**1. Please translate the following paragraph into Chinese (15%).**

Soil biodiversity is increasingly recognized as providing benefits to human health because it can suppress disease-causing soil organisms and provide clean air, water and food. Poor land-management practices and environmental change are, however, affecting belowground communities globally, and the resulting declines in soil biodiversity reduce and impair these benefits. Soil biodiversity can be maintained and partially restored if managed sustainably. Promoting the ecological complexity and robustness of soil biodiversity through improved management practices represents an underutilized resource with the ability to improve human health. (Adapted from Nature, 2015)

**2. Please translate the following paragraph into Chinese (15%).**

Soil microorganisms are clearly a key component of both natural and managed ecosystems. A gram of soil can contain thousands of individual microbial taxa, including viruses and members of all three domains of life. Although most soil microorganisms remain undescribed, we can begin to categorize soil microorganisms on the basis of their ecological strategies. The field is now poised to identify how we can manipulate and manage the soil microbiome to increase soil fertility, improve crop production and improve our understanding of how terrestrial ecosystems will respond to environmental change. (Adapted from Nature Reviews, 2017)

**3. Please translate the following paragraph into Chinese (20%).**

The nitrogen cycle is one of the most important biogeochemical cycles on Earth because nitrogen is an essential nutrient for all life forms. To supplement natural nitrogen fixation, farmers add large amounts of nitrogen-containing fertilizer to their soils such that nitrogen never becomes a limiting nutrient for plant growth. However, of the nitrogen added to fields — most of which is in the form of $NH_3$ and $NO_3^-$ — only 30–50% is taken up by plants, while the remainder is metabolized by soil microorganisms in processes with detrimental environmental impacts. Nitrification refers to the biological oxidation of $NH_3$ to $NO_2^-$ and $NO_3^-$, which have low retention in soil and pollute waterways, leading to downstream eutrophication and ultimately 'dead zones' (low oxygen zones) in coastal waters. (Adapted from Nature Reviews, 2018)

**4. Please answer the questions <u>in Chinese</u> after reading the following paragraphs (30%).**

Coeliac disease (CD) is an autoimmune enteropathy triggered by the ingestion of gluten or related prolamins, in genetically vulnerable individuals. The mean frequency of CD in the general population is approximately 1%, but this prevalence is increasing every year worldwide. To date the only available effective therapy is to follow a lifelong strict gluten-free diet (GFD), which will lead to progressive clinical improvement and intestinal mucosa recovery. However, the adherence to a GFD may be difficult to pursue and social life can be restricted because gluten-free products (GFP) available are more expensive and have a different taste. Social life can be also restricted because of the fear of contamination when eating outside home. Additionally, following a GFD implies the removal of staples such as gluten-containing bread and pasta, which are considered mainstays in a typical Western diet. With the avoidance of these cereal-based products shortage of dietary fiber and several vitamins and minerals can occur, unless patients do not follow a balanced diet, although these imbalances may be difficult to assess due to scarce information available in food labelling.

Gluten is a mixture of proteins found in wheat, related grains and hybrids, representing the main proportion of the protein content of most of the commonly consumed cereal-based products. Although gluten proteins are of low biological value, their chemical properties make them appealing for the food industry, as they are the only component providing the baked products dough with viscosity and extensibility. In order to make it possible for CD patients to maintain a normalized diet, a series of GFP have been specifically developed and launched onto the market. In addition, GFP appeal to other population groups.

GFP are made up of alternative ingredients that do not contain gluten, i.e. corn starch, potato flour/starch and tapioca flour/starch. Recently, some studies have pointed out that patients with CD tend to present with high serum cholesterol and increased body weight. GFP are possibly a major component of their diets, as they are replacing staple foods such as bread or pasta. Thus, some authors have suggested the nutrient composition of GFP as possible determinants of these risk factors. Today, the increase in the number of GFP available in the market and the possible incorporation of new ingredients like pseudocereals in their manufacturing suggest an update. Thus, the need of conducting a broad study on GFP nutritional composition could be considered useful and necessary. (Adapted from European Journal of Clinical Nutrition, 2019)

**Questions (Please answer the questions <u>in Chinese</u>)**

**(a) What is Coeliace disease (CD, 乳糜瀉症) and what is the therapy for the CD patients? (10%)**

**(b) What is gluten-free products (GFP) and how to make it? (10%)**

**(c) Why a broad study on GFP nutritional composition is useful and necessary? (10%)**

見背面

**5. Please translate the following paragraphs into Chinese (20%).**

Sweet potato (Ipomoea batatas) is a herbaceous perennial vine, which produces storage roots and edible leaves and can grow on marginal lands. The sweet potato plants have been widely dispersed by humans throughout the world since its domestication in the New World. Currently, sweet potato is the sixth most important food crop after rice, wheat, potatoes, maize and cassava. In 2015, 105 million tonnes of sweet potatoes were produced worldwide and 95% thereof in developing countries with China as the lead producer.

Both the leaves and storage roots of sweet potato have a high nutritional value for the human diet. Next to starch which comprises 60% of the dry matter (DM), leaves and storage roots are high in protein, dietary fiber, micronutrients (e.g. iron), vitamins (e.g. vitamin C) as well as bioactive compounds such as carotenoids and phenylpropanoids. The main use of sweet potato leaves is as animal feed, as it can be harvested several times throughout the year, whereas storage roots are mainly for human consumption. The storage roots of sweet potato vary in flesh color from white to orange and to purple, depending on the nature of the pigments produced. The two major pigment classes in sweet potato are carotenoids, cream to orange coloration, and anthocyanins, reddish to bluish purple, and both classes are known for their antioxidant properties. Previous studies highlighted the especially high levels of β-carotene in orange varieties and led to the incorporation of sweet potato into the program to prevent vitamin A deficiency in Africa. Since then, one of the main focus of sweet potato breeding was an increase of starch and DM whilst maintaining high provitamin A levels. (Adapted from Horticulture Research, 2019)

試題隨卷繳回