

1. Addition of an excess of  $\text{AgNO}_3$  to a 0.5012g sample yielded a mixture of  $\text{AgCl}$  and  $\text{AgI}$  that weighed 0.4715g. The precipitate was then heated in a stream of  $\text{Cl}_2$  to convert the  $\text{AgI}$  to  $\text{AgCl}$ . The precipitate was found to weigh 0.3922g after this treatment. Calculate the percentages of  $\text{KI}$  and  $\text{NH}_4\text{Cl}$  in the sample. If the weights measured have a relative standard deviation of 0.1%, what will be the standard deviations for the calculated percentages of  $\text{KI}$  and  $\text{NH}_4\text{Cl}$ . (10%)
2. Describe "in detail" the procedures for preparing one liter 0.01M standard EDTA solution from reagent grade  $\text{Na}_2\text{H}_2\text{EDTA} \cdot 2\text{H}_2\text{O}$ . (10%)
3. Give definitions or explain the following terms: (10%)
  - 1) confidence level,
  - 2) sensitivity,
  - 3) end point,
  - 4) noise
4. For the reversible reaction:  
$$\text{Ox} + 4\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{R}$$
the half-wave potential is -0.349V at a dropping mercury electrode from a solution buffered to pH 2.5. Predict the half-wave for this reaction at pH 3.5. (8%)
5. For the voltammetric studies of the following electrochemical reaction. Please select the preferred electrode from a)Hg, b)pt, and c)C. Give your reasons for your choice. (4%)
  - (1)  $\text{M}^+ + \text{e}^- \rightleftharpoons \text{M}$   $E^0 = +1.05 \text{ V (vs SCE)}$ .
  - (2)  $\text{A} + \text{e}^- \rightleftharpoons \text{A}^-$   $E^0 = -1.20 \text{ V (vs SCE)}$ .
6. Define Liquid Junction Potential and describe its effect on electrochemical methods. (4%)
7. What are the requirements for a solvent to be used for voltammetry (or polarography) experiments? (4%)
8. 一般以螢光器去定量物質濃度時，在高濃度時並不遵守  $F=KC$  ( $F$ : fluorescence power,  $C$ : concentration of analyte) 請說明其可能之原因。 (10%)
9. 試比較傅式轉換型儀器 (Fourier transform instrument) 和傳統光譜儀之優缺點。 (10%)
10. 試比較氣體層析(gas chromatography), 液體層析(liquid chromatography), 及超臨界流體層析 (supercritical fluid chromatography) 在分離速度、分離效率、及應用範圍之不同，並說明理由。 (10%)
11. 試說明在充填式(packed column)及開管式(open tubular)管柱在層析法中影響分離效率( $N$ )之因素，並說明。 (10%)
12. 作定量分析時，如果樣品中有和被分析物不易分離之干擾物質存在時則用何種方法去定量最容易? (5%)
13. 測 (a)礦石中之鐵成份  
(b)合金中之鐵成份  
最快且最容易之方法是否相同，其原因為何? (5%)

IA	IIA	IIIB	IVB	VB	VIB	VIIIB	IB	IIIB	IIIA	IVA	VA	VIA	VIIA	Noble Gases																
1 H 1.008														2 He 4.003																
3 Li 6.941	4 Be 9.012												9 F 18.998	10 Ne 20.179																
11 Na 22.990	12 Mg 24.305												17 Cl 35.453	18 Ar 39.948																
19 K 39.098	20 Ca 40.08	21 Sc 44.956	22 Ti 47.88	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.847	27 Co 58.933	28 Ni 58.69	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80													
37 Rb 85.468	38 Sr 87.62	39 Y 88.906	40 Zr 91.22	41 Nb 92.906	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.905	46 Pd 106.42	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.904	54 Xe 131.30													
55 Cs 132.905	56 Ba 137.33	57* La 138.905	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.2	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.966	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (~222)													
87 Fr (223)	88 Ra 226.02	89* Ac 227.028	104 Unq (261)	105 Uup (262)	106 Uuh (263)	Inner Transition Metals																								
The Active Metals														61 La 140.12	62 Ce 140.907	63 Pr 144.24	64 Nd 147.07	65 Pm (145)	66 Sm 150.4	67 Eu 151.96	68 Gd 157.25	69 Tb 158.925	70 Dy 162.50	71 Ho 164.930	72 Er 167.26	73 Tm 168.934	74 Yb 173.04	75 Lu 174.96		
* Lanthanides														87 Fr (223)	88 Ra 226.02	89* Ac 227.028	90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	94 Pu 244	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (254)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)
† Actinides																														