.
B. The estrogen peak in blood cause LH surge.
C. The LH surge triggers ovulation.
D. All of the above

33. Indicate the correct consequences of the fertilization.
A. Fusion of egg and sperm → ↑ DAG and IP_3 → egg releases Ca^{++} from ER → cortical reaction → formation of fertilization envelope.
B. Acrosomal reaction → fusion of egg and sperm → cortical reaction → ↑ DAG and IP_3 → ↑ egg releases Ca^{++} from ER → formation of fertilization envelope
C. Acrosomal reaction → ↑ DAG and IP_3 → egg releases Ca^{++} from ER → fusion of egg and sperm → cortical reaction → formation of fertilization envelope
D. Fusion of egg and sperm → cortical reaction → ↑ DAG and IP_3 → egg releases Ca^{++} from ER → acrosomal reaction → formation of fertilization envelope

34. The developmental fate of cells depends on their _____
A. Uneven distribution of cytoplasmic determinants in the unfertilized egg.
B. Organizer
C. Zone of polarizing activity
D. All of the above

35. The nematode Caenorhabditis elegans is used as a model organism for genetic studies. One of the key advantages of using C. elegans for such studies is that
A. its genome is as large as ours.
B. morphogenesis and growth occur throughout its life.
C. it is hermaphroditic, making it easy to detect recessive mutations.
D. its development is extremely variable.

（背面仍有題目，請繼續作答）

本試題是否可以使用計算機：□可使用 ，☑不可使用 （請命題老師勾選）

36. "Nuclear transplantation" refers to a/an
    A. cloning method involving the transfer of a nucleus from a differentiated cell into an enucleated egg cell or zygote.
    B. method of creating new species by injecting diploid nuclei into diploid zygotes in order to produce tetraploid embryos.
    C. experimental method involving transferring nuclei from cells of an organism of one species into cells of an organism from another species, and examining the resulting phenotype.
    D. form of gene therapy involving the transfer of nuclei from a healthy individual to the cells of a patient with a genetic disorder.

37. All of the following are characteristics of adult arthropods ***except***
    A. a heart.
    B. a coelom.
    C. an exoskeleton.
    D. hemolymph.

38. All of the following animal groups include terrestrial life forms ***except***
    A. Mollusca.
    B. Arthropoda.
    C. Echinodermata.
    D. Annelida.

39. What should be true of fossils of the earliest tetrapods?
    A. They should show evidence of having produced shelled eggs.
    B. They should indicate limited adaptation to life on land.
    C. They should feature the earliest indications of the appearance of jaws.
    D. They should be transitional forms with the fossils of chondrichthyans that lived at the same time.

40. All of the following are characteristics of most extant non-avian reptiles, ***except***
    A. the amniotic egg.
    B. keratinized skin.
    C. brachiation.
    D. ectothermy.

41. In a typical multicellular animal, the circulatory system interacts with various specialized surfaces in order to exchange materials with the exterior environment. Which of the following is **NOT** an example of such an exchange surface?
    A. muscle
    B. kidney
    C. lung
    D. skin

42. Which of the following tissues lines the kidney tubules?
    A. smooth muscle
    B. nervous
    C. adipose
    D. epithelial

43. Which one of the following statements is ***false***?

A. The anterior pituitary is composed of endocrine cells.
B. The posterior pituitary is composed of nervous tissue.
C. The pituitary is the master control center of the entire endocrine system.
D. Releasing hormones stimulate the anterior pituitary to secrete hormones.

44. Our biological clock, which regulates the sleep-wake cycle, is housed within the
A. cerebrum.
B. hypothalamus.
C. cerebellum.
D. brainstem.

45. The relationship between spinal nerves and the spinal cord is most like the relationship between:
A. the hairs on a person's head.
B. pancakes and the syrup poured over them.
C. the teeth on a comb.
D. an interstate highway and the many roads that intersect with it via on and off ramps.

46. Which one of the following is not an interconnected function of the nervous system?
A. integration
B. motor output
C. sensory output
D. sensory input

47. The sophisticated behavior of mammals and birds is directly related to
A. their relatively large cerebrum.
B. the presence of a hindbrain.
C. the presence of a midbrain.
D. the presence of a forebrain.

