

# 河北大学 2006 年博士研究生入学考试试题

(套别: A)

| 学科、专业 | 研究方向 | 考试科目及科目代码 | 考试时间 |
|-------|------|-----------|------|
| 分析化学  |      | 专业英语      |      |

特别声明: 答案一律答在答题纸上, 答在本试卷纸上无效。

## 一、Translate to Chinese (20分)

### 1. Recent Contributions of Analytical Chemistry to Society

Today there is a tendency to use the term “process analytical technology” (PAT) than “process analytical chemistry” (PAC) as measurement demands are more than just chemical. PAT, for example, can be used in the pharmaceutical industry to optimize quality and cost in the manufacture of pharmaceuticals. This includes both the preparation of active compounds and the form of the final bulk dose. Thus, both the compositional measurements and those that determine parameters such as mixing efficiency and degree of dryness are required to be known. Furthermore, during recent decades, analytical chemistry has experienced rapid and important advances in miniaturization, data processing, computer technology and the development of (bio)sensors.

These advances are a direct result of research focused on solving fundamental and basic problems in the real-time measurement and process control of (bio)-chemical diagnostic phenomena. Figure 3 shows recent contributions of analytical chemistry to the process of solving remote and realtime measurement challenges and Fig. 4 shows recent technologies developed for such purpose. Technology is clearly needed to present-day society to monitor processes, to improve productivity and quality in industry, increase the quality of life, and aid the work of governmental control. The real-time miniature sensors capable of detecting and quantifying weapons of mass destruction are just one example of this. Advances in micromachining technology, particularly if based on capillary electrophoresis, has led to the

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integration of electrochemical sensor gene arrays involving sample clean-up, DNA extraction, DNA amplification, and separation on a microchip platform. This miniaturized device or lab-on-a-chip, presents clear advantages in speed, cost, portability, and solvent and sample consumption. Several companies have commercialised micropchip technology, and a few products are already commercially available.

## 2. Future Contributions of Analytical Chemistry

The evolution of analytical chemistry in recent years has been spectacular. The most important advances have been in the analysis of new compounds in even smaller concentrations, in the development of instruments having even better resolution and sensitivity capacities, and in miniaturization, which is

Analytical chemistry is a science that advances in line with the advances made in other fields. An obvious example is nanobioelectronics in which nanomaterials are applied to the analysis of biomolecules. Nanobioelectronics is a rapidly developing field aimed at integrating nano- and biomaterials with electronic transducers. These include microfluidic devices, the so called lab-on-a-chip, nanoparticle-based bioassays, the bioelectronic detection of biomolecules such as nucleic acids and proteins, electrochemical sensing devices for clinical and environmental monitoring, in-vivo glucose biosensors, etc. These developments will clearly aid analytical chemistry in the search for solutions to new problems.reaching nanoscale levels. The development of microsystems or lab-on-a-chip will provide fast response, high sensitivity and selectivity, aspects that can result, for example, in analyzers providing a time warning and alarm in the case of field-deployable analyzers for explosives or nerve-agents. Although

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lab-on-a-chip instruments are being manufactured with moderate success, widespread use of these systems is likely in the future. In a not very distant future, we may well find that the demands of society extend beyond the requirements just for genetic analysis to include analysis of target analytes such as biological markers and the characterization of products to warrant quality. There is no doubt that the integration of the technology described above (together with biotechnology and new screening platforms) will change the way we live our everyday lives.

During recent years, we have observed how the electronics industry have changed the world, but probably even bigger personal changes will happen when microsystems will be integrated in our water taps, or when people will be able to establish their own health profile (to test, for example, for indications for signs of cancer or cardiac arrest), when cars will control the emission of contaminants, or when a microarray will monitor the amount of bacteria in foodstuff. However, there is still a long way to go before this will happen.

## 二、Translate to English (10 分)

原子吸收光谱法; 原子荧光光谱法; 原子发射光谱; 紫外分光光度法; 气相色谱法; 高效液相色谱法; 毛细管电泳; 环境分析; 材料分析; 药物分析

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