> **注意事項：**
> 1. 本試題共 7 大題，共 100 分。
> 2. 請標明大題、子題編號作答，不必抄題。
> 3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

1. Write chemical formulas for the following compounds　(30 points total)

   a.　sodium sulfite

   b.　tin (IV) fluoride

   c.　ammonium hydrogen phosphate

   d.　potassium perchlorate

   e.　sodium hydride

2. Please balance the following equations. (15 points)

   a.　$Ca(OH)_{2\ (aq)} + H_3PO_{4\ (aq)} \rightarrow H_2O_{\ (l)} + Ca_3(PO_4)_{2\ (s)}$

   b.　$Al(OH)_{3\ (s)} + HCl_{\ (aq)} \rightarrow AlCl_{3\ (aq)} + H_2O_{\ (l)}$

   c.　$AgNO_{3\ (aq)} + H_2SO_{4\ (aq)} \rightarrow Ag_2SO_{4\ (s)} + HNO_{3\ (aq)}$

3. Calculate the pH of a 0.20 M $C_2H_5NH_2$ solution ($K_b = 5.6 \times 10^{-4}$). (10 points; atomic weight of C = 12.01; N = 14.01; H = 1.008;)

4. Explain why HF is weak acid, whereas HCl, HBr, and HI are all strong acid. (10 points)

5. To calculate ΔS_{surr} at constant pressure and temperature, we use the following equation: $\Delta S_{surr} = -\frac{\Delta H}{T}$.　Why does a minus sign appear in the equation, and why is ΔS_{surr} inversely proportional to temperature? (10 points)

6. Draw Lewis structures that obey the octet rule for the following species. (15 points)

   a. PO_4^{3-}

   b. NO_4^{3-}

   c. SO_2Cl_2

   d. ClO_3^-

   e. $POCl_3$

7. The unknown sample of 9.486 g contained thallium (II) sulfate (Tl_2SO_4) was precipitated with sodium iodide to give thallium (I) iodide.　Calculate the mass percent of Tl_2SO_4 in the sample if 0.1842g of TlI was recovered. (10 points; atomic weight Tl = 204.38; S = 32.07; O = 16.00)