※ 注意：請於試卷上「選擇題作答區」依序作答

(一) 單選題（每題 2 分，共 70 分）

1. The primary vegetative organs of plants are:

A) stems, leaves, nodes, and axillary buds.
B) sepals, petals, stamens, and carpels.
C) sporangia, seeds cones, and pollen cones.
D) roots, stems, and leaves.
E) aboveground stems, underground roots, leaves, and flowers.

2. Which of the following is an example of a prokaryotic organism?

A) Plant B) Animal C) Bacterium D) Fungus E) Protist

3. The red color of beets is due to a water-soluble pigment called anthocyanin, which is most likely found in a beet cell' s:

A) vacuole. B) chromoplasts. C) cytoplasm. D) nucleus. E) chloroplasts

4. During meiosis, DNA replication occurs during:

A) G1. B) S. C) G2. D) interkinesis. E) cytokinesis.

5. Which of the following is wrong about stem vascular bundles?

A) Can be scattered or located in a ring
B) Cells of primary xylem or larger than cells of primary phloem
C) Relative amount of cell types with the bundles can vary
D) Phloem is found to the inside and xylem to the outside
E) Can be interconnected with other vascular bundles

6. Leaves are quite vulnerable to damage by fungi and chewing insects. A leaf adaptation that would not be a deterrent to those pests would be:

A) a thick cuticle on the surface of the epidermis.
B) a bundle sheath around leaf vascular bundles.
C) stomata in the epidermis.
D) trichomes on the surface.
E) a blade divided into leaflets.

7. A root is not uniform along its length but has distinct zones. Starting at the tip, these zones proceed as which of the following?

A) Apical meristem → root cap → zone of elongation → zone of maturation/root hairs
B) Root cap → zone of elongation → apical meristem → zone of maturation/root hairs
C) Root cap → apical meristem → zone of elongation → zone of maturation/root hairs
D) Root cap → apical meristem → zone of maturation/root hairs → zone of elongation

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8. Many people buy furniture made of oak. The wood of this tree is particularly good for furniture construction because it contains large amounts of:

A) fibers. B) parenchyma. C) sclereids. D) tracheids. E) vessel elements.

9. Which of the following is the order in which flower parts are attached to the receptacle, from lowest or highest?

A) Petals → sepals → stamens → carpels
B) Sepals → petals → stamens → carpels
C) Sepals → stamens → petals → carpels
D) Sepals → petals → carpels → stamens

10. ATP is synthesized from ADP and phosphate in:

A) the cytoplasm using the oxidation of organic molecules as the energy source.
B) mitochondria using light energy as the energy source.
C) chloroplasts using light energy as the energy source.
D) chloroplasts using the oxidation of organic molecules as the energy source.

11. To promote plant growth, lights called *grow lights* should produce light enriched in what wavelengths?

A) Red and green. B) Red and blue. C) Yellow and blue.
D) Blue and violet. E) Orange and violet

12. The main advantage of Kranz anatomy is that:

A) RuBP carboxylase is found only in bundle sheath chloroplasts.
B) RuBP carboxylase is found only in palisade parenchyma chloroplasts.
C) RuBP carboxylase is found only in spongy mesophyll chloroplasts.
D) RuBP carboxylase is found only in mesophyll chloroplasts.
E) PEP carboxylase is found only in bundle sheath chloroplasts.

13. Plants as a whole are:

A) obligate aerobes. B) obligate anaerobes. C) facultative aerobes.
D) facultative anaerobes.

14. The synthesis of proteins from amino acids is a very endergonic process. In most organisms, the energy to drive this synthesis comes from all of the following *except*:

A) glycolysis. B) photorespiration. C) the citric acid cycle.
D) the electron transport chain and chemiosmotic oxidative phosphorylation.
E) respiration from lipids.

15. If a cell has a water potential of –0.3 MPa, water will diffuse from that cell toward a cell whose water potential is:

A) –0.4 MPa. B) –0.3 MPa. C) –0.2 MPa. D) –0.1 MPa. E) 0 MPa.

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16. Which of the following about phloem translocation is false?

A) It is explained by pressure flow hypothesis.
B) At sources, sugars are actively transported to sieve elements.
C) Water moves out from sieve elements at sources.
D) At sinks, sugars are actively transported from sieve elements to sink cells.