48. Recent research has demonstrated how some organisms taste salty substances. Which of the following statements accurately describes the mechanism associated with triggering this taste response in the taste receptor cells?
A. The sodium ions penetrate the membrane of the receptor cells and depolarize these cells.
B. The sodium ions penetrate the membrane of the receptor cells and hyperpolarize these cells.
C. The sodium ions block the potassium channels causing potassium to accumulate inside the cell and leading to depolarization.
D. The sodium ions bind to surface receptors on the cell membrane which trigger depolarization in these cells.

49. Which evolutionary force causes differential reproduction and survival?
A. migration.
B. genetic drift.
C. natural selection.
D. mutation.

50. A graded change in a trait along a geographic axis is called
A. cline.
B. global change.

（背面仍有題目，請繼續作答）

C. bottleneck effect.
D. natural selection.

51. An evolutionary change in the rate or timing of developmental events is called
A. monophyly.
B. heterochrony.
C. adaptive radiation
D. punctuated equilibrium

52. Which of the followings is **NOT** the paradigm of Darwinism?
A. gradualism.
B. natural selection.
C. survival of the fittest.
D. common descent with modification.

53. Which of the followings emphasizes monophyly of a species?
A. evolutionary taxonomy.
B. morphological taxonomy.
C. phenetics.
D. cladistics.

54. Which of the followings does not indicate homology?
A. bird wings vs. bat wings.
B. human's hands vs. bird wings.
C. insect wings vs. human's hands
D. bat wings vs. human's hands

55. Of the followings, which is **NOT** Lamarck's theory of evolution?
A. natural selection.
B. adaptation.
C. environmentalism.
D. inheritance of acquired characteristics.

56. When a population is in Hardy-Weinberg equilibrium, it means that there is (are)
A. positive selection.
B. balanced polymorphisms.
C. secondary contacts between sister populations.
D. no evolution.

57. The movements of individuals can affect the patterns of geographic distributions of species. Which action taken by animals is most likely to expand their natural range?
A. invasion
B. dispersal
C. migration
D. re-introducing

58. Which of the following population-limiting factors is independent of population density?
A. disease
B. predation
C. catastrophe
D. competition

59. Dr. Dolittle wanted to estimate the population size of lizards on campus. He set up a transect line, and 50 lizards were captured, marked, and released. After a week, he surveyed again alone the transect line and caught 60 lizards, and 10 of the 60 lizards were previously marked. If all the assumptions for this mark-recapture method are met, approximately how many lizards there are on campus?
A. 100
B. 200
C. 300
D. 400

60. A mother bird is gathering food for her chicks, constrained by the fact that she can not leave her chicks for more than 15 minutes. There are five plots with different conditions listed in the table below for her to choose. If everything else being equal, according to Optimal foraging theory, which plot will you predict this mother bird will go for foraging?

Plot	Time for traveling (min)	# of prey/㎡	chance of being eaten
1	5	10	0.1
2	5	15	0.1
3	10	20	0.2
4	10	25	0.2
5	20	50	0

A. Plot 1.
B. Plot 2.
C. Plot 3.
D. Plot 5.

61. The diversity and complexity of bird songs may be associated with I. where a bird is distributed ; II. how old a bird is ; III its reproductive success ; IV physiological and genetic conditions.
A. all of them
B. none of them
C. only II, III
D. only I, III

62. Which of the following terms is/are correctly described?
I. Benthic zone: in a lake, the well-lit, open surface water farther from shore.
II. Estuaries: the area where a freshwater stream or river merges with the ocean.
III. Intertidal zone: open water at the edge of the continental shelf.
IV. Littoral zone: in a lake, the shallow, well-lit water close to shore.
A. II, IV
B. I, II,
C. I, IV
D. II, III

63. A lake community suddenly suffers from algal blooms. Using the strategy of biomanipulation, an ecologist may propose _____.

