國立嘉義大學九十一學年度轉學生招生考試試題

科目：分析化學　　　　　　　　　　　　　　（請將答案寫在答案卷上）

Analytical Chemistry Exam (Total 100 pts, 20pts each question)

1. A mixture of $Al_2O_3(s)$ and $CuO(s)$ weighing 18.371 mg was heated under $H_2(g)$ in a thermogravimetric experiment. Upon reaching a temperature of 1000^oC, the mass was 17.462 mg and the final products were $Al_2O_3(s)$, $Cu(s)$, and $H_2O(g)$. Find the weight percent of Al_2O_3 in the original solid mixture. (Atomic Mass of O: 15.9994 g/mol, Cu: 63.546 g/mol, Al: 26.981 g/mol)

2. Given that pKa for iodate ion $[IO_3^-]$ is 13.83, find the quotient $[HIO_3]/[IO_3^-]$ in a solution of sodium iodate with (a) pH 7.00 and (b) pH 1.00.

3. A solution of 100.0 mL of 0.0400 M sodium propanoate (the sodium slat of propanoic acid) was titrated with 0.0837 M HCl. Find Ve and calculate the pH at Va = 0, 0.25Ve, 0.5 Ve, 0.75 Ve, Ve, and 1.1 Ve. (pKa of propanoic acid $CH_3CH_2CO_2H$ = 4.874, Ve = volume at equivalence point).

4. A 25.00 mL sample of unknown containing Fe^{3+} and Cu^{2+} requires 16.06 mL of 0.05083 M EDTA for complete titration. A 50.00 mL sample of the unknown was treated with NH_4F to protect the Fe^{3+}. Then the Cu^{2+} was reduced and masked by addition of thiourea. Upon addition of 25.00 mL of 0.05083 M EDTA, the Fe^{3+} was liberated from its fluoride complex and formed an EDTA complex. The excess EDTA requires 19.77 mL of 0.01883 M Pb^{2+} to reach an end point, using xylenol orange. Find $[Cu^{2+}]$ in the unknown.

5. Consider the cell

    Pt(s) | H_2(g,0.100bar) | H^+(aq, pH = 2.54) ‖

    $$Cl^-(aq,0.200M) \mid Hg_2Cl_2(s) \mid Hg(l) \mid Pt(s)$$

    (a) Write a reduction reaction and Nernst equation for each half-cell. For the Hg_2Cl_2 half-reaction, E^o = 0.268 V.

    (b) Find E for the net cell reaction and state whether reduction will occur at the left- or right- electrode.