

※ 注意：請於試卷上「選擇題作答區」依序作答。

(一) 單選題(60分)

1. In photophosphorylation, the role of the ATP synthase complex is to provide a channel for protons to flow back into the:

A) lumen of the thylakoid.                      B) chloroplast stroma.  
C) intermembrane space of the mitochondrion.      D) intermembrane space of the chloroplast.  
E) cytosol.
2. In the antenna complex, light energy is transferred from one pigment molecule to another by:

A) pigment activation.                      B) fluorescence.                      C) resonance energy transfer.  
D) reduction.                      E) oxidation.
3. Which of the following conditions favors photorespiration?

A) A ratio of CO<sub>2</sub> to O<sub>2</sub> that favors CO<sub>2</sub>                      B) Conditions that cause the stomata to open  
C) Plants growing far apart                      D) A hot, dry environment  
E) Darkness
4. "Golden rice" is notable because of its:

A) high β-carotene content.                      B) high starch content.  
C) resistance to herbicides.                      D) delayed senescence.  
E) resistance to insect larvae.
5. Cytoplasmic inheritance in plants involves genes present in the:

A) cytosol only.                      B) plastids only.                      C) mitochondria only.  
D) cytosol and plastids.                      E) mitochondria and plastids.
6. Allopatric speciation is different from sympatric speciation in that allopatric speciation involves:

A) polyploidy.                      B) geographic isolation.  
C) hybridization.                      D) nondisjunction during meiosis.  
E) nondisjunction during mitosis.
7. Because meristems lack \_\_\_\_\_ tissues, meristem culture results in plants that lack \_\_\_\_\_.

A) vascular; viruses                      B) vascular; fungi                      C) epidermal; viruses  
D) epidermal; fungi                      E) epidermal; insect eggs
8. In the evolution of vascular plants, there is a trend toward the:

A) above-ground parts becoming structurally similar to the below-ground parts.  
B) progressive reduction of the sporophyte.  
C) sporophyte becoming nutritionally dependent on the gametophyte.  
D) increased protection of the gametophyte by the sporophyte.  
E) production of seeds in all lineages.

9. In gymnosperms, pollination occurs usually by:  
A) insects.      B) water.      C) wind.      D) birds.      E) mammals.
10. The four major groups of vascular plants are:  
I. ferns, lycophytes, sphenophytes, and progymnosperms  
II. flowering plants  
III. rhyniophytes, zosterophyllophytes, and trimerophytes  
IV. gymnosperms  
Which of the following is the correct sequence—from earliest to most recent—of the time period in which they were dominant on Earth?  
A) I, II, III, IV      B) I, III, IV, II      C) III, I, IV, II  
D) III, IV, II, I      E) IV, III, I, II
11. The innermost layer of the pollen sac wall is the:  
A) sporogenous layer.      B) sporopollenin layer.      C) exine.      D) intine.      E) tapetum.
12. As the seed develops, the ovary wall becomes the:  
A) perisperm.      B) pericarp.      C) endosperm.      D) nucellus.      E) integument.
13. A winged achene is called a:  
A) samara.      B) follicle.      C) legume.      D) silique.      E) capsule.
14. By definition an accessory fruit develops from:  
A) a single ovary only.      B) an ovary plus additional flower parts.  
C) several carpels of one gynoecium.      D) the gynoecia of more than one flower.  
E) a receptacle only.
15. Which of the following is NOT a group of secondary plant products?  
A) Glycosides      B) Alkaloids      C) Flavonoids      D) Carotenoids      E) Essential oils
16. Legumes have long been important in the human diet because they are:  
A) low in fats.      B) low in carbohydrates.      C) high in protein.  
D) high in fats.      E) high in carbohydrates.
17. \_\_\_\_\_ is obtained from bark.  
A) Black pepper      B) Cloves      C) Ginger      D) Cinnamon      E) Nutmeg
18. If natural selection over the time period of Eukaryote evolution has favored a DNA architecture in Eukaryotes that keeps genes turned off except when needed, this structure would be \_\_\_\_\_.  
A) nucleosomes      B) terminators      C) exons      D) introns

