

(英語・4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 (Freeman Dyson 著 “IMAGINED WORLDS” の一節) をよく読み、
(1)~(3) に答えよ。

If we are looking for new directions in science, we must look for scientific revolutions. When no scientific revolution is under way, science continues to move ahead along old directions. It is impossible to predict scientific revolutions, but it may sometimes be possible to imagine a revolution before it happens.

There are two kinds of scientific revolutions, those driven by new tools and those driven by new concepts. Thomas Kuhn in his famous book, *The Structure of Scientific Revolutions*, talked almost exclusively about concepts and hardly at all about tools. His idea of a scientific revolution is based on a single example, the revolution in theoretical physics that occurred in the 1920s with the advent of quantum mechanics. This was a prime example of a concept-driven revolution. (a) Kuhn's book was so brilliantly written that it became an instant classic. It misled a whole generation of students and historians of science into believing that all scientific revolutions are concept-driven. The concept-driven revolutions are the ones that attract the most attention and have the greatest impact on the public awareness of science, but in fact they are comparatively rare. In the last 500 years, in addition to the quantum-mechanical revolution that Kuhn took as his model, we have had six major concept-driven revolutions, associated with the names of Copernicus, Newton, Darwin, Maxwell, Freud, and Einstein. During the same period there have been about twenty tool-driven revolutions, not so impressive to the general public but of equal importance to the progress of science. Two prime examples of tool-driven revolutions are the Galilean revolution resulting from the use of the telescope in astronomy, and the Crick-Watson revolution resulting from the use of X-ray diffraction to determine the structure of big molecules in biology.

(英語・4枚中の2枚目)

The effect of a concept-driven revolution is to explain old things in new ways. The effect of a tool-driven revolution is to discover new things that have to be explained. In almost every branch of science, and especially in biology and astronomy, there has been a preponderance of tool-driven revolutions. We have been more successful in discovering new things than in explaining old ones. In recent times my own field of physics has had great success in creating new tools that have started revolutions in biology and astronomy. (b)Physics has been less successful in creating new concepts with which to understand its own discoveries.

- (1) 著者は科学革命にはどのような種類のものがあり、それらの科学革命にはどのような相違点があると考えているか。200字程度の日本語で説明せよ。
- (2) Thomas Kuhn は科学革命についてどのように考えているか。著者の考え方の相違がわかるように日本語で簡潔に述べよ。
- (3) 下線部 (a), (b) を和訳せよ。

(英語・4枚中の3枚目)

[問題 2]

次の文章 (J. McMurry & R. C. Fay の “ Chemistry ” の一節) を読み , 下線部 (a), (b) を和訳せよ .

The world is rarely as orderly as textbooks make it appear. For instance, we've made it seem that the distinction between liquids and solids is clear-cut and that the phase transition between them is always sharply defined. The truth, though, is more complex. At certain temperatures, many substances (about 0.5% of known compounds) exist in a phase that is neither fully liquid nor fully solid. The molecules in these liquid crystals can move around, as in viscous liquids, but have a restricted range of motion, as in solids. The molecules in most liquid crystals have a rigid, rodlike shape with a length four to eight times greater than their diameter. When packed together, the molecules tend to orient with their long axes roughly parallel, like logs in a stack of firewood. Individual molecules can migrate through the fluid and can spin around their long axis, but they can't rotate end over end. Several different liquid crystalline phases exist, depending on the amount of ordering. (a)Two of the most common are the *nematic* phase, in which the ends of the molecules are randomly arranged, and the *smectic* phase, in which the molecules are arranged in layers.

The widespread use of liquid crystals for displays in digital watches, pocket calculators, and computer screens hinges on the fact that the orientation of liquid-crystal molecules is extremely sensitive to the presence of small electric fields and to the nature of nearby surfaces. (b)A typical liquid-crystal display (LCD) contains a thin layer of *nematic* liquid-crystal molecules sandwiched between two glass sheets that have been rubbed in different directions with a thin nylon brush and then layered with tiny transparent electrode strips made of indium/tin oxide. The outside of each glass sheet is coated with a polarizer oriented parallel to the rubbing direction, and one of the sheets is further coated with a reflecting mirror. Because the molecules in the liquid crystal align parallel to the direction of rubbing, and because the two glass sheets are rubbed at 90° angles to each other, the molecules undergo a gradual 90° twist in orientation between the two surfaces.

[問題 3]

同位体に関して，次の (1), (2) に対し英文で答えよ．

- (1) 同位体とは何かについて記述し，同位体間でほとんど変わらない性質の例を挙げよ．(20～50語程度)
- (2) 同位体による性質の違いとその利用法について例を挙げて記せ．(50～100語程度)

[問題 4]

研究論文の原稿を作成中であるとして，以下の (1), (2) に答えよ．

- (1) 次の (a)～(d) の英文は，いずれも不適切な表現を含んでいる．それぞれについて，本来意図した文意を変えないよう必要最小限の修正を施せ．なお，解答に当たっては，修正した文を解答用紙に書き，修正箇所には下線を引け．
 - (a) After exposing to acetone vapor for 3 hours, the sample specimen was re-examined with the spectrophotometer.
 - (b) This reaction seems to be of no practical use, if 100% yield is achieved.
 - (c) No distinct change in the absorption intensity was observed for both cases before and after irradiation.
 - (d) There leaves some uncertainty in the value decided from the latest experiment.
- (2) 次の (a)～(d) の文を英訳せよ．
 - (a) 左側のフラスコには，右側のビーカーに比べて約3倍の水が入っている．
 - (b) この方法を用いることによって，その元素の存在が確認できた．
 - (c) 前に得られているデータと比べると，今回の結果は理論計算の値とよく一致している．
 - (d) このような類の問題は，不十分な検討からも起こることがある．