

※ 注意：請於答案卷內之「選擇題作答區」依序作答。

I. 選擇題: (30題，每題1.5分，共45分)

1) Which of the following statements concerning primitive cells is FALSE?

- a) They used organic molecules to satisfy their energy requirements.
- b) They constructed new cells from organic molecules made via photosynthesis.
- c) They acquired the ability to grow.
- d) They acquired the ability to reproduce.
- e) They acquired the ability to pass on their characteristics to subsequent generations.

2) Phytoremediation refers to process by which plants:

- a) transfer genes.
- b) deter pests.
- c) control weeds.
- d) form hybrids.
- e) clean up polluted environments.

3) The matrix of the plant cell wall contains:

- a) microfibrils and pectins.
- b) pectins and hemicelluloses.
- c) cellulose and chitin.
- d) chitin and glycogen.
- e) hemicelluloses and oligosaccharins.

4) A peptide bond occurs between the _____ groups of adjacent amino acids in polypeptides.

- a) amino and carboxyl
- b) sulfhydryl
- c) amino and phosphate
- d) carboxyl and hydroxyl
- e) amino

5) In an allosteric enzyme, the substrate binds at the _____ site and the regulatory substance binds at the _____ site.

- a) active; inhibitor
- b) effector; active
- c) active; effector
- d) inhibitor; active
- e) inhibitor; effector

6) In the reactions of glycolysis, ATP is formed:

- a) when glucose is split.
- b) when fructose-1,6-bisphosphate is split.
- c) when NADH donates electrons and protons to the electron transport chain.
- d) by the process of substrate-level phosphorylation.
- e) by the process of oxidative phosphorylation.

7) Because the first detectable product of the Calvin cycle is _____, the cycle is also known as the _____ pathway.

- a) ribulose 1,5-bisphosphate; C₅
- b) oxaloacetate; C₄
- c) 3-phosphoglycerate; C₃
- d) glyceraldehyde 3-phosphate; C₃
- e) Rubisco; C₄

8) The root and shoot apical meristems first become discernible during the transition between the _____ and _____.

- a) proembryo; globular stage
- b) torpedo stage; proembryo
- c) heart stage; globular stage
- d) globular stage; torpedo stage
- e) torpedo stage; embryo proper

9) Which of the following statements about Casparian strips is FALSE?

- a) They are found in the anticlinal walls of endodermal cells.
- b) They contain suberin.
- c) They are permeable to water but not to ions.
- d) They do not contain plasmodesmata.
- e) They are bandlike portions of the cell wall and middle lamella.

- 10) Which of the following statements about supernumerary cambia in sugarbeet roots is FALSE?
- a) They are types of additional cambia.
 - b) They are arranged in concentric rings.
 - c) They produce storage parenchyma.
 - d) They are responsible for most of the increase in thickness.
 - e) They produce phloem toward the inside and xylem toward the outside.
- 11) The physiological field hypothesis of leaf arrangement states that leaf primordia:
- a) preferentially develop in a whorled phyllotaxy.
 - b) cannot develop until sufficient space is available.
 - c) are surrounded by a physiological field that prevents initiation of new primordia.
 - d) contain vascular tissues organized in fieldlike rows.
 - e) produce electrical fields that attract one another.
- 12) Which of the following statements about thigmotropism is FALSE?
- a) It enables roots to navigate around rocks.
 - b) It is a response to contact with a solid object.
 - c) An example is the climbing of tendrils.
 - d) Cells touching the support lengthen more than cells on the other side.
 - e) The stems of peas can store the memory of tactile stimulation.
- 13) Cation exchange is important because:
- a) cations are more crucial to the plant than anions.
 - b) cations can exchange with anions that are used by the plant.
 - c) cations prevent anions from binding to colloidal particles.
 - d) exchangeable ions are not lost with leaching water.
 - e) potential harmful exchangeable ions are leached away from the roots.
- 14) Unlike grassland plants, plants growing in shady forests:
- a) have large leaf surfaces.
 - b) transpire at a rate that is unaffected by air currents.
 - c) have thick cuticles.
 - d) have sunken stomata.
 - e) transpire at a rate that is unaffected by humidity.
- 15) Which of the following statements about sources and sinks in assimilate movement is FALSE?
- a) A plant part unable to meet its nutritional needs functions as a sink.
 - b) In seedlings, the cotyledons commonly act as the major sinks.
 - c) In mature plants, the upper leaves commonly act as sources for the shoot apex.
 - d) In mature plants, the lower leaves commonly act as sources for the roots.
 - e) Developing fruits are highly competitive sinks.
- 16) Which of the following is NOT a possible cause of maternal inheritance?
- a) The generative cell receives neither plastids nor mitochondria from the microspore.
 - b) The generative cell receives plastids and mitochondria but they degenerate.
 - c) Plastids and mitochondria are excluded from generative and sperm cells.
 - d) Plastids and mitochondria are present in sperm cells but only plastids are transmitted into the egg.
 - e) Plastids and mitochondria are present in sperm cells but are not transmitted into the egg.

