

- ※ 說明：一、試題內如有選擇題作答部份，請依題號順序於【選擇題作答區】內作答。
二、非選擇題部份（含填充題），請於【非選擇題作答區】標明題號，依序作答。

I. 單選題：(每題 1 分，共 30 分)

1. Nucleic acids are different from proteins in that nucleic acids contain:
a. carbon. b. hydrogen. c. nitrogen. d. phosphorus.
2. Molecular chaperones function by:
a. catalyzing the hydrolysis of peptide bonds.
b. catalyzing the dehydration synthesis of a protein.
c. facilitating protein folding.
d. denaturing proteins.
3. Which of the following best designates a somatic cell containing 6 chromosomes?
a. $n = 6$ b. $n = 12$ c. $2n = 3$ d. $2n = 6$
4. Which of the following is NOT part of the endomembrane system?
a. Endoplasmic reticulum b. Peroxisome membrane
c. Plasma membrane d. Golgi complex
5. The binomial for the coast redwood is *Sequoia sempervirens*. What is the species name of this plant?
a. *Sequoia* b. *Sempervirens* c. *Sequoia sempervirens* d. Coast redwood
6. When the members of a taxon are all descendents of a common single ancestral species, the taxon is said to be:
a. phylogenetic. b. paraphyletic. c. monophyletic. d. polyphyletic.
7. Sequencing of _____ from a variety of species provided the first evidence for the existence of three domains of organisms.
a. cytochrome *c* b. enzymes in glycolysis
c. ribosomal RNA d. the *rbcL* gene
8. The cell walls of *Bacteria* differ from those of *Archaea* and eukaryotes in that the cell walls of *Bacteria* contain:
a. cellulose. b. sterols. c. peptidoglycans. d. phospholipids.

9. Which of the following is the uptake of DNA by a prokaryotic cell from its environment?
a. Binary fission b. Transduction c. Transformation d. Conjugation
10. By definition, autotrophs differ from heterotrophs in that autotrophs:
a. use inorganic compounds as an energy source.
b. use light as an energy source.
c. use carbon dioxide as their sole source of carbon.
d. obtain their carbon from dead organic matter.
11. The heterocysts of cyanobacteria are most closely associated with:
a. sporulation. b. nitrogen fixation.
c. photosynthesis. d. gliding movements.
12. A viral capsid is a:
a. protein coat. b. strand of DNA.
c. strand of RNA. d. plasma membrane.
13. Haustoria are _____ found in _____ fungi.
a. spores; saprophytic b. gametes; symbiotic
c. hyphae; parasitic d. gametangia; endophytic
14. In the life cycle of *Puccinia graminis*, which of the following are produced on wheat?
a. Spermogonia b. Aecia c. Spermatia d. Urediniospores
15. Bryophytes are a group of organisms at the transition between:
a. brown algae and green algae. b. fungi and plants.
c. green algae and vascular plants. d. nonvascular and vascular plants.
16. A major difference between the spore walls of bryophytes and charophytes is that the bryophyte spore walls contain:
a. lignin. b. sporopollenin. c. cellulose. d. phenolic materials.
17. In *Marchantia*, the mature capsule contains:
a. spores only. b. elaters only.
c. gemmae only. d. spores and elaters only.

