

I. 選擇題：(一題 2 分，共 38 分) ※ 注意：請於試卷內之「選擇題作答區」依序作答。

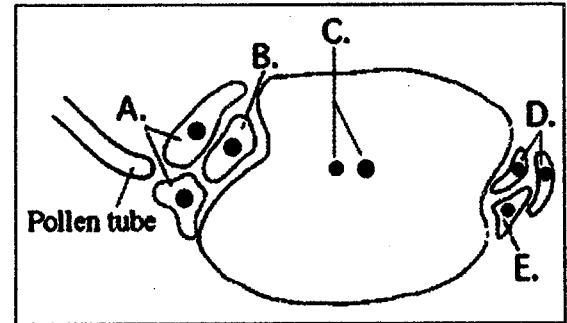
1. As you stroll through a moist forest, you are most likely to see a _____.
 - (A) zygote of a green alga
 - (B) gametophyte of a moss
 - (C) sporophyte of a liverwort
 - (D) gametophyte of a fern
2. As fuels, wood and coal _____.
 - (A) are the main fuel sources in industrialized countries today.
 - (B) are both formed from living or fossil plants.
 - (C) are both formed under pressure deep in the Earth.
 - (D) are sustainable as they are even now being made at high rates.
3. The major function of medicinal compounds in plants is to _____.
 - (A) attract pollinators for seed dispersal
 - (B) attract insects and birds to spread seeds and fruits
 - (C) defend the plant against herbivores
 - (D) defend the plant against human
4. Angiosperms are the most successful terrestrial plants. Which of the following features is unique to them and helps account for their success?
 - (A) wind pollination
 - (B) dominant gametophytes
 - (C) fruits enclosing seeds
 - (D) embryos enclosed within seed coats
5. Compared to most animals, the growth of most plant structure is best described as _____.
 - (A) perennial
 - (B) weedy
 - (C) indeterminate
 - (D) derivative
6. A student examining leaf cross sections under a microscope finds many loosely packed cells with relatively thin cell walls. The cells have numerous chloroplasts. What type of cells are they?
 - (A) parenchyma
 - (B) endodermis
 - (C) collenchyma
 - (D) sclerenchyma
7. A plant has the following characteristics: a taproot system, several growth rings evident in a cross section of the stem, and a layer of bark around the outside. Which of the following best describes the plant?
 - (A) herbaceous eudicot
 - (B) woody eudicot
 - (C) woody monocot
 - (D) herbaceous monocot

8. Endosperm is a major part of monocot seeds. In most eudicots, _____.

- (A) the same thing is true; there is a substantial amount of endosperm
- (B) endosperm never even starts to form after double fertilization
- (C) endosperm nutrients are repackaged into the cotyledons
- (D) endosperm replaces cotyledons in the seed

9. Based on the figure shown on left, after fertilization, which cell(s) give(s) rise to the embryo plant?

- (A) A
- (B) B
- (C) C
- (D) D



10. Plant hormonal regulation differs from animal hormonal regulation in that _____.

- (A) there are no dedicated hormone-producing organs in plants as there are in animals
- (B) all production of hormones is local in plants with little long-distance transport
- (C) plants do not exhibit feedback mechanisms like animals
- (D) only animal hormone concentrations are developmentally regulated

11. 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) tip of the coleoptile
- (B) elongating cells in the coleoptile
- (C) base of the coleoptile
- (D) cotyledon

12. The transduction pathway that activates systemic acquired resistance to pathogens in plants is initially signaled by _____.

- (A) herbivory
- (B) phytochrome production
- (C) methyl salicylate
- (D) proteinase inhibitors

13. Compared to plants from other environments, the cells of many desert plants contain high concentrations of solutes. This helps them survive in their arid surroundings because the high solute concentrations create relatively _____, which help reduce water loss.

- (A) low solute potentials
- (B) high pressure potentials
- (C) low pressure potentials
- (D) high solute potentials

14. Which of the following statements about bulk flow are correct?

- I. Bulk flow is driven primarily by pressure potential.
- II. Bulk flow depends on a difference in pressure potential at the source and sink.
- III. Bulk flow depends on the force of gravity on a column of water.
- IV. Bulk flow may be the result of either positive or negative pressure potential.

- (A) I and III

(B) II and III

(C) I, II, and IV

(D) I, II, III, and IV

15. Phloem transport of sucrose is often described as going from source to sink. Which of the following is most likely to function as a source?

(A) a growing leaf in early spring

(B) a growing root in late summer

(C) a tuber in early spring

(D) a shoot tip in late fall

16. Active transport of sucrose in plants at the cellular level requires _____.

(A) NADP and channel proteins

(B) xylem membranes and channel proteins

(C) sodium/potassium pumps and xylem membranes

(D) ATP, transport proteins, and a proton gradient

17. You are conducting an experiment on plant growth. You take a plant fresh from the soil that weighs 5 kilograms (kg). Then you dry the plant overnight and determine the dry weight to be 1 kg. Of this dry weight, how much would you expect to be made up of oxygen, carbon, and hydrogen?

(A) 1 gram

(B) 4 grams

(C) 960 grams

(D) 1 kg

18. Iron deficiency is often indicated by yellowing in newly formed leaves. This suggests that iron is _____.

(A) a relatively immobile nutrient in plants

(B) tied up in formed chlorophyll molecules

(C) concentrated in the xylem of older leaves

(D) concentrated in the phloem of older leaves

19. Which of the following would be the most effective strategy to remove toxic heavy metals from a soil?

(A) heavy irrigation to leach out the heavy metals

(B) application of fertilizers to compete with heavy-metal uptake

(C) application of sulfur to lower the soil pH and precipitate the heavy metals

(D) adding plant species that have the ability to take up and accumulate heavy metals

II. 問答題：(請依題號順序作答)

1. Why do we study plant biology? (5 分)

2. Explain respectively and compare these two terms: monoecious and dioecious. (7 分)

3. What is the process of alternation of generations? (10 分)

4. The transport of xylem and phloem has both common and different features. Compare xylem and phloem transport by listing common and different features between them. (15 分)

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5. Most plants close their stomata in hot and dry day to preserve water loss from leaves. The phenomenon will reduce plants to access CO₂ and cause photorespiration in C3 plants. However, some plant species evolve different strategies to overcome the arid environment. The two most important plant species in photosynthetic adaptations are C4 plants and CAM plants. Please answer following questions: (1) Please describe how photorespiration lowers photosynthetic output for C3 plants (3 分). (2) Please compare the adaptations in C4 and CAM plants from carbon fixation, reaction places, and take two examples of plant species, respectively (10 分). (3) How would you expect the relative abundance of C3 versus C4 and CAM plants in facing global climate change with the climate becoming much hotter and drier? (2 分)
6. Draw a three-year-old woody trunk in cross section, labeling secondary xylem, secondary phloem, vascular cambia, cork cambia, and cork. Add arrow showing the direction of growth in each meristem (10 分).

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