【問題用紙】

令和８年度　愛媛大学大学院農学研究科入学者選抜学力検査

（生命機能学専攻　応用生命化学コース）

外国語

問１～３に答えよ。解答は解答用紙に記入し、紙面が不足する場合は裏面を使用しても良い。その場合は「裏面に続く」と特記すること。

問１．以下の文章を読み、下線部①～⑤を和訳せよ。

An enzyme reaction in its simplest form can be written as below.

$$E + A \underset{k_{-1}}{\overset{k_1}{\rightleftarrows}} EA \xrightarrow{k_2} E + P$$

①Substrate A reacts with enzyme E to form an enzyme-substrate complex EA. From this, product is formed in a consecutive irreversible step, and the enzyme can enter into a new reaction cycle. ②To each reaction step belongs a specific rate constant *k*. It is marked with a positive figure (k_1, k_2, k_3, ...) in the forward direction and with a negative one (k_{-1}, k_{-2}, k_{-3}, ...) in the backward. ③Upon a more detailed examination of this apparently simple reaction, however, additional steps must be considered:

$$E + A \underset{k_{-1}}{\overset{k_1}{\rightleftarrows}} EA \underset{k_{-2}}{\overset{k_2}{\rightleftarrows}} E^*A \underset{k_{-3}}{\overset{k_3}{\rightleftarrows}} E^*P \underset{k_{-4}}{\overset{k_4}{\rightleftarrows}} EP \underset{k_{-5}}{\overset{k_5}{\rightleftarrows}} E + P$$

④Initially, substrate and enzyme form in a rapid equilibrium a loose association complex EA. Rearrangement in the following step by interaction of the substrate with the residues of the catalytic center yields a tight transition state complex E*A. ⑤This state is prepared to convert the substrate into the product forming a tight E*P complex, which turns into a loose association complex EP before dissociating into free product and enzyme. The whole reaction sequence appears quite symmetrically and can be run through from the forward direction, but similarly from the backward direction, P acting as substrate and A as product. In contrast to the upper simple scheme with two reaction steps and three rate constants, 5 reaction steps with 10 rate constants must be considered for a more exact description of the same reaction.

（訳注）product : 生成物、consecutive : 連続した、rate constant : 速度定数、transition state : 遷移状態

出典：Enzyme Kinetics Principles and Methods（Third, Enlarged and Improved Edition, WILEY-VCH）Hans Bisswanger 著　より一部改変

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問 2. 以下の文章を和訳せよ。

Concerned about the potential health effects of artificial food colors, regulators and consumers are pushing food companies to replace them with natural alternatives. The industry has felt this pressure before. Ten years ago, a wave of big food companies promised to remove synthetic colors from their products. But many customers rejected the duller, naturally colored products, and the synthetics remained on grocery store shelves. New techniques that make naturals more stable and new sources of color could now help companies make the switch. But even with improved technology, natural colors will struggle to match the brightness and performance of synthetics.

出典：Biois M, “Is now the time for natural food colors?”, *Chemical & Engineering News*, 103, 2025

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問 3. 以下の文章を和訳せよ。

In 1953, Frederick Sanger determined the amino acid sequence of insulin, a protein hormone. This work is a landmark in biochemistry because it showed for the first time that a protein has a precisely defined amino acid sequence. Moreover, it demonstrated that insulin consists only of L-amino acids in peptide linkage between α-amino and α-carboxyl groups. This accomplishment stimulated other scientists to carry out sequence studies of a wide variety of proteins. Indeed, the complete amino acid sequences of more than 10,000 proteins are now known. The striking fact is that each protein has a unique, precisely defined amino acid sequence. A series of incisive studies in the late 1950s and early 1960s revealed that the amino acid sequences of proteins are genetically determined. The sequence of nucleotides in DNA specifies a complementary sequence of nucleotides in RNA, which in turn specifies the amino acid sequence of a protein. In particular, each of the 20 amino acids of the repertoire is encoded by one or more specific sequences of three nucleotides. Furthermore, proteins in all organisms are synthesized from their constituent amino acids by a common mechanism.

（訳注）Frederick Sanger；人名

出典：Stryer Biochemistry, Freeman, Chapter 2 より一部改変