

(英語・3枚中の1枚目)

[英 語] (全4題)

注意： 解答は問題ごとに別の解答用紙を用いること。

[問題 1]

以下の文章 (note 著、"Biochemistry" の一節)を読んで、内容を日本語で約 200 字程度に要約せよ。ただし、下記の 2 項目について必ず記述すること。

どのような現象について述べているか

なぜそのような現象が起こると考えられるのか

PROPERTIES OF LIPID AGGREGATES

The first recorded experiments on the physical properties of lipids were made in 1774 by the American statesman and scientist Benjamin Franklin. In investigating the well-known (at least among sailors) action of oil in calming waves, Franklin wrote:

At length being at Clapham (in London) where there is, on the common, a large pond, which I observed to be one day very rough with the wind, I fetched out a cruet of oil [probably olive oil] and dropt a little of it in the water. I saw it spread itself with surprising swiftness upon the surface. I then went to the windward side, where the waves began to form; and there the oil, though not more than a teaspoonful, produced an instant calm over a space several yards square, which spread amazingly, and extended itself gradually till it reached the lee side, making all that quarter of the pond, perhaps half an acre, as smooth as a looking glass.

This is sufficient information to permit the calculation of the oil layer's thickness (although there is no indication that Franklin made this calculation, we can). We now know that oil forms a monomolecular layer on the surface of water in which the polar heads of these amphiphilic molecules are immersed in the water and their hydrophobic tails extend into the air.

The calming effect of oil on rough water is a consequence of a large reduction in the water's surface tension. An oily surface film has the weak intermolecular cohesion characteristic of hydrocarbons rather than the strong intermolecular attractions of water for its normally large surface tension. Oil, nevertheless, calms only smaller waves; it does not, as Franklin later observed, affect the larger swells.

(注) Clapham: ロンドン西南部の地区名、 amphiphilic: 両親媒性、 hydrophobic: 疎水性

[問題 2]

以下の文章は最近の Scientific American に掲載されたプロテオーム（細胞の作り出す全タンパク質）解析に関する記事の一部である。下線部を和訳せよ。

Cells usually modify proteins by adding sugars or fats, or both, to them in ways that can be hard to anticipate. To produce a protein encoded by a newly discovered gene, scientists cannot merely string together amino acids in the order dictated by the gene; often they must also ensure that the proper fat and sugar modifications are made. And to determine how a protein behaves, researchers must also take into account that some proteins dissolve in water, whereas others act normally only in an oily environment or have regions that are embedded in fat-filled cell membranes.

That's not the end of the complexity. Although most researchers agree that the genome contains roughly 40,000 genes, a typical cell makes hundreds of thousands of distinct proteins. To understand the proteome, scientists have to learn the characteristics of all of those proteins. Simply making use of the data from the Human Genome Project, which finally put to rest the old dogma that one gene encodes one protein, will not do the trick. Clearly, one gene can somehow give rise to many different proteins.

(注) genome: ゲノム (遺伝子の集合) proteome: プロテオーム

[問題 3]

次の(1)~(3)の項目から1つを選び、その項目について50語以内の英文で説明せよ。ただし、英文のセンテンスの数は問わないが、指示された4つのキーワードを含んだ文章とすること。

(1) 水

【キーワード：水素結合、静電的相互作用、双極子、酸素】

(2) 光合成 (photosynthesis)

【キーワード：クロロフィル(chlorophyll)、二酸化炭素、
アデノシン トリリン酸 (adenosine triphosphate)、炭水化物】

(3) 色

【キーワード：光、電子、波長、Lambert-Beer の法則】

[問題 4]

次の(1)から(5)までの文章を英訳せよ。

- (1) 約 5 時間にわたる連続加熱で、黄色の析出物が形成された。
- (2) 有機分子の反応性に関して我々が理解していることの殆どは、気相か又は等方的な液相において行われた実験に基づいている。
- (3) 光子が電子にあたると、その衝突でエネルギーの交換が起こる場合がある。
- (4) 実験誤差のために、計算された原子数比は整数値からずれることもある。
- (5) 細胞膜を通過するイオンの拡散速度に影響する一つの因子は、膜を横切る電位差である。