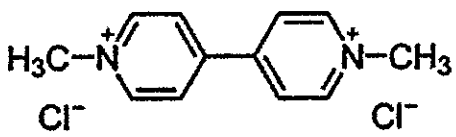
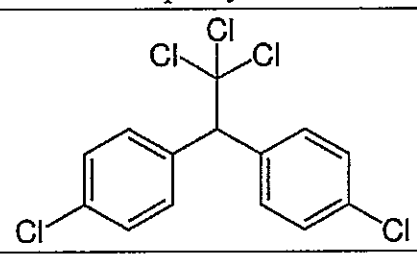
國立臺灣大學 113 學年度碩士班招生考試試題

1. 臺灣已禁用農藥巴拉刈(paraquat)及滴滴涕(DDT)，理化性質如下表。請由其理化性質及基質特性，論述其在河川水、底泥及農地土壤三種基質中消散可能途徑及影響其消散的原因。(30%)
表: paraquat 及 DDT 物理化學性質

名稱	paraquat	DDT
化學名	1,1'-dimethyl-4,4'-bipyridinium	Dichloro-Diphenyl-Trichloroethane
		
蒸氣壓	<0.01 mPa (25°C)	2.53×10^{-8} kPa/20°C
溶解度	水中 620 g/L(20°C)	DDT 在水中極不易溶解，在有機溶劑中的溶解情況如下（g/100ml）：苯爲 106，環已酮爲 100，氯仿爲 96，石油溶劑爲 4-10，乙醇爲 1.5
安定性	在酸性或中性介質中安定，在鹼性中水解，水溶液中照射紫外光分解	DDT 化學性質穩定，在常溫下不分解。對酸穩定，強鹼及含鐵溶液易促進其分解。當溫度高於熔點時，特別是有催化劑或光的情況下，p,p'-DDT 經脫氯化氫可形成 DDE
Log Kow	-4.22	6.91
Log Koc		5.18

2. 分光光度計(spectrophotometer)是環境分析之重要工具，其定量之基本原理為比爾定律(Beer's Law)，請敘述何謂比爾定律？ (10%) 高錳酸鉀在520nm的莫耳吸光係數為1.80x103 L cm-1 mol-1，以1.00cm的貯槽(cell)測得莫耳吸光度為0.51計算 (a)高錳酸鉀之濃度 (5%) (b)換成1.5cm的貯槽測得莫耳吸光度為多少 (5%)。

3. Consider an unsaturated soil and suppose the concentration of dissolved oxygen in soil water at equilibrium with soil air is 100 mmol/liter (mM). Given a dimensionless Henry's law constant of 26 for oxygen at 20 °C, what is the corresponding oxygen concentration in soil air? What is the Henry's law constant in units of (atm m^3/mol) at 20 °C? (10%)

4. Aniline, one probable human carcinogen, is used in the manufacture of dyes such as indigo and in the manufacture of polyurethane, pharmaceuticals, and other chemicals. Consider the equilibrium constant from aniline to anilinium ion in aqueous reaction (log K= 4.63), what is the ratio of the anilinium ion concentration to the aniline molecule concentration in water if the pH is 8? (10%)

5. An ethylene bis-dithiocarbamate (EBDC) fungicide degrades in a storage tank to N,N-ethylene thiourea (ETU) at a rate of 0.046/day at 20 °C; at 0° C, the reaction proceeds at a rate of 0.011/day. How fast will the reaction proceed at 15°C? (15%)

6. A sealed radioactive source used for physics demonstrations contained 10 microcuries (μCi) of ^{60}Co (cobalt-60) in 1980. Given a half-life of 1900 days for ^{60}Co, what will be the source strength in 2033? (15%)

試題隨卷繳回