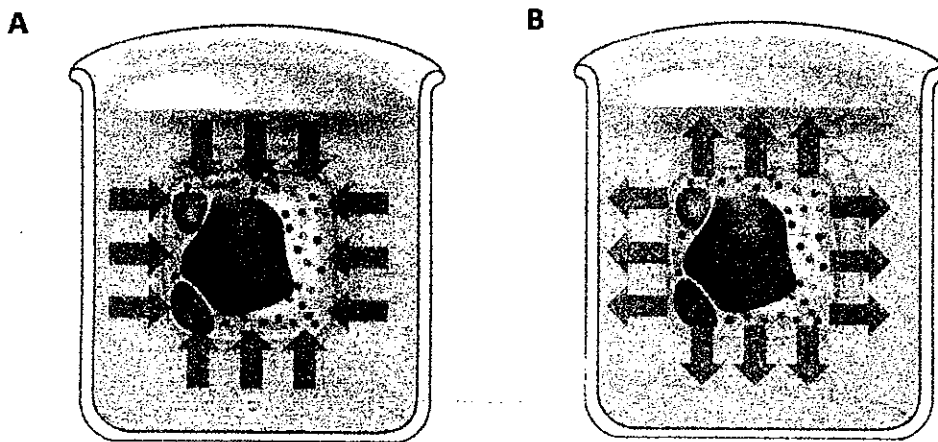


重要! 依照題號、標示題號將答案寫在試卷上，請勿將答案填寫於試題紙上

- 1) [2pt] Compared to most animals, the growth of most plant structure is best described as [1].
A) slow
B) weedy
C) indeterminate
D) derivative
E) primary
- 2) [2pt] When a cell is placed in pure water, the cells' solute potential is [2.1] [high OR low?] relative to its surroundings. [2pt] Which of the following figures would best depict the net movement of water? [2.2]



- 3) [2pt] Carbon dioxide enters the inner spaces of the leaf through the [3].
A) petal
B) stoma
C) epidermal trichomes
D) xylem
E) walls of guard cells
- 4) [2pt] One important difference between the anatomy of roots and the anatomy of leaves is that [4].
A) only leaves have phloem and only roots have xylem
B) root cells have cell walls and leaf cells do not
C) a waxy cuticle covers leaves but is absent from roots
D) vascular tissue is found in roots but is absent from leaves
E) leaves have epidermal tissue but roots do not
- 5) [4pt] Which of the following best describes double fertilization in a diploid flowering plant (genotype AA on A locus) hand-pollinated using pollens from another plant (genotype aa on A locus)?
A) The egg of the embryo sac is haploid (genotype A on A locus)
B) The endosperm is triploid (genotype Aaa on A locus)
C) The genotype of seed coat is Aa on A locus
D) The sperm is haploid (genotype could be either A or a on A locus)

見背面

6-10) From the list of terms below, please match with the best corresponding part for each tissue/organ in the figure.

Apical bud, lateral root, stem, node, internode, axillary bud, primary root, branch, leaf

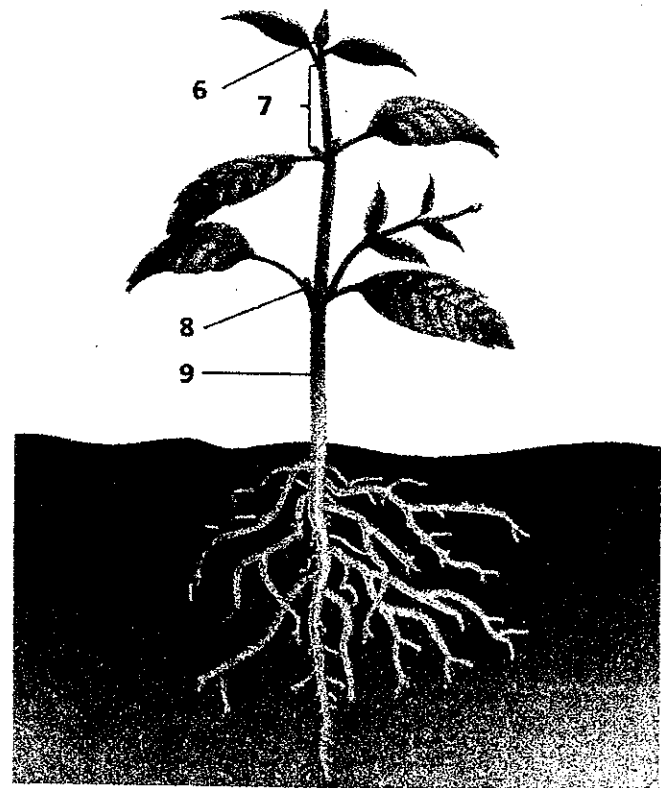
6) [2pt]

