

1. Trace elements like Cd, Zn, Fe... etc. are important parameters in marine environment but difficult to measure due to the interferences by major ions. To solve this problem scientists need to separate trace elements from sea salts (e.g. by solvent extraction) before detecting them using analytical instruments (e.g. atomic absorption spectrometry). Apart from the above-mentioned techniques, please describe principles of at least three other separation methods and state three other types of instrumentation. (25%)
2. Carbon dioxide in atmosphere can be dissolved in seawater. After dissolution and becoming H_2CO_3 , which further dissociates as HCO_3^- and CO_3^{2-} . If the dissociate constants are $\text{p}K_1 = 6.5$ and $\text{p}K_2 = 9.2$ can you draw a diagram showing the composition of this weak acid against pH (i.e the α vs pH diagram)? If the initial pH of a seawater sample is 8, can you draw two titration curves one by acid and the other by base? (25%)
3. The Winkler titration method based on iodometry is still the favorable method for the determination of dissolved oxygen in seawater. Describe its principle, list necessary reaction equations showing how to calculate the oxygen concentration using thiosulfate as titrant. (25%)
4. Ferrous and ferric ions can co-exist in certain environments like acid mine water, estuarine water and anoxic pore water. If you are the analyst, how can you measure and identify Fe^{2+} and Fe^{3+} in a water sample? (25%)

試題隨卷繳回