

題號： 209

國立臺灣大學114學年度碩士班招生考試試題

科目：植物營養學

節次： 3

題號： 209

共 3 頁之第 1 頁

※ 注意：請於試卷內之「選擇題作答區」依序作答。

Part I : Select the correct answer, only 1 answer is correct. (50%)

1- In which organic molecules is nitrogen assimilated by plants?

- a- Sugars (for instance sucrose, glucose)
- b- Polysaccharides (for instance cellulose, starch)
- c- Amino acids
- d- Lipids

2- What are the main elements used as indicators to characterize a fertilizer?

- a- Fe, Mg and Mn
- b- Ca, S and Mg
- c- Na, Mg and Si
- d- N, P and K

3- What are the main forms of nitrogen transported by plants?

- a- Na and N_2
- b- N_2O and NO
- c- Nitrite and nitrogen dioxide
- d- NO_3^- and NH_4^+

4- What is the origin of nitrogen in soil?

- a- It comes from the slow weathering of N-containing rocks
- b- N is abundant in sea water which can be used to fertilize plants
- c- Dinitrogen is highly abundant in the atmosphere and is fixed by microorganisms
- d- Nitrogen was produced over the years by industrial means

5- How can plants assimilate nitrogen from the environment?

- a- They take up nitrogen that has been assimilated by soil microorganisms
- b- Plants possess a nitrogenase enzyme that reduces N_2 at their root surface
- c- Plant roots secrete protons that can solubilize nitrate
- d- Plant leaves can absorb dinitrogen from the atmosphere through their stomata

6- Is nitrogen a highly mobile element?

- a- No, it is not mobile and therefore it is difficult to solubilize for plants
- b- Nitrogen is mobile in alkaline soil only
- c- Nitrogen is mobile in acidic soil only
- d- Yes, N is highly mobile and leaching from soil is a cause of water pollution

7- Which of these is NOT used as a nitrogen fertilizer?

- a- Nitrogen-containing rocks from mining
- b- Nitrate produced industrially through the Haber-Bosch process
- c- Animal excrements
- d- Plant residues

8- Is phosphorus a mobile element?

- a- No, it is not mobile and therefore it is difficult to solubilize for plants
- b- Phosphorus is mobile in acidic soil only
- c- Phosphorus is mobile in soils containing high calcium and aluminum
- d- Yes, P is highly mobile and leaching from soil is a cause of water pollution

見背面

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節次： 3

題號：209

共 3 頁之第 2 頁

- 9- What is the main source of phosphorus in the environment?
- a- It comes from the slow weathering of P-containing rocks
 - b- P is abundant in sea water which can be used to fertilize plants
 - c- P is abundant in the atmosphere and is fixed by microorganisms
 - d- P can be produced by industry by fixing P from the air
- 10- What can decrease phosphorus availability in soils?
- a- P precipitates with potassium and nitrogen if they are too abundant
 - b- P precipitates with aluminum and calcium if they are too abundant
 - c- In alkaline soils, hydroxyl ions bind to phosphate ions and precipitates
 - d- P can be leached from soil after heavy rains
- 11- Which part of the plants has the highest concentration of calcium?
- a- The bones
 - b- The cell walls
 - c- The cytosol
 - d- The leaves
- 12- Which of the following is a major biological function of calcium in plants?
- a- It is incorporated in amino acids
 - b- It is incorporated in sugars
 - c- It keeps cellulose fibers straight
 - d- Ca concentration is a signal during plant-environment interactions
- 13- Which form of sulfur can be absorbed by plant leaves?
- a- Sulfite
 - b- Sulfur dioxide
 - c- Sulfate
 - d- Methionine
- 14- Is potassium a mobile element?
- a- No, it is not mobile and therefore it is difficult to solubilize for plants
 - b- Potassium is mobile in acidic soil only
 - c- Potassium is mobile in soils containing high calcium and aluminum
 - d- Yes, K is highly mobile in all types of soils
- 15- What is the main biological function of potassium in plants?
- a- Potassium can mediate electron transfer
 - b- Potassium is an important constituent of amino acids
 - c- Potassium is an important constituent of sugars
 - d- Potassium is an essential osmolyte
- 16- What is the main biological function of iron in plants?
- a- Fe can mediate electron transfer
 - b- Iron is an important constituent of amino acids
 - c- Fe is an important constituent of sugars
 - d- Iron is an essential osmolyte
- 17- What is the main biological function of magnesium in plants?
- a- Potassium can mediate electron transfer

接次頁

題號： 209
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節次： 3

國立臺灣大學 114 學年度碩士班招生考試試題

題號： 209
共 3 頁之第 3 頁

- b- Potassium is an important constituent of amino acids
- c- Potassium is incorporated into chlorophyll and necessary for photosynthesis
- d- Potassium can function as a signal

18- Is magnesium highly bioavailable to plants?

- a- Magnesium is not very mobile and therefore poorly bioavailable
- b- Magnesium easily precipitates and its solubility and bioavailability is low
- c- Magnesium is soluble but is easily outcompeted by other elements at acidic pH
- d- Magnesium from the atmosphere can easily be absorbed by leaves

19- Is copper (Cu) an abundant element in plant tissues?

- a- Cu does not accumulate in plants tissues because it is highly toxic
- b- Cu is an abundant macronutrient in plant leaves
- c- Cu is the most abundant of all micronutrients in plant tissues
- d- Cu is only abundant in plants growing on alkaline soil

20- Which of these elements are all essential micronutrients?

- a- Nitrogen, potassium, phosphorus
- b- Magnesium, calcium, sulfur
- c- Boron, molybdenum, zinc
- d- Silicon, iron, magnesium

※ 注意：請於試卷內之「非選擇題作答區」依序作答，並應註明作答之大題及小題題號。

Part II. Short answer questions (50%)

21. Plants grown in acidic or alkaline soils are prone to deficiencies or toxicities of which mineral elements? (10 points)
22. Explain the Green Revolution in plants. (10 points)
23. Aluminum is a beneficial element for tea plants, and excessive accumulation of aluminum does not cause toxicity to tea plants:
- (1) Explain the definition of a beneficial element. (5 points)
 - (2) Explain the possible reasons why tea plants are not affected by aluminum toxicity. (5 points)
24. Answer the following questions related to photosynthesis:
- (1) List five types of antenna pigments. (5 points)
 - (2) What is the first product of carbon fixation in C3 and C4 plants? (5 points)
25. Answer the following questions:
- (1) The theory of mineral nutrients in plants. (5 points).
 - (2) Fertilizer burn. (5 points)

試題隨卷繳回