

平成20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・冬募集)

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. 次の英文を読んで設問に答えよ。

The hundreds of different pharmaceutical agents approved for use by the U.S. Food and Drug Administration come from many sources. Many drugs are isolated directly from plants or bacteria, others are made by chemical modification of naturally occurring compounds, and still others are made entirely in the laboratory and have no relatives in nature.

(a) Those drugs that come from natural sources, either directly or after chemical modification, are usually chiral and are generally found only as a single enantiomer rather than as a racemic mixture. Penicillin V, for example, an antibiotic isolated from the *Penicillium* mold, has the $2S,5R,6R$ configuration. Its enantiomer, which does not occur naturally but can be made in the laboratory, has essentially no biological activity.

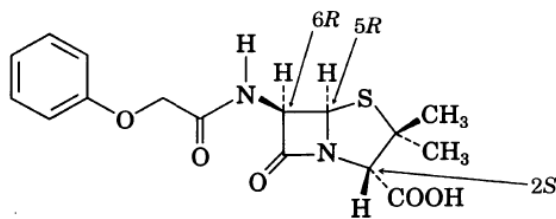
In contrast to drugs from natural sources, those drugs that are made entirely in the laboratory are either achiral or, if chiral, are often produced and sold as racemic mixtures. Ibuprofen, for example, contains one chirality center, and only the *S* enantiomer is active as an analgesic and anti-inflammatory agent. The *R* enantiomer of ibuprofen is inactive, although it is slowly converted in the body to the active *S* form. Nevertheless, the substance marketed under such trade names as Advil, Nuprin, and Motrin is a racemic mixture of *R* and *S*.

(b) Not only is it chemically wasteful to synthesize and administer an enantiomer that does not serve the intended purpose, many examples are now known where the presence of the "wrong" enantiomer in a racemic mixture either affects the body's ability to utilize the "right" enantiomer or has unintended pharmacological effects of its own. The presence of (*R*)-ibuprofen in the racemic mixture, for instance, slows substantially the rate at which the *S* enantiomer takes effect in the body, from 12 minutes to 38 minutes.

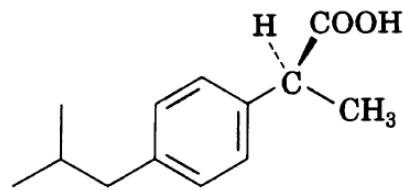
(c) To get around this problem, pharmaceutical companies are now devising methods of so-called enantioselective synthesis, which allows them to prepare only a single enantiomer rather than a racemic mixture. Viable methods have already been developed for the preparation of (*S*)-ibuprofen, which is now being marketed in Europe.

(d) The time may not be far off when television commercials show famous athletes talking about the advantages of chiral drugs.

Note: The *S* enantiomer of ibuprofen soothes the aches and pains of athletic injuries much more effectively than the *R* enantiomer.



Penicillin V (*2S,5R,6R* configuration)



(*S*)-Ibuprofen (an active analgesic agent)

- 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 下線部(d)を日本語に訳せ。
 問 5 上記の問題文全体の内容に適した英語の標題を提案せよ。

2. 次の英文を日本語に訳せ。

Methanol, CH₃OH, is a candidate to replace fuels based on crude oil. It is already made in large quantities from a type of synthesis gas using copper/zinc oxide catalyst, but no one is sure how the catalyst works. Radioactive labeling experiments show that all the methanol comes from the carbon dioxide rather than the carbon monoxide. It is known that the reaction occurs on the copper rather the zinc oxide and, from infrared spectroscopic measurements, that the methanoate group (HCO₂) is involved. One puzzle is that the rate of reaction of carbon dioxide with copper is slower than the rate at which methanol is produced in the reaction.

(a candidate to replace : 代替候補、radioactive labeling experiment : 放射能標識実験)

3. 次に示す(1)～(15)の単語または語句の中から10個を選び、英訳せよ。

なお、解答は選んだ番号とともに記すこと。

- (1) 濃度
- (2) 溶液
- (3) 塩化銀の溶解度積
- (4) エーテル抽出
- (5) 無水硫酸ナトリウムによる乾燥
- (6) 減圧下での溶媒留去
- (7) エタノールから再結晶
- (8) 氷酢酸と無水酢酸
- (9) 異核二原子分子
- (10) 波動関数
- (11) 常磁性
- (12) 遷移金属錯体
- (13) 励起状態
- (14) 並進、回転、振動の吸収スペクトル
- (15) アミノ酸配列