

I. Translation: translate Questions 1~2 into Chinese, 20 points each**1. Microbial Conversion**

Conversion of tropical forest to pasture (牧場) has been widespread in the Amazon Basin in recent decades, a process that has been accompanied by a loss of diversity of flora and fauna and often by a reduction in soil fertility. However, how conversion affects soil microorganisms is largely unknown. Using DNA sequencing techniques, Rodrigues (羅德里格斯) *et al.* compared the bacterial composition of forest and pasture soils at a site in Rondonia, Brazil (巴西朗多尼亞省). In pasture soils, there was a reduction in the diversity of taxa in the phylum Acidobacteria (酸桿菌), organisms that are sensitive to increases in pH and soil carbon content, both of which occur after forest clearance. On the other hand, there was an increase in diversity within the phylum Firmicutes (厚壁菌), which are tolerant of desiccation (乾燥) and greater extremes of temperature. At individual sample sites, the alpha diversity (number of taxa) of bacteria was higher in the pasture soils than in forest soils, but the beta diversity (variation between sites) of the pasture soils was significantly lower than in the forest. The lower beta diversity of the pasture soils implies a biotic homogenization of the soil microbiota after the conversion to pasture, and an eventual loss of overall diversity despite local increases in alpha diversity.

2. Making Eggs from Stem Cells

Researchers have been trying for more than a decade to make egg cells in the laboratory. This year, they took an important step toward that goal, as lab mice gave birth to the first live pups born of eggs derived from mouse embryonic stem (ES) cells. The technique, developed by researchers in Japan, still requires a mouse to host the developing eggs during a key part of their maturation, so it doesn't achieve the big prize: deriving egg cells entirely in vitro. But it does demonstrate that ES cells can give rise to fertile oocytes, and it gives scientists a way to learn more about how these complex and powerful cells develop.

Egg and sperm cells, also known as germ cells, have a particularly complicated development. They undergo meiosis, a special kind of cell division that leaves them with half the normal number of chromosomes. They also reset the genomic imprinting that helps determine which genes are turned on and which are turned off. Although pluripotent cells (多能幹細胞)-including ES cells-are capable of becoming any kind of cell in the body, turning them into germ cells in the lab has proved difficult.

II. Translate the following protocol into English (15% each)

3. 將洋菜膠(agarose gel, 1%)置於電泳槽中，注入電泳液，至與膠體等高為止。將DNA樣品與10倍染液混合，加至膠片凹槽中。以100伏特電壓，驅動DNA樣品由負極向正極移動。40分鐘後，以紫外光觀察DNA片段的分佈，並以數位相機照相。
4. 為瞭解氧化壓力對粒線體活性的影響，我們以過氧化氫 (H_2O_2 , 1%) 處理細胞，並測量細胞中ATP的含量。結果顯示，過氧化氫處理後，胞內ATP濃度由控制組的 6.8 ± 0.9 mM，顯著降為 3.3 ± 0.6 mM。因此氧化壓力會降低粒線體的活性，減少ATP的生成；然而此實驗並不能排除氧化壓力抑制糖解作用，因而減少胞內ATP含量。

見背面

※ 注意：選擇題請於試卷之「選擇題作答區」依序作答。

III. Choose the better expression from those two sentences in each question. (3 points each)

5. A. Calcium addition improves salinity tolerance of tomato.
B. Improvement effects of added calcium on salinity tolerance of tomato.
6. A. After 4h, the cells were removed from the culture dishes by treatment with trypsin and EDTA.
B. After 4 hr, we treated cells with trypsin and EDTA to detach cells from culture dishes.
7. A. In order to test this hypothesis, it was necessary to develop an assay for c-myc promoter function *in vitro*.
B. To test this hypothesis, it was necessary to develop an assay for c-myc promoter function *in vitro*.
8. A. The supernatant of a low speed centrifugation ($250 \times g$, 4 min.) was centrifuged at $3000 \times g$ for 10 min. to obtain a plasma membrane pellet.
B. To get the plasma membrane pellet, the sample was centrifuged first at $250 \times g$, for 4 min. and the supernatant was then centrifuged again at $3000 \times g$ for 10 min.
9. A. In Figure 1, we can see clearly the difference.
B. Figure 1 shows the difference.
10. A. The kinase activity is sensitive to NaCl concentration.
B. The sensitivity of the kinase activity is determined by the NaCl concentration.
11. A. The response before the treatment was normalized to that after treatment.
B. The value before the treatment was divided by that after the treatment.
12. A. Ten samples were collected by us every day.
B. We collected 10 samples a day.
13. A. The significance was determined by Student's *t*-test with a *p* value < 0.05 .
B. Student's *t*-test was used to calculate the *p* value and it was significant when $p < 0.05$.
14. A. The interaction between AA and ZZ was determined by these results.
B. These results demonstrate the interaction between AA and ZZ.

試題隨卷繳回