

## 簡答題

1. Draw block diagrams to illustrate the components of the following three types of instruments for optical spectroscopy. Use the diagrams to explain how these instruments work and the major differences among them.
  - (a) Absorption spectrometer.
  - (b) Fluorescence spectrometers.
  - (c) Chemiluminescence. (9%)
2. What is an internal standard? What advantages does it provide when it is used in quantitative measurements? (10%)
3. Define "detection limit" and explain how it can be obtained for an analytical method. (10%)
4. Draw and give the name of the chemical structures for the stationary phases that are commonly used in GLC columns? (8%)
5. Explain 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. (8%)
6. Describe how the following values can be calculated: (9%)
  - (1) The precision of an analytical procedure
  - (2) The selectivity of two species X and Y eluted from an HPLC column
  - (3) The plate height of an HPLC column
7. An electron impact ionization source generally induces large amount of fragment ions from an analyte molecule. What analytical advantages are provided by such fragmentation? (8%)
8. What is MS/MS? Describe briefly how a triple-stage-quadrupole mass spectrometer is used to obtain product ion spectra. (8%)
9. For Atomic Absorption Spectroscopy (AAs), please briefly describe the theory behind for (a) the element identification and (b) quantitative analysis (10%)
10. Please compare the advantages and disadvantages between Flame Atomic Absorption Spectroscopy (FLAAs) and Electrothermal Atomic Absorption Spectroscopy (ETAAs) (10%)
11. Please briefly describe the theory for the inductively coupled plasma - ICP? (10%)