7) [2pt]

8) [2pt]

9) [2pt]

10) [2pt]



11) [2pt] Which of the following describes secondary growth?

- A) growth in height
- B) development of leaves and flowers
- C) growth of herbaceous tissue
- D) development of wood and bark
- E) development of fruit

12) [3pt] Plant hormones [12].

- A) naturally exist in very large amounts in plants
- B) change their shape in response to stimulus
- C) are unable to move from one cell to another
- D) affect only cells with the appropriate receptor

13) [3pt] What is the adaptive advantage of having small, needlelike leaves?

- A) increased surface area, increasing photosynthesis
- B) decreased efficiency of light capture
- C) decreased surface area, reducing gas exchange
- D) decreased surface area, reducing water loss

14) [3pt] Which of the following would be LEAST likely to affect osmosis in plants?

- A) temperature
- B) a difference in solute concentrations
- C) receptor proteins in the membrane
- D) aquaporins
- E) a difference in water potential

15) [2pt] 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 [15], which help reduce water loss.

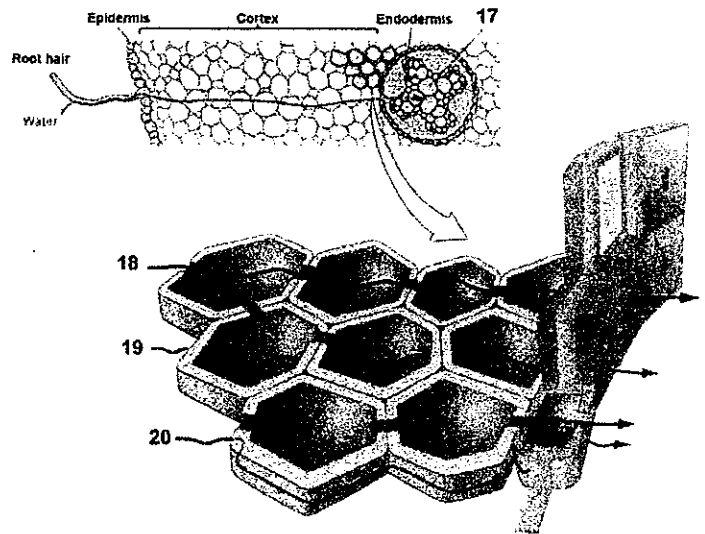
- A) low solute potentials
- B) high pressure potentials
- C) low pressure potentials
- D) high solute potentials

16) [2pt] The detector of light during de-etiolation (greening) of a tomato plant is [16].

- A) carotenoid
- B) xanthophyll
- C) phytochrome
- D) chlorophyll
- E) auxin

17-20) Please pick the best term from the following list for questions 17 to 20:

phloem, xylem, pith, cambium
Symplastic route, Apoplastic route, Transmembrane route



17) [3pt]

18) [3pt]

19) [3pt]

20) [3pt]

21) [2pt] Which elements are most often the limiting nutrients for plant growth?

