※ 考生請注意：本試題 □可 ☑不可 使用計算機

1. Describe the difference between calibration sensitivity and analytical sensitivity. (10%)

2. Draw a diagram showing components of a GC system and describe the functions of these components. (10%)

3. Draw a diagram showing components of a mass spectrometer system and describe the functions of these components. (10%)

4. Describe the working principles and applications of MALDI and ESI. Make a comparison between these two ionization techniques. (15%)

5. Draw block diagrams to illustrate the components of the following three types of instruments for optical spectroscopy: absorption, fluorescence, and chemiluminescence spectrometers. Use the diagrams to explain how these instruments work and the major differences among them. (15%)

6. Construct a hypothetical van Deemter plot for a packed liquid chromatographic column. Explain the meanings of A, B, and C terms. (15%)

7. Briefly answer the following questions: (25%)

(1) What are effects of poor vacuum conditions to the operations of mass spectrometers?

(2) What are the chemical structures for the stationary phases that are commonly used in GLC columns?

(3) How standard addition method can be applied to measure the concentration of a benzene metabolite, SPMA, in urinary matrix?

(4) How and why the particle size in a packed HPLC column affects the column efficiency and the pressure required for pumping mobile phase through the column?

(5) How can the detection limit of an ICPOES (inductively coupled plasma optical emission spectroscopy) method for measuring trace arsenic levels in drinking water be assessed?