



**Time : 2 Hours**

King Saud University  
College of Science – Chemistry Department

الاختبار الفصلي الأول في المقرر 652 كيم للفصل الدراسي الثاني 1442هـ

أرجو إجابة الأسئلة المرفقة بالطرق التالية:  
أ- الطريقة الحسابية.  
ب- طريقة استخدام Excel.

**Q1:** In an experiment of determination of water hardness in different samples.  
The results obtained as follows:

**104.2, 104.8, 103.1 & 104.3 ppm**

Calculate the following:

- a- Standard Deviation?
- b- Standard Deviation of the mean?
- c- % Relative Standard Deviation of the mean?
- d- Coefficient of Variation (%RSD)?

**Q2:** In the following reaction of hydrogen and iodine:



The concentrations of reactants and products at equilibrium and temperature at 400°C were:

$$[\text{H}_2] = [\text{I}_2] = 1.0 \times 10^{-3} \text{ M}, \quad [\text{HI}] = 0.8 \times 10^{-2} \text{ M}$$

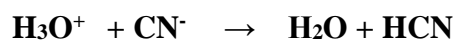
Calculate the value of equilibrium constant and concentrations of reactants and products at equilibrium, if we mix 4.0 moles for each  $\text{H}_2$  and  $\text{I}_2$  in a container capacity 10.0 L and the temperature is the same?

**Q3:** Calculate the solubility product of lead sulphate ( $\text{PbSO}_4$ ) salt in water (which dissolves 0.038 g per liter in water)?  $\text{PbSO}_4$  f.wt. = 303 g/mole



**Q4:** Calculate the value of pH for the solution of sodium acetate its concentration 0.25 M? ( $K_a = 1.75 \times 10^{-5}$ ,  $K_w = 1.0 \times 10^{-14}$ )

**Q5:** During titration of (100 ml) of potassium cyanide (KCN) solution its molarity (0.10 M) with hydrochloric acid (HCl) (0.20 M):  
( $K_a = 2.10 \times 10^{-9}$ ,  $K_w = 1.0 \times 10^{-14}$ )



Calculate the pH after adding different volumes of acid:

- (a) 0.00 ml?
- (b) 20.0 ml?
- (c) 50.0 ml?
- (d) 60.0 ml?

قيم F عند مستوى ثقة ٩٥%

v1 v2	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.

v *	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