[問題 1]

以下の文章（Stryer 著 “Biochemistry” 第 5 版 W. H. Freeman and Company の一節）を読んで，次の問に答えよ．

(1) 何を問題点として設定しているか，50 字以内の日本語で記せ．

(2) 問(1)について筆者はどのように解説しているか，日本語で簡潔に述べよ．

Many membrane proteins, like bacteriorhodopsin, employ α helices to span the hydrophobic*[1] part of a membrane. As noted earlier, typically most of the residues*[2] in these α helices are nonpolar and almost none of them are charged. Can we use this information to identify putative membrane-spanning regions from sequence*[3] data alone? One approach to identifying transmembrane*[4] helices is to ask whether a postulated helical segment is likely to be most stable in a hydrocarbon milieu or in water. Specifically, we want to estimate the free-energy change when a helical segment is transferred from the interior of a membrane to water. Free-energy changes for the transfer of individual amino acid residues from a hydrophobic to an aqueous environment are given. For example, the transfer of a poly-L-arginine helix, a homopolymer of a positively charged amino acid, from the interior of a membrane to water would be highly favorable [-12.3 kcal mol^{-1} (-51.5 kJ mol^{-1}) per arginine residue in the helix], whereas the transfer of a poly-L-phenylalanine helix, a homopolymer of a hydrophobic amino acid, would be unfavorable [+3.7 kcal mol^{-1} (+15.5 kJ mol^{-1}) per phenylalanine residue in the helix].

注*[1] hydrophobic は「疎水的」の意味.

注*[2] residues は「amino acid residues」の意味.

注*[3] sequence は「amino acid sequence」の意味.

注*[4] transmembrane は「膜貫通」の意味.

[問題 2]
以下の文章は C. N. R. Rao 著, “Ultra-Violet and Visible Spectroscopy”（第 2 版, 1967 年発行, Butterworths）の一節である.

(1) 第一段落で述べられている赤外分光法の特徴を端的に表すセンテンスの番号 2 つ（丸数字）を答え，その和訳を記せ.

(2) 下線部を和訳せよ.

① Modern methods of spectroscopy in the different regions of the electromagnetic spectrum have provided the chemist with powerful tools for analysis and investigation of structure. ②The methods include electronic (ultra-violet and visible) spectroscopy, infra-red and Raman spectroscopy, microwave spectroscopy and nuclear magnetic resonance spectroscopy. ③The choice of the type of spectroscopy for a specific problem depends upon, among other factors, the structure and properties of the specimen and the information sought. ④Thus, the detailed structural information on certain types of molecules may be obtained form microwave spectroscopy. ⑤Infra-red spectroscopy is best for structural investigations because of the ideal wavelength region it covers in the electromagnetic spectrum. ⑥The infra-red spectra of molecules have both group character and considerable structural character. ⑦ Electronic spectroscopy, on the other hand, does not give much information on the detailed structural features of molecules, but throws light on their group character. ⑧However, by studying the electronic spectra of a large number of different types of molecules, it has been possible to correlate the spectra with structure.

Identification of organic compounds by their absorption spectra has become a routine procedure for the past several years. It is a standard practice now, to record either the infra-red or the ultra-violet spectrum while proposing a structure for a new compound or while reporting its physical properties. Electronic absorption spectroscopy has been used as confirmatory evidence for the identity of a previously known substance, just as any other physical properties (e.g., melting point, refractive index). Many examples may be cited where a particular structure of a compound was selected from several possibilities on the basis of its ultra-violet or visible spectrum. The high intensity of many of the absorption bands in the near ultra-violet and visible regions not only permits the identification with minute quantities of material, but also serves as an aid in the control of purification of substances.

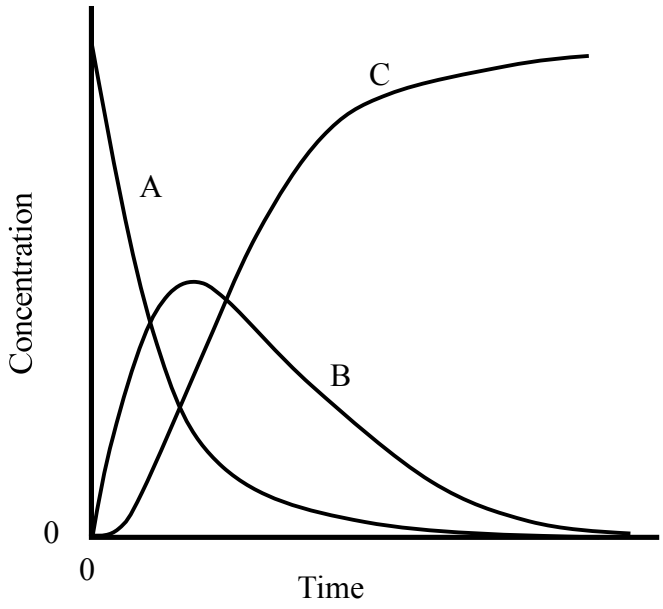
[問題 3]

下記の図は物質 A，B，C の濃度が時間に対して変化する様子を示している．

(1)　物質 A の濃度は，最初，急激に減少し，その後ゆっくりとゼロに近づいた．この説明文を英訳せよ．

(2)　物質 C の濃度は，少し遅れて増加し，一定値に達した。この説明文を英訳せよ．

(3)　問(1)，(2)の説明文を参考にして，物質 B の濃度の経時変化を英文で記述せよ．



[問題 4]

次の 5 つの和文を英訳せよ．

(a) 液体が固化する際，一般に系は収縮するが，例外的に，水は氷に相転移するときに膨張する．

(b) 分光学の原理は，$h\nu = \Delta E$ という一つの式で表されるが，現実の測定装置および解析法は極めて多様である．

(c) 近年，量子化学計算が，有機化学および合成化学で広く使われるようになっている．

(d) 化学は物質変換の学であり，環境に優しい反応の開発が大きな社会的要請である．

(e) 生命現象が物理学と化学の原理から解明可能であると多くの人々が考えるようになったのは，近代科学の成果である．