

本試題是否可以使用計算機：可使用，不可使用（請命題老師勾選）

考試日期：0302，節次：3

1. Describe the working principles, applications, and/or definitions in chemical instrumentation of the following techniques, devices, or terminologies. If the terms are acronyms, give their full names (in English). (60%)
  - (1) MALDI
  - (2) FID
  - (3) ESI
  - (4) TOF
  - (5) AED
  - (6) ECD
  - (7) FT-ICR
  - (8) Precision and accuracy
  - (9) van Deemter plot
  - (10) Analytical selectivity
  - (11) Retention factor
  - (12) Internal standard
  
2. Briefly answer the following questions: (40%)
  - (1) How standard addition method can be applied to measure the concentration of a benzene metabolite, SPMA, in urinary matrix?
  - (2) How the detection limit of an ICPOES (inductively coupled plasma optical emission spectroscopy) method for measuring trace arsenic levels in drinking water can be assessed?
  - (3) How the confidence limit (uncertainty) of a measurement can be assessed and reported. Then write down an equation that describes how the measurement uncertainties of three measurements,  $p$ ,  $q$ , and  $r$ , propagate into the uncertainty of  $x$ , where  $x = f(p, q, r)$ ?
  - (4) Why molecular absorption spectra are band spectra, in contrast to that atomic absorption spectra are line spectra?
  - (5) 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.
  - (6) What are the characteristics of an ideal detector for a GC instrument?
  - (7) What are effects of poor vacuum conditions to the operations of mass spectrometers?
  - (8) What is the definition of resolution of a mass analyzer? How to measure and calculate the resolution for a specific mass analyzer? Calculate the resolution required to resolve the mass spectral peaks for  $^{116}\text{Sn}^+$  and  $^{232}\text{Th}^{2+}$ . Atomic weights: Sn (115.90219 Da) and Th (232.03800 Da).