環境科學概論

一、 環保署正積極推動執行購物用塑膠袋及塑膠類免洗餐具限制使用政策，請說明該政策內容及在學理上需先做那些周詳考量？（15 分）

二、土壤重金屬污染是嚴重環保問題，請說明那八種重金屬是被規範為污染性物資，並說明其來源及原因。（20 分）

三、本省北部地區正面臨缺水問題，請詳細說明聖嬰現象在缺水問題上扮演的角色。（15 分）

四、戰爭是最嚴重的環境問題之一，請逐條說明美伊大戰開打可能對環境的影響（人口、污染、經濟、能源、資源等）。（20 分）

五、請藉由以下面文字、圖 1 及公式說明你對 Electrical Double Layer and Zeta Potential 的瞭解。（15 分）

In aquatic environment, organic and inorganic colloidal particles as well as biocolloids (e.g. viruses, bacteria) are generally negative charged. In the presence of an electrolyte, the particles attract a cloud of positively charged ions that are organized in two layers: (1) the stern layer, a compact layer of counter ions adjacent to the charged colloid surface; and (2)the Gouy-Chapman diffuse double layer, containing the rest of the counter ions, which extend in the bulk of the solution.

$$Z=0.33\times10^{-2}(\varepsilon/I)^{1/2}$$

Z=thickness of double layer (cm)
ε=dielectric constant of solution (C/V · cm)
I=ion strength of solution (mol/L)

Zeta potential is the potential at the surface of a colloidal particle. It is important in predicting the coagulation of colloidal particles in water and wastewater treatment. It is necessary to neutralize the charge of the colloidal particle to induce their flocculation and precipitation.

$$\zeta=4\pi\eta EM/\varepsilon$$

ζ=Zeta potential(mv)
η=viscosity of the medium(poise)
π=3.1416
EM=electrophoretic mobility(μm/s.V.cm)=v/X[where v=particle velocity(μm/s) and X=applied potential per unit length of cell(V/cm)
ε=dielectric constant of the liquid

六、請藉由以下面文字及公式說明你對 Partition 的瞭解。（15 分）

Soil organic matter (e.g. humic substance) is the main absorbent of hydrophobic organic chemicals in soils. Thus we use the partition coefficient K_{oc} to describe the distribution of organic chemicals between soil pore water and soil organic matter.

$$K_{oc}=C_{oc}/C_{pw}$$

C_{oc} =chemical concentration in the organic matter (mg chemical/g soil organic carbon)
C_{pw} =chemical concentration in the pore water (mg chemical/ml water)

The octanol-water partition K_{ow} is the ratio of the concentration of an organic compound in an organic phase (e.g. octanol) to its concentration in water. In environmental toxicology, this partition coefficient is useful for predicting the bioconcentration potential of hydrophobic compounds in the biota and their sorption by organic adsorbents such as organic matter of soil ans sediments.

$$K_{ow}=C_o/C_w$$

C_o = concentration of compounds in octanol (mol/L)
C_w = concentration of compounds in water (mol/L)

Sometimes, K_{oc} and K_{ow} have a simple relationship.

$$\log K_{oc}=a\ \log K_{ow}+b$$

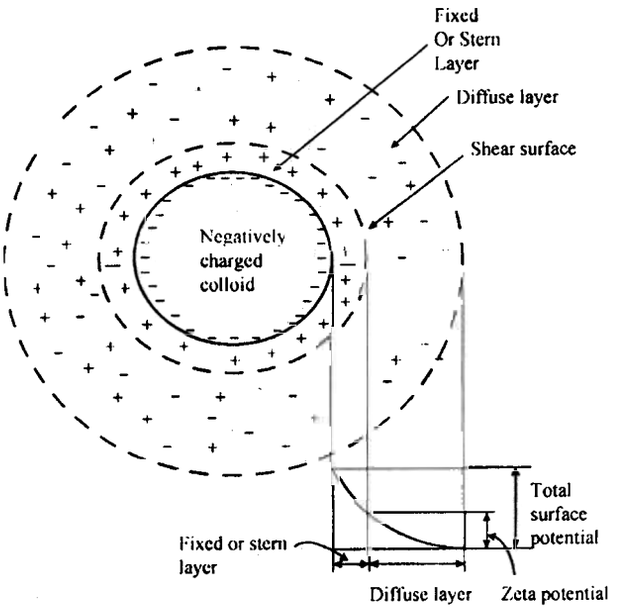

FIGURE . Electrical Double Layer of a Negatively Charged Colloidal Particle

六、請藉由以下面文字及公式說明你對 Partition 的瞭解。(15 分)

Soil organic matter (e.g. humic substance) is the main absorbent of hydrophobic organic chemicals in soils. Thus we use the partition coefficient K_{oc} to describe the distribution of organic chemicals between soil pore water and soil organic matter.

$$Koc=Coc/Cpw$$

Coc =chemical concentration in the organic matter (mg chemical/g soil organic carbon)

Cpw =chemical concentration in the pore water (mg chemical/ml water)

The octanol-water partition Kow is the ratio of the concentration of an organic compound in an organic phase (e.g. octanol) to its concentration in water. In environmental toxicology, this partition coefficient is useful for predicting the bioconcentration potential of hydrophobic compounds in the biota and their sorption by organic adsorbents such as organic matter of soil ans sediments.

$$Kow=Co/Cw$$

Co = concentration of compounds in octanol (mol/L)

Cw = concentration of compounds in water (mol/L)

Sometimes, Koc and Kow have a simple relationship.

$$\log Koc=a \log Kow+b$$