

平成18年度 理学系研究科博士前期課程 入学試験問題
(分子科学専攻・秋募集)

英語

試験時間 : 10:30～12:00

配点 : 150点

【注意】

- (1) 問題冊子（1部）、問題1、2、3の解答用紙（3枚）を配布する。
手元に上記4種類が所定の枚数配布されていることを確認すること。
過不足がある場合には速やかに申し出ること。
- (2) 3枚の解答用紙の各々に受験番号と氏名とを必ず記入すること。
- (3) 問題1、2、3の解答をそれぞれ指定された解答用紙に記入すること。
なお、解答用紙の表面だけで書ききれない場合には裏面を使用すること。

1. 次の英文を読んで下記の設問に答えよ。

In the words of the eminent chemist Sir Jack Baldwin: “Chemistry is about making forms of matter that have never existed before.” These new forms of matter, from plastics and detergents to contraceptives and anticancer drugs, have had an extraordinary impact on the lives of everyone. We now take so many of these modern products for granted that we forget that they would not exist without the chemical knowledge used to make them. (a) Although designing and making new molecules is at the heart of chemistry, another important aspect is analyzing substances and working out how and why chemical reactions happen. (b) In this way chemistry has also contributed to our quality of life by providing the means for quality control in manufacturing, for monitoring the environment and assessing our health needs, and even for crime detection. It is worth looking back at the rise of chemistry and how it has affected our social and cultural development. In fact, we have to go back a long way to the earliest times when humans first started to manipulate their environment – through fire, a chemical reaction, to cook, and later, to extract metals. Many of the first chemical reactions used were probably accidental discoveries. Primitive forms of both soap and man-made glass were probably first made by accident thousands of years ago – soap from a mixture of goat tallow and wood ash, and glass from sand, seaweed and salt in the ashes of camp fires on the beach. At that time, of course, people had no idea how one material appeared to change into another.

However, (c) the Ancient Greeks were very interested in understanding the material nature of the world but they took the wrong course. Aristotle suggested that matter consisted of the so-called four elements Earth, Air, Fire and Water. Later, in the Middle Ages, the alchemists (the predecessors of the modern chemist), supported Aristotle and spent much of their time trying to convert base metals such as lead into gold. Not surprisingly, they were unsuccessful. Nevertheless, we should not scorn their efforts since they did develop methods that were to form the basis of real chemistry such as filtration, crystallization, distillation, and they studied a wide range of chemical reactions.

(Aristotle: アリストテレス、alchemist: 錬金術師)

- 問 1 下線部(a)を日本語に訳せ。
- 問 2 下線部(b)を日本語に訳せ。
- 問 3 下線部(c)を日本語に訳せ。
- 問 4 錬金術師たちの努力は、化学の発展に対してどのように寄与したかを日本語で説明せよ。

2. 次の各英文を日本語に訳せ。

(1) Historically, the technology for converting the hydrogen/carbon monoxide synthesis gas, which is obtained from coal and water, was used to produce motor fuels. However, with its new vigor, the technology is being directed towards the production of basic hydrocarbons.

(2) As every bench chemist knows, curiosity driven research is only possible because our level of fundamental understanding of the subject is such that there is still no substitute for careful experimentation. On the other hand, the pursuit of chemical research is not only a matter of idea selection and philosophy, but also requires minimum funding and good collaborators.

(3) Quite substantial levels of iron pentacarbonyl ($\text{Fe}(\text{CO})_5$) are frequently present in commercial cylinders of carbon monoxide. However, iron pentacarbonyl is easily detected by bubbling the gas gently through dichloromethane and measuring the infrared spectrum ($\nu(\text{CO}) = 1994, 2020 \text{ cm}^{-1}$). The impurity is completely removed by passing through the carbon monoxide through a short column of activated charcoal.

3. 次の各問いに答えよ。

問1 示す(1)~(15)の単語の中から10個を選び、英訳せよ。解答は選んだ番号とともに記すこと。

- (1) 分子量
- (2) 平衡
- (3) 硫酸
- (4) 付加反応
- (5) 不斉中心
- (6) 真空
- (7) 励起状態
- (8) 求電子置換反応
- (9) 転位反応
- (10) 水素結合
- (11) 熱力学的安定性
- (12) 電子供与体
- (13) 酵素
- (14) 酸化
- (15) 溶媒和

問2 次の日本語の実験内容を英文で表現せよ（注：必ずしも直訳する必要はない）。

1-ヘキセン (4.2g, 0.05 mol) を溶かしたクロロホルム溶液 (8 mL) を 0°C に冷却し、この溶液に臭素 (8g, 0.05 mol) を溶かしたクロロホルム溶液 (5 mL) を 30 分かけて滴下した。その後、反応混合液を室温とし、さらに 2 時間攪拌し、減圧下に溶媒留去を行ったところ、11 g の無色の液体を得た。