務請標明題號，並以橫式作答

I. 單選題 (30%；每題 1 分；依序標明題號後作答)

1. The opening of stomata is thought to involve
   A) an increase in the osmotic concentration of the guard cell
   B) a decrease in the osmotic concentration of the stoma
   C) active transport of water out of the guard cells
   D) decreased turgor pressure in guard cells
   E) movement of K^+ out of guard cell

2. Which of the following characteristics of plants is absent in their closest relatives, the charophytes?
   A) chlorophyll b B) cellulose in cell walls
   C) alternation of multicelluar generations
   D) sexual reproduction
   E) formation of a cell plate during cytokinesis

3. Gymnosperms and angiosperms have the following in common except
   A) seeds B) pollen C) vascular tissue D) ovaries E) ovules

4. Which of the following would not contribute to water uptake by a plant cell?
   A) an increase in the water potential (ψ) of the surrounding solution
   B) a decrease in pressure on the cell exerted by the wall
   C) the uptake of solutes by the cell
   D) a decrease in ψ of the cytoplasma
   E) increase in tension on the surrounding solution

5. The movement of sap from a sugar source to a sugar sink
   A) occurs through the apoplast of sieve-tube members
   B) may translocate sugars from the breakdown of stored starch in a root up to developing shoots
   C) is similar to the flow of xylem sap in depending on tension, or negative pressure
   D) depends on the active pumping of water into sieve tubes at the source end
   E) results mainly from diffusion

6. A plant that is self-incompatible has a genotype of S5S9 for the S-locus. It receives pollen from a plant that is S3S9. Which of the following is most likely to occur?
   A) all of the pollen will germinate, forming pollen tubes
   B) about half of the pollen will germinate
   C) none of the pollen will germinate
   D) fertilization will occur in about half of the flowers of the pollinated plants
   E) pollen from the S3S9 plant will secrete ribonuclease that destroys epidermal cells of the S5S9 stigma.

接背面

7. During which stage of glucose metabolism is the most ATP produced?
   A) glycolysis B) fermentation C) Krebs cycle D) electron transport system
8. Why not just stop at pyruvate in the absence of oxygen during respiration? Why lactate?
   A) The reaction from pyruvate to lactate converts NADH back to NAD+, which is required for glycolysis.
   B) The reaction from pyruvate to lactate converts ADP to ATP.
   C) The reaction from pyruvate to lactate converts ATP to ADP.
   D) The reaction from pyruvate to lactate generates energy.
9. In terms of energy production, what is the most important product produced by the Krebs cycle?
   A. ATP B. CO_2 C. NADH and $FADH_2$ D. glucose
10. Which electron transport chain produces ATP?
   A) the electron transport chain after photosystem I
   B) the electron transport chain between photosystem II and photosystem I.
   C) the electron transport chain after the last photosystem
11. Fungi are among the most adaptable of all living organisms, because they
   A) can perform photosynthesis
   B) digest their food inside the cell
   C) can move about in search of food or mates
   D) are unicellular in most stage of their life cycle
   E) decompose many toxic pollutants
12. What kind of plant formed vast coal?
   A) lycopods B) conifers C) seed plant D) moss E) lichen
13. Tendril with its tip coiled around a wire is a modified
   A) root B) stem C) runner D) leaf E) rhizome
14. The eggs of seed plants are fertilized within ovules, and the ovules then develop into
   A) seed B) spores C) gametophyte D) fruit E) sporophytes
15. Angiosperms are different from all other plants because only they have
   A) a vascular system B) seeds C) flower D) a sporophytic phase
   E) a life cycle that involves alternation of generations
16. Which type of plant hormone can stimulate the growth of lateral buds
   A) Auxins B) Gibberellins C) Cytokinins D) Abscisic acid
   E) Ethylene
17. Under water stress conditions, the level of a stress hormone is elevated to effectively control the stomatal closure to avoid severe water loss. What is the responsible hormone
   A) Auxins B) Gibberellins C) Cytokinins D) Abscisic acid E) Ethylene

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18. In p the daytime of hotosynthetic cells, starch and sucrose are synthesized in _____and _____, respectively,

A) chloroplasts, mitochondria B) chloroplast, cytosol

C) chloroplast, ER D) cytosol, chloroplast E) chloroplast, vacuole

19. For forming one molecule of **NADPH** by photochemical reaction, at least how many photons are required to drive the electrons transferred through the photosystems in thylakoid?

