1. 解釋下列名詞 (18%)
   (a) Precision
   (b) Standard Deviation
   (c) Spike (添加分析)
   (d) MDL (Method Detection Limit)
   (e) Calibration
   (f) Primary Standard

2. 重覆檢測一個樣品，得一組測量值
   0.403, 0.401, 0.381, 0.401, 0.394, 0.411, 0.409
   請問測定值0.381 與0.394 是否應捨棄？ (12%)

   附表：95% 可信度的Q 臨界值(Q Critical Value)

點數	Q Crit
3	0.970
4	0.831
5	0.717
6	0.621
7	0.570
8	0.524
9	0.492
10	0.464

3. 計算下列二式 (10%)

   (a) $x=0.50(\pm0.02)+4.10(\pm0.03)-1.97(\pm0.05)$

   (b) $x=\dfrac{4.10(\pm0.02)\times 0.0050(\pm0.0001)}{1.97(\pm0.04)}$

4. 試詳述AA的測定原理及金屬元素於溶液中至氣態原子的詳細變化步驟 (10%)

5. 家庭用漂白劑次氯酸鈉NaOCl，普通也可以當做消毒劑 (15%)
   忽略離子強度效應，新製備10^{-3} M NaOCl之1L蒸餾水溶液，求其
   "游離氯物種" (free chlorine) HOCl 及 OCl^-的濃度
   $k_b = [HOCl][OH^-] / [OCl^-] = 10^{-6.5}$
   $k_a = [H^+][OCl^-] / [HOCl] = 10^{-7.5}$

6. The chloride in a 0.3212-g sample of impure NaCl required (10%)
   35.52ml of 0.1070 N $AgNO_3$. Express the results of this analysis in terms of percentage NaCl.

7. A 25.00-ml aliquot of white dinner wine was diluted to 60ml (15%)
   and titrated with 19.80 ml of 0.0367 N NaOH to a phenolphthalein end point. Express the acidity of the wine in terms of grams tartaric acid ($H_2C_4H_4O_6$) per 100 ml.
   Assume that both acidic hydrogens are titrated.
   (Dissociation Constant of Tartaric Acid $K_1=9.4\times10^{-4}$, $K_2=2.9\times10^{-5}$)

8. Complete and balance the following equations: (10%)
   (a) $Mn(s) + H^+ \rightarrow Mn^{2+} + H_2(g)$
   (b) $Fe^{2+} + MnO_4^- + H^+ \rightarrow Fe^{3+} + Mn^{2+} + H_2O$
   (c) $Fe(CN)_6^{4-} + V(OH)_4^+ + H^+ \rightarrow Fe(CN)_6^{3-} + VO^{2+} + H_2O$
   (d) $I_2(aq) + S_2O_3^{2-} \rightarrow I^- + S_4O_6$
   (e) $HOI + OH^- \rightarrow IO_3^- + I^- + H_2O$