

九十二學年度 原子科學 系(所) 乙 組碩士班研究生招生考試

科目 環境化學 科號 3304 共 1 頁第 1 頁 \*請在試卷【答案卷】內作答

一、 Explain the following terms : (20%)

1. Ozone depletion potential and ozone hole.
2. Temperature inversion and Adiabatic lapse rate.
3. Basicity, Alkalinity, Temporary hardness and salinity in water.
4. Four conditions necessary before photochemical smog can be development.
5. Dry and wet deposition of  $\text{SO}_2$ .

二、 Describe the treatment processes for the municipal wastewater and the industrial wastewater? (10%)

三、 A chlorination facility is built to the specification that the residence time of the water in the chlorination tank should be 25 minutes, and that  $2.0 \times 10^6$  liters per hour of finished water can be produced. (20%)

(a) At what rate (in  $\text{Kg h}^{-1}$ ) should chlorine be injected into the tank if the finished water is to have a chlorine residual of 1.2 ppm? Assume

- (i) zero chlorine demand
- (ii) a chlorine demand of 0.44 ppm

(b) How large a chlorination tank will be required?

四、 A 12.0-L sample of waste air from a smelter process was collected at  $25^\circ\text{C}$  and 1.00 atm pressure, and the sulfur dioxide was removed. After  $\text{SO}_2$  removal, the volume of the air sample was 11.5 L. What was the percentage by weight of  $\text{SO}_2$  in the original sample? (Air mass= $29 \text{ g mol}^{-1}$ ) (10%)

五、 (15%)

(a) Why are aerosols in the  $0.1\text{-}1 \mu\text{m}$  size range especially effective in scattering light?

(b) Per unit mass, why are smaller particles more effective catalyze for atmospheric chemical reactions?

(c) In terms of origin, what are the three major categories of elements found in atmospheric particles?

六、 Decide whether the TLV is exceeded in each of the following cases. (10%)

(a)  $\text{SO}_2$  (1.6 ppmv, TLV= $5 \text{ mg m}^{-3}$ ) and chlorine (0.9 ppmv,  $1.5 \text{ mg m}^{-3}$ )

(b) Benzene (1.5 ppmv,  $30 \text{ mg m}^{-3}$ ) and toluene (85 ppmv,  $375 \text{ mg m}^{-3}$ )

(Atomic weight of C=12, S=32, Cl=35.5)

七、 The atmosphere contains 20.9% of  $\text{O}_2$  and 78.1% of  $\text{N}_2$ , if a lake is situated at an altitude of 3810m. Calculate the  $\text{mg l}^{-1}$  of DO (dissolved oxygen) in the lake at  $5^\circ\text{C}$  and 100 Kpa (The Henry's law constant is  $1.9 \times 10^{-8} \text{ mol l}^{-1} \text{ Pa}^{-1}$  and the vapor pressure of water is 0.5 Kpa at  $5^\circ\text{C}$ . Molecular weight of  $\text{O}_2$  is 32). (15%)