- 17) When scientists describe the genetic code as degenerate, they mean that:
- a) it becomes disorganized over time.
 - b) many amino acids have more than one codon.
 - c) some codons specify stop signals.
 - d) it varies with cell type.
 - e) it varies among species.
- 18) Changes in a gene pool due to chance are called:
- a) mutation.
 - b) gene flow.
 - c) genetic drift.
 - d) natural selection.
 - e) nonrandom mating.
- 19) Which of the following statements about the role of fungi in decomposition is FALSE?
- a) Fungi are the principal decomposers on Earth.
 - b) Fungi produce enzymes that degrade lignin.
 - c) Fungi produce enzymes that degrade cellulose.
 - d) As a group, fungi can attack virtually anything.
 - e) Individual species are highly specific to particular substrates.
- 20) In recombinant DNA technology, cutting different samples of a single DNA molecule with different restriction enzymes allows one to:
- a) amplify the DNA molecule.
 - b) carry out DNA hybridization.
 - c) locate a gene of interest.
 - d) determine the function of a gene.
 - e) determine the nucleotide sequence of a gene.
- 21) The most comprehensive studies of seed plant phylogeny are based on differences among _____ sequences of _____.
- a) nucleotide; the *rbcL* gene
 - b) amino acid; cytochrome *c*
 - c) nucleotide; ribosomal RNA
 - d) nucleotide; mitochondrial genes
 - e) amino acid; Rubisco
- 22) Prokaryotic flagella differ from eukaryotic flagella in that prokaryotic flagella:
- a) are surrounded by a plasmalemma.
 - b) consist of microtubules.
 - c) consist of subunits of flagellin.
 - d) are long, slender appendages.
 - e) are involved in motility.
- 23) Which of the following statements about members of the phylum Phaeophyta is FALSE?
- a) They are almost entirely marine.
 - b) They dominate rocky shores in cooler regions.
 - c) Some are rockweeds and kelps.
 - d) Their classification is based on thallus structure.
 - e) They contain the xanthophyll fucoxanthin.
- 24) In a typical member of the Filicales, the:
- a) antheridia and archegonia form on the prothallus.
 - b) roots develop by circinate vernation.
 - c) sporangia are produced on the upper surface of the leaves.
 - d) gametophyte persists long after the sporophyte has become independent.
 - e) rhizomes are the most conspicuous part of the sporophyte.
- 25) Which of the following statements about sexual reproduction in bryophytes is FALSE?
- a) Sperm are the only flagellated cells produced by bryophytes.
 - b) The zygote is matrotrophic.
 - c) Sex is governed by the distribution of sex chromosomes.
 - d) In the antheridium, the spermatogenous cells are "sterile."
 - e) Chemicals released from the archegonium attract sperm.

- 26) Polyembryony is common in gymnosperms because a(n):
- a) seed produces several ovules.
 - b) ovule produces several megasporangia.
 - c) megagametophyte produces several archegonia.
 - d) archegonium contains several eggs.
 - e) megasporangium produces several megaspores.
- 27) The Irish potato famine of 1846–1847 and the U.S. epidemic of southern leaf blight of maize in 1970 resulted from:
- a) increases in the mutation rate.
 - b) mistakes in genetic engineering.
 - c) the overuse of chemical sprays.
 - d) an unusual abundance of numerous types of plant pathogens.
 - e) widespread cultivation of genetically uniform varieties that were susceptible to disease.
- 28) In most angiosperms, petals are probably evolutionary derivatives of:
- a) stamens.
 - b) sepals.
 - c) carpels.
 - d) receptacles.
 - e) peduncles.
- 29) In the process of megasporogenesis, the _____ divides _____.
- a) megaspores; meiotically
 - b) megasporocyte; meiotically
 - c) megasporocyte; mitotically
 - d) nucellus; mitotically
 - e) integument; mitotically
- 30) Which of the following statements about an upright pyramid of energy is FALSE?
- a) It represents the energy relationships among trophic levels.
 - b) The total energy of producers is represented at the base of the pyramid.
 - c) The total energy of consumers is greater than the total energy of producers.
 - d) The total energy of primary carnivores is greater than the total energy of secondary carnivores.
 - e) The total energy decreases at successively higher trophic levels.

※ 注意：請於答案卷上「非選擇題作答區」內依序作答，並應註明作答之大題及其題號。

II. 解釋名詞 【每題3分；5題共15分】

- 1) Procambium, vascular cambium, cork cambium
- 2) Essential elements, macronutrients, micronutrients
- 3) Structural gene, intron, exon,
- 4) Mixotrophy, matrotrophy, oligotrophy,
- 5) Centromere, kinetochore, synaptonemal complex

簡答題 【每題5分 (8題共40分)】

- 1) Describe the general function of the shoot system and the general function of the root system. Which tissues are continuous throughout these two systems? Suggest a hypothesis to explain why the shoot and root systems of different species are so variable in size and shape.
- 2) Consider a carpel, an ovary, and an ovule. Which is responsible for producing the female gametophyte, and which produces the pericarp of a fruit? Are these structures part of the sporophyte, the gametophyte, or a combination of the two?
- 3) Describe the process by which each of the following would be moved across membrane: O_2 , H_2O , PO_4^{2-} , Na^+ , sucrose.

- 4) A plant's response to a given hormone depends on the cells or tissues that receive the signals, the plant's developmental stage or age, the concentration of the hormone, and the concentration of other plant hormones that are present. Provide examples that support each of these claims.
- 5) What roles do cotranslational and posttranslational import play in the sorting of proteins in the cell?
- 6) Describe the differences in cell wall structure between gram-positive and gram-negative *Bacteria*.
- 7) (a) Explain the relationship between plasmogamy, karyogamy, and dikaryon formation.
(b) Describe the sexual and asexual life cycles of black bread mold (*Rhizopus stolonifer*).
- 8) Explain how eukaryotic cells are thought to have evolved from prokaryotic cells.