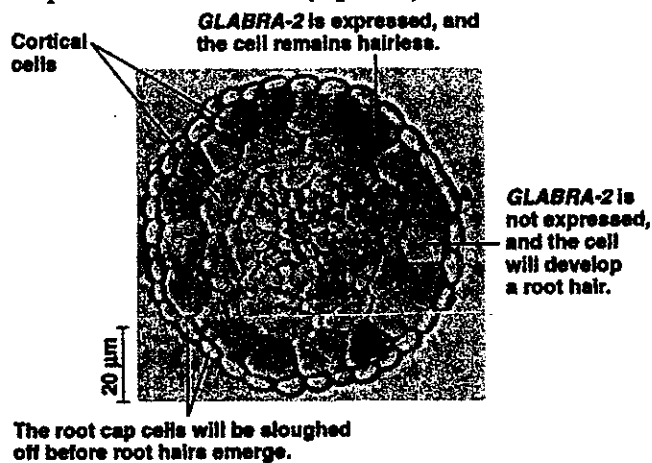
19. Snapdragons are flowers that come in a variety of colors, including red, pink, and white. A series of crosses with snapdragons having flowers of different colors produced the following results:  
pink × pink: 27 pink, 13 red, 14 white  
red × red: all red  
white × white: all white  
pink × white: 29 pink, 26 white  
pink × red: 28 pink, 27 red  
white × red: all pink  
Based on the results, what is the most reasonable explanation for the inheritance of these flower colors?  
A) more than two alleles      B) incomplete dominance      C) codominance  
D) pleiotropic effects      E) qualitative effects
20. Plasmodesmata are cell-cell junctions that are found between \_\_\_\_\_.  
A) individual cardiac cells in heart muscle tissue  
B) adjacent plant cells  
C) adjacent animal cells in the same tissue type  
D) the plasma membrane of actively dividing prokaryotes
21. Which of the following description is about a growth response, not a behavioral response?  
A) opening of the leaf's stomatal pores during the day when sufficient water is available  
B) leaflet folding by *Mimosa pudica* upon being touched  
C) elongation of a cell in the root cortex upon auxin-induced cell wall acidification  
D) "sleep" movement of plant leaves at night to align them vertically
22. Upon pathogen attach, plants can defend themselves via following methods except \_\_\_\_\_  
A) synthesizing chemicals that inhibit the pathogen.  
B) limiting the spread of the pathogen to other cells.  
C) Secreting chemicals that signal the presence of pathogens to other parts of the plant.  
D) generating antibodies against specific items found in the pathogen.
23. In the life cycle of flowering plants, what are the two generations?  
A) petal and sepal      B) embryo and endosperm  
C) sporophyte and gametophyte      D) none of the above
24. Self-incompatibility most importantly involves \_\_\_\_\_.  
A) a biochemical mechanism on the part of the pistil  
B) morphological differences between flowers  
C) the genetic identities of pistil and pollen  
D) a and c

25. Plants differ from animals in that some of their growth is more likely to be \_\_\_\_\_.  
A) a result of cell elongation    B) radial    C) determinate    D) indeterminate
26. Which tissue system is the greatest obstacle to the entry of pathogens into a plant?  
A) dermal    B) vascular    C) ground    D) b and c equally
27. Which of the following is not a function resulting from the action of guard cells?  
A) lowering the loss of water upon detecting certain signals from water-stressed roots  
B) keeping the leaves at a more positive water potential relative to the roots  
C) allowing an optimal rate of photosynthesis to occur by letting CO<sub>2</sub> enter the leaf  
D) permitting cooling of the leaf by the evaporative loss of water
28. Which reflects the correct relationship of water potentials for a typical tree on a sunny day?  
A) leaf  $\Psi$  < trunk  $\Psi$  < soil  $\Psi$   
B) outside air  $\Psi$  > leaf mesophyll  $\Psi$  < root  $\Psi$   
C) leaf  $\Psi$  > trunk  $\Psi$  > soil  $\Psi$   
D) soil  $\Psi$  < root  $\Psi$  > leaf  $\Psi$
29. In the formation of a root nodule, which step normally occurs first?  
A) Bacteria produce "nod factors."  
B) The infection thread is formed.  
C) Plant roots secrete signals that attract *Rhizobium*.  
D) Vascular connections to the nodule are established.
30. Legumes (such as soybeans) commonly obtain their nitrogen through a mutualistic association with \_\_\_\_\_.  
A) nitrifying bacteria, which oxidize ammonium to nitrite  
B) ammonifying bacteria, which convert organic nitrogen to ammonium  
C) nitrifying bacteria, which extract nitrogen from decomposing animals  
D) nitrogen-fixing bacteria, which convert gaseous nitrogen to ammonium

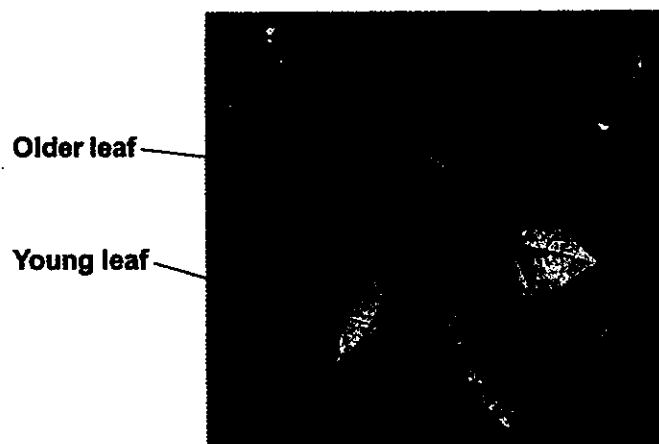
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(二) 問答題 (40 分)

1. Distinguish between fleshy fruits, dry indehiscent fruits, and dry dehiscent fruits. Give two examples of each. (10 points)
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? (10 points)
3. The figure below is a cross section of an Arabidopsis root. According to the description in the figure, please answer the following questions. (1) What is the relationship between the function of *GLABRA-2* and root hair formation? (2) If the *GLABRA-2* is gone in the whole root, what will happen to the development of root hairs? (8 points)



4. The figures below showed the chlorosis in the young leaves. Please answer the questions according to this figure. (1) What nutrients whose deficiencies give rise to this symptom? (2) According to the symptom's location, which nutrients are likely to be the cause? (6 points)



5. You have isolated a new compound which is synthesized in plants. How would you know whether this compound accelerate or delay the leaf senescence? Please describe two methods or experiments to answer this question. (6 points)

試題隨卷繳回