17. Which of the following statements is true?

A) The contents of the phloem are under pressure and the contents of the xylem are under tension.
B) Sieve tube members are empty, dead cells.
C) Vessel element protoplasm is unique because the vacuolar membrane disintegrates, allowing vacuolar water to mix with the cytosol.
D) Phloem sap movement is driven by the atmospheric water potential.
E) Phloem sap moves only short distances, whereas xylem sap moves long distances.

18. Which of the following is false about criteria for essentiality for a mineral?

A) The element must be necessary for complete plant development in its entire life cycle.
B) The element cannot be substituted to be effective and must be necessary by itself.
C) The element can be substituted to be effective.
D) The element must be acting inside the plant and not outside of it.

19. Essential elements would *not* be made available to plants by:

A) alternate freezing and thawing of rock.
B) runoff from rainstorms and avalanches.
C) acids released by an organism called a *lichen*.
D) the release of CO_2 by roots.
E) being incorporated into the crystalline matrix of rocks.

20. Flowers of night-blooming cereus are open at night and closed during the day. This is an example of a:

A) positive phototropic response. B) negative phototropic response. C) photonastic response.
D) photomorphogenic response. E) positive phototaxis response.

21. Which of the following was the first plant hormone discovered?

A) Gibberellin B) Auxin C) Abscisic acid D) Ethylene E) Cytokinin

22. If plants are kept in the dark, they have elongated internodes, making them spindly. This effect is due to:

A) an overproduction of auxin.
B) phytochrome in the Pr form.
C) phytochrome in the Pfr form.
D) an overproduction of gibberellins.
E) a lower auxin/cytokinin ratio in the stems.

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23. What do results of research on gravitropic responses of roots and stems show?

A) The effect of a plant hormone can depend on the tissue.
B) Different tissues have the same response to auxin.
C) Some responses of plants require no hormones at all.
D) Cytokinin can only function in the presence of auxin.

24. The most recently evolved group of plants are the:

A) ferns. B) conifers. C) gnetophytes. D) flowering plants. E) cycads.

25. The habitat of a plant species would include all of the following *except*:

A) a person who picks some of the species' flowers once.
B) nearby plants of other species.
C) the composition of the soil.
D) insects that lay their eggs in the plant's leaves.
E) length of the growing season.

26. Fossil material of progymnosperms, a now extinct group, never contains:

A) megaphylls. B) two kinds of spores. C) seeds.
D) secondary xylem and phloem. E) cork cambia.

27. Which of these actions describes secondary growth?

A) growth in height. B) growth or herbaceous tissue.
C) development of wood and bark. D) development of leaves and flowers

28. Systemin can correctly be described as a(n)

A) lipid. B) receptor. C) peptide. D) oligosaccharide.

29. Cellulose synthase is the enzyme situated in the:

A) plasma membrane. B) vacuole. C) mitochondria. D) cell wall. E) chloroplast.

30. If a polypeptide chain contains 144 amino acids, what is the minimum number of nucleotides in the mRNA coding for this chain?

A) 72 B) 144 C) 288 D) 432 E) 576

31. Which of the following mutations is the most likely to be harmful to a plant?

A) A point mutation in an rRNA gene
B) An insertion in an intron of an enzyme gene
C) A deletion in spacer DNA
D) An inversion in a tRNA gene
E) A point mutation in the region of DNA coding for a start codon

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32. Which of the following is the correct way to write the species name of corn?

A) Zea mays B) *Zea mays* C) Zea Mays D) Mays E) *mays*

33. The taxonomic level between family and class is:

A) genus. B) species. C) division (phylum). D) order. E) kingdom.

34. The major characteristic used to identify species of diatoms is:

A) their shape.

B) the pattern of ridges, depressions, and pores in the cell wall.

C) their photosynthetic pigments.

D) their type of cell division.

E) the number of positions of their flagella.

35. Rhizoids of mosses:

A) provide anchorage to the gametophore.

B) absorb water for the rest of the plant.

C) absorb minerals for the rest of the plant.

D) have chloroplasts.

E) conduct water and minerals for the rest of the plant.

※ 注意：請於試卷上「非選擇題作答區」標明題號依序作答

（二）問答題（每題 10 分，共 30 分）

1. **Please explain and distinguish substrate-level phosphorylation, oxidative phosphorylation and photophosphorylation.**

2. **What is the current model for flower organ formation? According to this model, which class (es) of genes determine the formation of sepal, petal, stamen, and carpel, respectively?**

3. **Define and give examples of the four ways (tropic, nastic, morphogenic, and taxis) that a plant or a cell can respond to a stimulus.**

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