Time : 3 Hours

King Saud University
College of Science – Chemistry Depatrment

الاختبار النهائي في المقرر 652 كيم للفصل الدراسي الثاني ١٤٤١/١٤٤٢هـ

أرجو إجابة الأسئلة المرفقة بالطرق التالية:

أ- الطريقة الحسابية:

ب- طريقة استخدام Excel:

Q1: In experiment of determination of Chromium (Cr) concentration using ICP-MS. The results obtained as follows:

Concentration (ppm)	Intensity (ions/sec.)
0.1	2400
0.2	4600
0.3	6620
0.4	8760
Sample	4520

Calculate:

1. **Correlation Coefficient?**
2. **Linear Least Square?**
3. **Concentration of Chromium in Sample?**

Q2: Dissociation of silver oxalate ($Ag_2C_2O_4$) in solution as following:

$$\mathbf{Ag_2C_2O_{4(S)} \leftrightarrow 2Ag^{+}_{(aq)} + C_2O_4^{-2}{}_{(aq)}}$$

Concentration of silver (Ag) in saturated solution is 4.1×10^{-5} mole/L. Find the solubility product for silver oxalate?

Q3: Calculate the concentration of cobalt ion (Co^{2+}) at equilibrium in CoY^{2-} solution, its concentration is 0.020 M at pH:

(a) pH = 4.0?

(b) pH = 9.0?

($K_{CoY} = 2.0 \times 10^{16}$), (pH = 4.0, $\boldsymbol{\alpha_4} = 3.61 \times 10^{-9}$), (pH = 9.0, $\boldsymbol{\alpha_4} = 5.21 \times 10^{-2}$)

Q4: (a) A solution contains 0.002 M in $Cr_2O_7^{-2}$ and 0.02 M in Cr^{+3}, if the pH is 3.0, what is the potential of the half-reaction? **$E^oCr_2O_7$, Cr^{+3} = 1.33 V**

(b) Determine the concentration of silver ion at equivalent point and the voltage of silver electrode and also determine the total voltage of the cell at equivalent point if connected with Saturated Calomel Electrode in case of chloride ion titrated with silver ion? Known the solubility product of silver chloride equal ($K_{sp} = 1.82 \times 10^{-10}$). **$E^oAg$ = 0.799 V, E_{SCE} = 0.242 V**

Q5: (a) Compound with molecular weight equal to 250 g/mole absorbs 65.0% of the spectrum at a given wave length in the path length 2.0 cm in solution 17.0 mg/L. Calculate the molar absorptivity at the same wave length?

(b) In aqueous solution its volume 30 ml and containing (3.6 mmol, butyric acid), shake well with 15 ml ether then the two layers were separated and determine the acid using titration method. The rest of the acid remains in the aqueous solution equal 0.60 m mol. Calculate the Distribution Ratio D and the percentage of extraction % E?

Q6: The retention time of two compounds A and B: 19.20 min for A, 20.40 min for B in gas chromatographic column its length 40 cm, peak width for A and B at the base line equal to 1.20 min and 1.30 min respectively. Calculate the following:

(a) The degree of separation of column or the resolution?
(b) Average number of theoretical plates?
(c) HETP?
(d) Length of column needed at resolution Rs = 1.4?
(e) The Retention time required for the exit of material B?

قيم F عند مستوى ثقة ٩٥%

ν1 ν2	2	3	4	5	6	7	8	9	10	15	20	30
2	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.5
3	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.70	8.66	8.62
4	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.86	5.80	5.75
5	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.62	4.56	4.50
6	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	3.94	3.87	3.81
7	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.51	3.44	3.38
8	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.22	3.15	3.08
9	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.01	2.94	2.86
10	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.85	2.77	2.70
15	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.40	2.33	2.25
20	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.20	2.12	2.04
30	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.01	1.93	1.84

قيم t عند درجات حرية ومستويات ثقة مختلفة.

ν *	**90 %**	**95 %**	**99 %**	**99.5 %**
1	6.314	12.706	63.657	127.32
2	2.920	4.303	9.925	14.089
3	2.353	3.182	5.841	7.453
4	2.132	2.776	4.604	5.598
5	2.015	2.571	4.032	4.773
6	1.943	2.447	3.707	4.317
7	1.895	2.365	3.500	4.029
8	1.860	2.306	3.355	3.832
9	1.833	2.262	3.250	3.690
10	1.812	2.228	3.169	3.581
15	1.753	2.131	2.947	3.252
20	1.725	2.086	2.845	3.153
25	1.708	2.060	2.787	3.078
∝	1.645	1.960	2.576	2.807

v^* = N-1 = degrees of freedom .