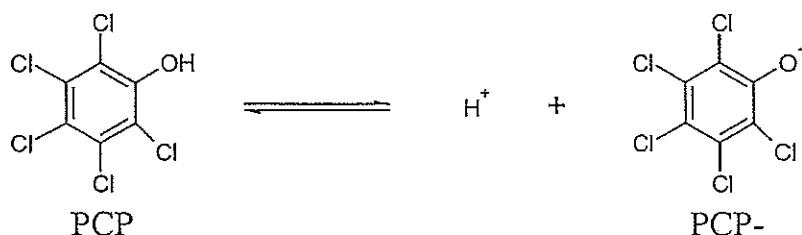


※ 考生請注意：本試題可使用計算機。請於答案卷(卡)作答，於本試題紙上作答者，不予計分。

1. Pentachlorophenol (PCP) is an organochlorine compound used as a pesticide and a disinfectant. A human pentachlorophenol poisoning study shown that PCP is 99.7% ionized (PCP^-) in the human body, which is buffered at $\text{pH} = 7.41$.



- (a) Please estimate the pK_a for PCP. (10%)
- (b) Sketch a labeled pH speciation diagram for Pentachlorophenol. (5%)
2. Please comment briefly on the following reactions using chemical equilibria to illustrate your answer.
- (a) Affect of NTA (Nitrilotriacetic acid) on the mobility of cadmium contaminated lake sediments. (5%)
- (b) Affect of pH on the effectiveness of hypochlorous acid disinfection. (5%)
- (c) The effect of pH on the mobility of metal ions in soils remediated with biosolids. (5%)
- (d) The effect of pe on the toxicity of arsenic species. (5%)
- (e) The effect of increased temperature on the solubility of CaCO_3 . (5%)
3. What is electrophoresis? What measurement (or application) can be achieved by this phenomenon? (10%)

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■ 環境微生物學考題

4. 三氯乙烯雖然是毒性物質，卻可以在環境中被某些好氧菌與厭氧菌分解成無毒產物。請簡單說明在氧氣充足的情況下，好氧菌如何分解三氯乙烯(8分)，並列舉一種可以分解三氯乙烯的好氧菌(2分)。若三氯乙烯污染發生在較深的地層(絕對厭氧環境)，一般會選擇厭氧生物分解技術整治，其做法是將有機物注入地層中，刺激地層中的厭氧菌生長而分解污染物。請以蔗糖($C_{12}H_{22}O_{11}$)為例，說明蔗糖如何在絕對厭氧的地層中被分解(9分)，促使三氯乙烯分解成乙烯(9分)，請列舉一種分解三氯乙烯的厭氧菌(2分)，並說明此菌如何獲得生長能量(5分)。

5. 請舉例說明傳統培養微生物學方法及環境分子生物學方法如何分析水中大腸桿菌(*Escherichia coli*) 濃度，並比較兩者之差異(15分)。