國立中山大學九十四學年度博士班招生考試試題

科目：環境工程與科學【環工所】

1. Select the correct statement(s) below: (15%)

   (a) In a viscous fluid flow, a favorable pressure gradient is the one in which pressure gradient increases with downstream distance.

   (b) In a boundary layer, the normal diffusion is much smaller than the stream-wise diffusion.

   (c) A flow with secondary flow usually has stronger mixing effect than the one without secondary flow.

   (d) The distinct feature of atmospheric (or planetary) boundary layer is that flow is turbulent constantly.

   (e) In free atmosphere, the wind vector is parallel to the constant-pressure surface.

2. 世界各國(包括台灣)正大力推動奈米科技，試回答下列問題：

   (1) 何謂奈米材料？(5%)

   (2) 舉例說明奈米科技在環境工程中的三個次領域其可能應用性。(10%)

3. 已知反應式如下，試證明水之 $pK_w=14$ 與中性 $pH=7$，假設離子強度效應忽略。(10%)

$$H^+ + OH^- \underset{k_2}{\overset{k_1}{\rightleftharpoons}} H_2O$$

   $[H_2O]=55.5$ mol/L, $k_1=1.4\times10^{11}$ L/mol.s, $k_2=2.5\times10^{-5}$ 1/s (25°C)。

4. 已知 HOCl 之 $pK_a=7.45$ (25°C)，試計算自來水水樣[HOCl]之濃度在 $pH=7.5$ 為在 $pH=8.5$ 之大約倍數？(10%)

5. 試述垃圾焚化及其排氣處理流程。(10%)

6. What is health and risk assessment? Please describe the concept of applying health and risk assessment to derive soil and groundwater remediation goals. (10%)

7. Please use the concept of "treatment train" to develop a remedial system for chlorinated-solvent contaminated groundwater remediation. (10%)

8. 與往年比較，我國去年(93 年)整體空氣品質有何明顯變化？又造成此變化的可能原因為何？另試闡述潮州空氣品質監測站之 PSI 值經常超過 100 之可能原因為何？又以何種污染物為主？(10%)

9. 試說明大陸沙塵暴之發生源地位於中國大陸何處？其傳輸路徑為何？又其好發季節為何時(以月份表示)？試繪圖說明大陸沙塵暴來襲前後懸浮微粒粒徑分佈(particle size distribution)之變化情形(以 $dC/d(\log d_p)$ *vs.* d_p 繪圖)。(10%)