

Please translate the following paragraphs into Chinese (英翻中).

- (1) Radioactive decay in rocks: Measurements performed on rock containing radioactive elements can reveal the age of the rock. (3%)
- (2) Dormancy: Quiescent, resting state assumed by vegetative cells, especially those unable to develop specialized resting stages. In the dormant state, energy expenditure counteracts macromolecular damage. (5%)
- (3) Environmental microbiology: The study of microorganisms that inhabit the Earth and their roles in carrying out processes in both natural and human-made systems; emphasis is on interfaces between environmental sciences and microbial diversity. (5%)
- (4) Aquatic chemistry: Fundamental reactions of aqueous inorganic and organic chemistry and their quantification based on thermodynamics, equilibrium, and kinetics. (5%)
- (5) Metabolome: the metabolite pool of cells, tissues, or an organism; determined by liquid chromatography/mass spectrometry; mapped onto the proteome, transcriptome, and genome of an organism. (5%)
- (6) Abiotic reactions: These include all of the reactions not encompassed by biotic reactions. Included are inorganic, organic, photolytic, surface-catalyzed, sorptive, and transport. (5%)
- (7) Bioremediation: A managed or spontaneous process in which biological, especially microbiological, catalysis acts on pollutant compounds, thereby remedying or eliminating environmental contamination. (5%)
- (8) 2011, the United States used more than 6.8 billion barrels of oil for heating, generation of electricity and transportation. Other sources of energy are coal, natural gas and nuclear energy. Large amounts of waste, including solvents, acids, bases and metals, are also produced by the paper, transportation, electronics, defense, and metals industries. (6%)
- (9) Mineralization: Conversion of an organic molecule into its inorganic constituents. Mineralization occurs when an organic compound is altered by central catabolic cellular mechanisms. The responsible organism(s) typically benefit from mineralization and reactions - thus, microbial growth is expected, and a substantial portion (~50%) of the carbon in the original organic molecule is usually incorporated into biomass. (6%)
- (10) The copper-containing enzymes have diverse metabolic roles with one common characteristic: all involve reactions that consume oxygen or oxygen radicals. For example, copper-containing enzymes catalyze the oxidation of ferrous iron to ferric iron. (5%)
- (11) Betalains (甜菜鹼) are nitrogenous, water-soluble, red-violet and yellow pigments that form one of the major pigment classes providing striking colors to plant organs, alongside chlorophylls, anthocyanins (and other flavonoids), and carotenoids. In addition to their attractive colors, betalains were also found to have strong antioxidant activity. They have thus been widely studied with respect to their potential health-promoting properties, including anticancer, hypolipidemic, hepatoprotective, anti-inflammatory, and antidiabetic activities, as was previously reviewed. Their reported nutritional values have led to commercialization of a variety of betalain-based products in the dietary supplements industry, while their stability in a wide range of pH has made them a pigment of choice for the food industry, where they are widely used as natural food colorants. To date, structures of approximately 75 betalains have been unambiguously identified from 17 different plant families; however, many more compounds have been detected to which structures have only been putatively assigned. The number of reported betalains is also continuously increasing due to the introduction of new analytical technologies and development of better methodologies in liquid chromatography and mass spectrometry. (20%)
(Adapted from Molecular Plant 2018, 11, 7–22)
- (12) In recent years, non-biodegradable petroleum plastics have caused serious problems such as marine microplastic pollution. To solve these problems, biodegradable plastics that can be degraded into water and carbon dioxide by the action of microorganisms are desired. Several types of biodegradable plastics have been

developed. Most biodegradable plastics contain ester bonds as a hydrolyzable linkage in their backbones. Among biodegradable plastics, poly(L-lactic acid) (PLLA), poly[(R)-3-hydroxybutyrate] (P(3HB)) and its copolymers, poly(ϵ -caprolactone) (PCL), poly(butylene succinate) (PBS), poly(butylene succinate/adipate) (PBSA), and poly(butylene terephthalate/adipate) (PBAT) have been widely investigated and developed in industry. In particular, PLLA has been subjected to extensive fundamental and applied research. (15%) (Adapted from *Biomacromolecules* 2020, 21, 3301–3307)

(13) Nonribosomal peptide synthetases (NRPSs) are multidomain, modular megaenzymes that synthesize various bioactive natural products, ranging from therapeutic drugs (antibiotics, antitumor agents, and immunosuppressants) to virulence factors (cancer-causing agents and siderophores). The effectiveness of the catalysis relies on the intramodule and intermodule organization of the assembly lines of NRPSs. These enzymes select specific amino acids, incorporate them into the growing peptide, and modify the peptide backbone in a ribosome-independent manner, and altogether the family of NRPSs are able to use more than 500 precursors. These large molecular machines have been widely valued as one of the most promising resources for the production of novel bioactive compounds. (15%) (Adapted from *Nature Communications* 2022, 13, 592)

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