（背面仍有題目，請繼續作答）

A. removing zooplankton
B. adding mineral nutrients to the water
C. adding fish that eat zooplankton
D. removing fish that eat zooplankton

64. The poison-arrow frogs *Dendrobates* of tropical America are all brightly colored and have very similar patterns. Each species is distasteful to predators and all possess toxic skin secretions, although some of the species live quite separate from the others. The adaptive relationship among these species is best termed _____.
A. cryptic coloration
B. parasitism
C. commensalism
D. Müllerian mimicry

65. When researchers at Hubbard Brook Experimental Forest cut down trees and measured subsequent mineral levels in the soil, they found that _____.
A. the mineral levels were unaffected as long as the tree remains were not removed
B. primary production was not affected as long as Ca^{2+} was added to the soil
C. the amount of nutrients leaving an intact forest ecosystem is controlled by the plants
D. the forest was able to grow back before mineral levels changed significantly

66. The rate at which producers convert solar energy to the chemical energy of organic compounds, minus the energy used during respiration, is called _____.
A. biomass
B. net productivity
C. biomagnification
D. standing crop

67. _____ is the science of facilitating the return of a degraded ecosystem to a more natural condition.
A. PVA
B. Preservationism
C. Landscape management
D. Restoration ecology

68. What is the key factor driving an extinction vortex?
A. loss of genetic variation
B. the size of the endangered organisms
C. the size of the population
D. the major threats to biodiversity that were involved in making the species endangered

69. Syntrophy is illustrated by the relationship(s) of:
A. Bacteroids and legumes.
B. Nitrosofying bacteria and nitrifying bacteria.
C. Thiovolum and some giant tube worms in deep-sea thermal vents.
D. (b), and (c).

70. Global warming is not increased by:
A. The tricarboxylic acid (TCA) cycle.
B. Industrial production of beer.

C. Production of CO_2 by methanotrophs.
D. Breeding of agricultural ruminants.

71. Some cyanobacteria produce potent neurotoxins that, if ingested, will kill humans. These cyanobacteria are most likely to contaminate:
A. Waters rich in organic carbon wastes but poor in phosphate.
B. Waters rich in phosphate wastes but poor in organic carbon.
C. Shellfish living in polluted waters.
D. B and C.

72. Sake is a Japanese alcoholic drink produced from steamed rice (which is primarily starch) by the combined actions of Saccharomyces cerevisiae and one other organism. From this, we can deduce that:
A. The other organism is one that excretes amylases, such as *Aspergillus oryzae.*
B. The other organism is a species of Acetobacter.
C. The other organism must act on the rice before S. cerevisiae.
D. A and C .

73. Which of the following is not considered part of the endomembrane system?
A. unclear envelope
B. chloroplast
C. Golgi apparatus
D. Plasma membrane

74. Which of the following statements is a correct distinction between prokaryotic and eukaryotic cells attributable to the absence of prokaryotic cytoskeleton?
A. Organelles are found only in eukaryotic cells.
B. Cytoplasmic streaming is not observed in prokaryotes.
C. Only eukaryotic cells are capable of movement.
D. Prokaryotic cells have cell walls.

75. According to the fluid mosaic model of membrane structure, proteins of the membrane are mostly
A. spread in a continuous layer over the inner and outer surfaces of the membrane.
B. confined to the hydrophobic core of the membrane.
C. embedded in a lipid bilayer.
D. randomly oriented in the membrane, with no fixed inside-outside polarity.

76. Which of the following factors would tend to increase membrane fluidity?
A. a greater proportion of unsaturated phospholipids
B. a greater proportion of saturated phospholipids
C. a lower temperature
D. a relatively high protein content in the membrane

77. The immediate energy source that drives ATP synthesis by ATP synthase during oxidative phosphorylation is
A. the oxidation of glucose and other organic compounds.
B. the flow of electrons down the electron transport chain.
C. the affinity of oxygen for electrons.
D. the H^+ concentration gradient across the inner mitochondrial membrane.

（背面仍有題目，請繼續作答）

78. Which of the following is a true distinction between fermentation and cellular respiration?
A. Only respiration oxidizes glucose.
B. NADH is oxidized by the electron transport chain in respiration only.
C. Fermentation, but not respiration, is an example of a catabolic pathway.
D. Substrate-level phosphorylation is unique to fermentation.

79. Phosphorylation cascades involving a series of protein kinases are useful for cellular signal transduction because
A. they are species specific.
B. they always lead to the same cellular response.
C. they amplify the original signal manyfold.
D. they counter the harmful effects of phosphatases.

80. Signal transduction pathways benefit cells for all of the following reasons except
A. they help cells respond to signal molecules that are too large or too polar to cross the plasma membrane.
B. they enable different cells to respond appropriately to the same signal.
C. they help cells use up phosphate generated by ATP break-down.
D. they can amplify a signal.

