

系所組別：環境醫學研究所乙組

考試科目：化學儀器分析

考試日期：0226，節次：3

1. Describe the applications and working principles of the following two related techniques/terms. Try to explain the major similarity and/or difference between them. (64%)

- (a) SDS-PAGE *and* IEF
- (b) Fluorescence *and* Chemiluminescence
- (c) Internal standard *and* Standard addition method
- (d) Electron capture detector *and* Electrochemical detector
- (e) Discrete dynode electron multiplier *and* Microchannel plate
- (f) Electrospray ionization *and* Matrix-assisted laser desorption ionization
- (g) Orbitrap mass spectrometer *and* Ion cyclotron resonance mass spectrometer
- (h) Triple quadrupole tandem mass spectrometer *and* Ion trap tandem mass spectrometer

2. Answer the following questions. (36%)

- (a) What are effects of poor vacuum conditions to the operations of mass spectrometers?
- (b) What are the analytical advantages and disadvantages provided by ion fragmentation in an EI source?
- (c) Explain why molecular absorption spectra are band spectra, in contrast to that atomic absorption spectra are line spectra.
- (d) How does the particle size in a packed HPLC column affect the column efficiency and the pressure required for pumping mobile phase through the column?
- (e) Draw a hypothetical van Deemter plot for a packed liquid chromatographic column. Write down an equation to describe the shape of the plot and explain the meanings of A, B, and C terms in the equation.
- (f) Describe how the precision, bias, sensitivity, detection limit, dynamic range, and selectivity of an HRGC-HRMS (high resolution gas chromatography-high resolution mass spectrometry) method for measuring trace dioxin levels in human blood samples can be assessed.