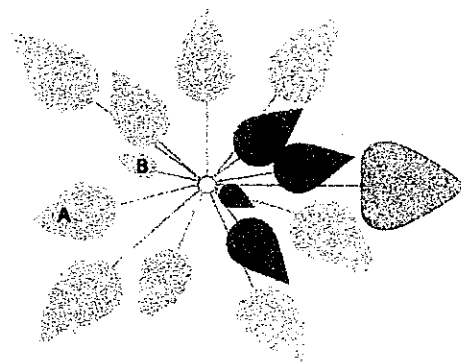
- A) nitrogen, potassium, phosphorus
- B) nitrogen, magnesium, carbon
- C) carbon, iron, zinc
- D) carbon, nitrogen, oxygen
- E) carbon, potassium, copper

22) [4pt] Please arrange the following events/status in the correct sequence during the alternation of generations in the life cycle of a flowering plant.

fertilization, gametophyte, gamete, meiosis, mitosis, sporophyte, zygote

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23) [3pt] Sucrose transport in the phloem transport is often described going from source to sink. Which of the leaves in the figure is more likely to function as a source? (A or B)



as

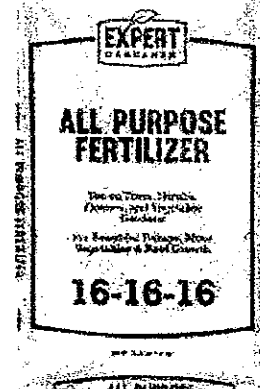
24) [3pt] A plant seedling bends toward sunlight because [24].
A) auxin migrates to the lower part of the stem due to gravity
B) there is more auxin on the light side of the stem
C) auxin is destroyed more quickly on the dark side of the stem
D) gibberellins produced at the stem tip cause phototropism
E) auxin is found in greatest abundance on the dark side of the stem

25) [3pt] Which of the following statements about essential nutrients are TRUE? Essential nutrients [25].
I. are necessary for plant growth and reproduction
II. are required for a specific structure or metabolic function
III. cannot be synthesized by a plant
IV. are produced by symbiotic bacteria
A) I and IV
B) I, and III
C) I, II, and III
D) I, II, III, and IV

26) [4pt] In what order should the following events take place during double fertilization:

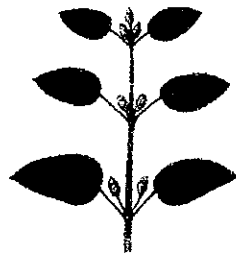
double fertilization, pollen tube emerges from pollen grain, pollen tube enters micropyle, pollination

27) [2pt] The three numerical values typically displayed on a fertilizer package, such as "16-16-16" in this context, signify the primary components of the fertilizer and also the essential macronutrients for plants. What are these nutrients?

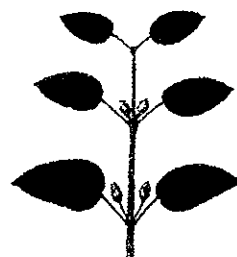


28-30) [2pt each] For each of the following conditions, please predict the most likely situation for the outgrowth of the axillary bud. Use 0 to indicate limited outgrowth and 1 to indicate some outgrowth.

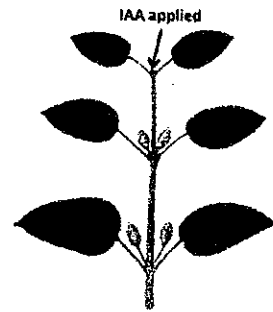
28



29



30



Answer (0 or 1)			
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31) [3pt] After mutagenesis and screening, you have found a mutant that is able to grow in soil with high salt content. Chemical analysis showed that this plant has a decreased amount of Na^+ throughout the entire plant relative to normal plants. What kind of mutation do you predict this plant contains?

- A) mutation affecting plasma membrane sodium channels
- B) mutation affecting metallothioneins
- C) mutation affecting tonoplast sodium channels
- D) mutation affecting tonoplast antiporters

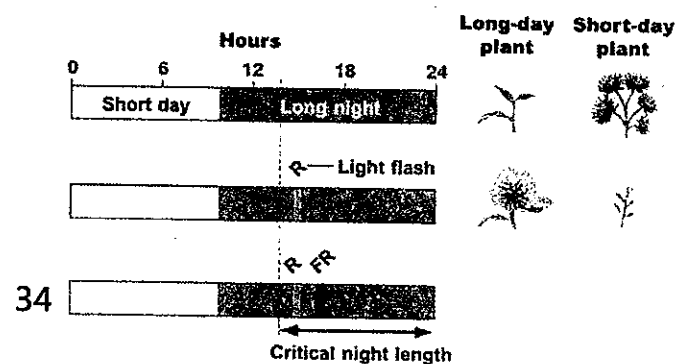
32) [2pt] Nitrogen fixation is a process that [32].