81. A particular cell has half as much DNA as some of the other cells in a mitotically active tissue. The cell in question is most likely in
A. G^1
B. G^2
C. Prophase
D. Metaphase

82. The decline of MPF activity at the end of mitosis is caused by
A. the destruction of the protein kinase (Cdk).
B. decreased synthesis of cyclin.
C. the degradation of cyclin.
D. synthesis of DNA.

83. Where is the electron transport chain found in plant cells?
A. cytoplasm
B. thylakoid membranes of chloroplasts
C. matrix of mitochondria
D. inner membrane of mitochondria

84. All of the following are adaptations that help reduce water loss from a plant *except*
A. C_4 photosynthesis.
B. sunken stomata.
C. transpiration.
D. crassulacean acid metabolism.

85. Which two elements make up more than 90% of the dry weight of plants?
A. oxygen and carbon
B. carbon and nitrogen
C. oxygen and hydrogen
D. nitrogen and oxygen

86. Which of the following statements is true about transgenic plants?
A. They require many years to be produced.
B. They contain genes from more than one species.
C. They can be produced only by genetic engineering.
D. Intermediate species are required for transgenic plants to be produced.

87. In modern agriculture, what does "terminator technology" refer to?
A. introduction of bacterial genes that release insect toxins into plants
B. introduction of male sterility genes into plants to prevent selfing
C. selection of resistant clones following mutator treatment of seeds
D. introduction of genes into a plant that prevent its seeds from maturing

88. Charles and Francis Darwin concluded from their experiments on phototropism by grass seedlings that the part of the seedling that detects the direction of light is the
A. phytochrome.
B. tip of the coleoptile.
C. root tip.
D. part of the coleoptile that bends during the response.

89. Which of the following is **NOT** presently considered a major mechanism whereby hormones control plant development?
A. affecting cell elongation through acid growth
B. affecting cell respiration via regulation of the citric acid cycle
C. affecting cell differentiation through altered gene activity
D. mediating short-term physiological responses to environmental stimuli

90. Which of the following has **NOT** been established as an aspect of auxin's role in cell elongation?
A. Auxin stimulates proton pumps.
B. Auxin activity permits an increase in turgor pressure.
C. Auxin increases the quantity of cytoplasm in the cell.
D. Through auxin activity, vacuoles increase in size.

91. If a plant is mechanically stimulated, it will grow shorter, thicker stems. This response is
A. an adaptation to windy environments.
B. caused by an increase in turgor.
C. the result of ethylene production.
D. A and C only

92. A plant will recognize a pathogenic invader
A. if it has the specific R gene that corresponds to the pathogen molecule encoded by an Avr gene.
B. if it has many specific plant disease resistance (R) genes.
C. when the pathogen secretes Avr protein.
D. when the pathogen has an R gene complimentary to the plant's antivirulence (Avr) gene.

93. In seed plants, the _____ develops into a seed.
A. antheridium
B. ovule
C. prothallium

（背面仍有題目，請繼續作答）

D. microsporangium

94. Choose the correct statement:
A. The male gametophyte is attached to and nutritionally dependent upon the sporophyte generation.
B. Gymnosperms and angiosperms have free-living gametophytes.
C. Only gymnosperms have life cycles with alternation of generations.
D. All gymnosperms and flowering plants are heterosporous.

95. Gymnosperms differ from bryophytes in having
A. alternation of generations.
B. seeds.
C. chlorophyll.
D. free-living gametophytes.

96. The oldest genus of living trees is
A. Pinus.
B. Ephedra.
C. Ginkgo.
D. Gnetum.

97. The group of gymnosperms that have vessel elements in their xylem is
A. conifers.
B. gnetophytes.
C. cycads.
D. ginkgo.

98. Double fertilization occurs when
A. one sperm cell fertilizes the egg and the other sperm cell fuses with the two polar nuclei.
B. two sperm cells fertilize one egg.
C. two eggs are fertilized at the same time.
D. one fertilized egg divides and forms two separate embryos.

99. Which of the following features increase the likelihood of reproductive success in flowering plants
A. closed carpels.
B. vessel elements in the xylem.
C. sieve tube elements in the phloem.
D. broad leaves.

100. In some liverworts, the flattened, lobed structure that is not differentiated into leaves, stems, or roots is called a/an
A. archegonium.
B. protonema.
C. rhizoid.
D. thallus.