A) 1 B) 2 C) 4 D) 8 E)12

20. Which following element is NOT essential for plant growth?

A) Ca B) K C) B D) I E) Fe

21. Which element is always existing as a free ion and not conjugated with any other organic molecules?

A) Ca B) K C) P D) Mg E) Mn

22. The cell cycle is commonly divided into two parts:

A) mitosis and interphase B) mitosis and the S phase

C) the G_1 phase and G_2 phase D) the G_2 phase and S phase

E) the G_1 phase and S phase.

23. Which of the following statement about the **phragmoplast** is **FALSE** during cell division :

A) it forms between the two daughter nuclei

B) it is composed of microtubules

C) its formation precedes the growth of the cell plate

C) it begins to form at the walls of the dividing cell and grows inward.

E) it guides the deposition of cell wall components

24. If two genes are linked, then by definition they

A) are alleles of the same gene

B) occur on the same chromosome

D) occur on different chromatids of the same chromosome

E) will segregate independently

F) will undergo independent assortment.

25. The components of electron transport chain occurring in the inner mitochondrial membrane carry out the electron relay from _____ to _____

A) Water, NAD^+

B) Water, $NADP^+$

C) NADH, oxygen

D) NADH, water

E) $FADH_2$, water

接背面

26. Which of the following is NOT evidence supporting the role of phloem in sugar transport?
A) honeydew contains amino acids but not sucrose
B) ^{14}C-labeled sucrose is transported in sieve tube
C) the exudate from the stylets of feeding aphids (蚜蟲)is mainly sucrose
D) radioactive assimilates are transported in the phloem
E) when a tree girdled, the bark above the ring become swollen

27. Guttation is a special way of water loss as liquid form from plants at night. What is the major force to drive the appearance of this phenomenon?
A) matric potential of xylem B) surface tension of water column in cell wall
C) osmotic potential of phloem D) root pressure
E) transpirational pull

28. Plants can receive stimuli of various electomagnetic waves and give rise specific responses. The phototropic movement of coleoptile of grasses is most sensitive to
A) Red light B) Yellow light C) Green light D) Blue light
E) UV light

29. Which enzyme is involved in the C4 pathway of photosynthetic metabolism?
A) Rubisco B) pyruvate kinase C) sucrose synthase D) starch synthase
E) PEP carboxylase

30. What is the function of the **coupling factor** in light reaction of photosynthesis?
A) photosplitting of water B) hydrolysis of ATP
C) transport of electrons from PSII to PSI D) formation of NADPH
E) formation of ATP

II. 解釋名詞 (30%：每題 2 分)

1. Chemiosmosis
2. Greenhouse effect
3. Lichens
4. primary growth
5. Pressure-flow mechanism
6. Rhizobium
7. Apical meristem

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8. CAM plants
9. Vernalization
10. Maternal inheritance
11. Polar transport of IAA
12. Totipotency
13. Diurnal rhythm
14. Cytoskeleton
15. Biological nitrogen fixation

III. 申論題 (40%；每題 10 分)

1. 1970 年代，生物學者 Carl Worse 研究不同生物之 small subunit rRNA（ssu RNA）之核苷酸序列而終於提出生物可分成三群。請你說出生命之三個 Domain 爲何？其中真核生物可再分爲許多 Kingdoms，請列出其中之四大 Kingdoms。
2. 近年來常有報導農民利用牛奶或雞蛋施肥果樹，請你從植物營養之觀點對此事提出你的看法。
3. 試分別敘述 Auxins 和 Gibberellins 對於植物生長發育的影響。
4. 近來經過基因改造之轉殖植物的產品已漸漸充斥整個國際市場，各式各樣滿足人類特殊需求的轉殖植物正快速散佈到世界的各個角落，(a)這種現象可能對地球上原有物種的生存(植被分佈)造成怎樣的影響？(5 分)
(b)簡述如何獲得可以生長在被鎘(或其他重金屬)污染土地的轉殖植物？(5 分)

試題必須隨卷繳回