- A) recycles nitrogen compounds from dead and decaying materials
- B) converts ammonia to ammonium
- C) releases nitrate from the rock substrate
- D) converts nitrogen gas into ammonia
- E) recycles nitrogen compounds from dead and decaying materials and converts ammonia to ammonium

33) [2pt] A short-day plant will flower only when [33].

- A) days are shorter than nights
- B) days are shorter than a certain critical value
- C) nights are shorter than days
- D) days and nights are of equal length

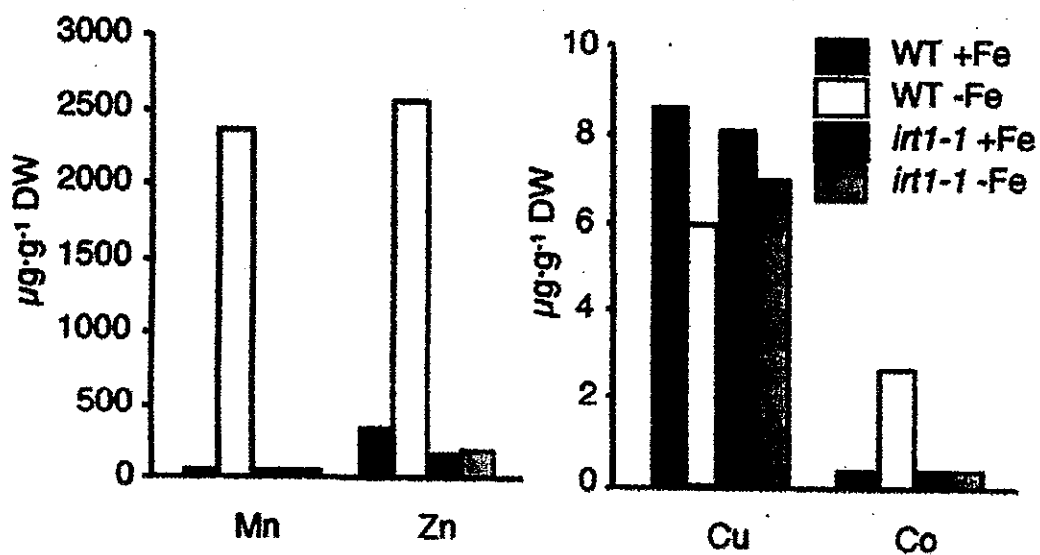
34) [2pt] If a flash of red light followed by a flash of far-red light occurs in the middle of the night, which type of plant is more likely to flower: the long-day plant or the short-day plant?



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35) [13pt] Plants are known to accumulate heavy metals when experiencing iron deficiency. Yeast-based characterization of IRT1 revealed its ability to transport not only iron but also zinc, manganese, cadmium, and likely cobalt. The IRT1 gene primarily governs iron uptake in roots (Vert et al., Plant Cell 14 [2002]: 1223-33). In assessing the specificity of the IRT1 transporter in Arabidopsis plants, researchers examined the concentrations of manganese, zinc, copper, and cobalt in both wild-type and *irt1-1* mutant plants. Please use the data in the accompanying figure to answer the following questions

- 35.1 [3 pt] Does IRT1 transport Mn in the presence of iron in Arabidopsis?
35.2 [3 pt] Does IRT1 transport Mn in the absence of iron in Arabidopsis?
35.3 [3 pt] Does IRT1 transport copper in Arabidopsis?
35.4 [4 pt] What conclusions regarding the specificity of the IRT1 transporter can be drawn?



試題隨卷繳回