18. In vascular plants, microphylls differ from megaphylls in that microphylls:
- a. occur in most vascular plants.
 - b. are associated with leaf gaps.
 - c. are associated with protosteles.
 - d. have branched veins.
19. The prothallus of Filicales is a(n):
- a. cluster of sporangia.
 - b. heart-shaped gametophyte.
 - c. outgrowth of a leaf.
 - d. type of pinna.
20. A seed is composed of a(n) _____ and _____.
- a. ovule; embryo
 - b. ovule; megasporangium
 - c. ovule; integuments
 - d. megasporangium; embryo
21. In seed plants, the _____ is called the nucellus.
- a. young sporophyte
 - b. megagametophyte
 - c. megaspore
 - d. megasporangium
22. In gymnosperms, _____ produce nonmotile sperm.
- a. Conifers and gnetophytes
 - b. Conifers and cycads
 - c. Cycads and *Ginkgo*
 - d. Cycads and gnetophytes
23. In the process of double fertilization, one sperm fuses with the _____, and the other sperm fuses with the _____.
- a. egg; synergids
 - b. egg; polar nuclei
 - c. egg; antipodals
 - d. synergid; polar nuclei
24. The procambium is the precursor of the:
- a. epidermis.
 - b. ground tissues.
 - c. protoderm.
 - d. xylem and phloem.
25. The cotyledon of grasses is called a(n):
- a. scutellum.
 - b. hypocotyl.
 - c. epicotyl.
 - d. coleorhiza.
26. The presence of Casparian strips forces substances entering and leaving the vascular cylinder to pass through the protoplasts of _____ cells.
- a. endodermal
 - b. epidermal
 - c. pericycle
 - d. xylem
27. In the shoot apex, the procambium originates from the:
- a. pith meristem.
 - b. peripheral meristem.
 - c. intercalary meristem.
 - d. ground meristem.

28. Anticlinal divisions are different from periclinal divisions in that anticlinal divisions:
- occur in relatively large cells.
 - occur solely in the corpus of the apical meristem.
 - increase the number of cell layers.
 - are perpendicular to the surface.
29. Which layer(s) of the peripheral zone of the shoot apical meristem give(s) rise to leaf primordia?
- L1 only
 - L2 only
 - L3 only
 - L1, L2, and L3
30. Angiosperm wood differs from conifer wood in that angiosperm wood has:
- tracheids.
 - vessels.
 - smaller rays.
 - orderly radial files of cells.

II. 解釋名詞：(每題 2 分，共 10 分)

- cytoskeleton
- endosymbiosis theory
- karyogamy
- homosporous plants
- parenchyma

III. 填充：(共 36 分)

- The four-carbon pathway used in the carbon-fixation for photosynthesis is a solution to prevent the energy loss by _____. (2 分)
- The mechanism that couples ATP synthesis to electron transport via an electrochemical H^+ gradient across a membrane is called _____. (2 分)
- The two anaerobic pathways to recycle NAD^+ in cells are _____ and _____. (4 分)
- The cell division cycle is divided into four stages: _____, _____, _____, and _____. (4 分)
- What's the characteristic of metaphase? (4 分)
- Sexual reproduction is characterized by two events: _____ and _____. (4 分)
- The principle of independent assortment by Mendel is not true when the two genes are _____. (2 分)
- An organism with more than two complete sets of chromosomes is called _____. (2 分)

9. Some traits are controlled by several genes. This phenomenon is known as _____. (2 分)
10. In prokaryotes, a group of function-related genes are clustered together to form a single regulatory unit that is called _____. (2 分)
11. The sum total of all the alleles of all the genes of all the individuals in a population is defined as its _____. (2 分)
12. Phototropism is under the influence of the hormone _____. (2 分)
13. Nitrogen fixation is the process by which _____ is converted to _____. (4 分)

IV. 簡答題：(共 14 分)

1. To produce one molecule of glyceraldehydes 3-phosphate, how many turns of the Calvin cycles are necessary? (2 分)
2. What's the meaning of a gene? (4 分)
3. What's the essential property of DNA to provide the ability for self-duplication? (4 分)
4. Which plant hormone is responsible for fruit ripening? (2 分)
5. Water is pushed up or pulled up to the top of tall trees? (2 分)

V. 申論題：(共 10 分)

1. 請繪圖說明單胞藻 (*Chlamydomonas*) 和石莖 (*Ulva*) 的生活史。(5 分)
2. 被子植物花部四輪 (4 whorls) 之構造為何? (2 分)
此四輪之發育如何受 Class A genes, Class B genes 和 Class C genes 控制? (3 分)