每題 20 分

1. Consider the following reaction:

$$CH_4(g) + 4Cl_2(g) \rightarrow CCl_4(g) + 4HCl(g)$$
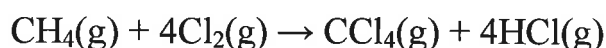
   What mass of CCl_4 will be formed if 1.4 moles of methane react with 1.4 moles of chlorine? (M.W.: Cl: 35.45; C:12.01)

2. $CH_4 + 4Cl_2(g) \rightarrow CCl_4(g) + 4HCl(g)$, $\Delta H = -434$ kJ

   Based on the above reaction, what energy change occurs when 1.7 moles of methane reacts?

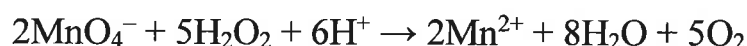3. For the reaction $A + B \rightarrow$ products, the following data were obtained.

Initial Rate (mol/L · s)	0.030	0.059	0.060	0.090	0.090
$[A]_0$ (mol/L)	0.10	0.20	0.20	0.30	0.30
$[B]_0$ (mol/L)	0.20	0.20	0.30	0.30	0.50

   What is the experimental rate law?

4. What concentration of HF ($K_a = 7.2 \times 10^{-4}$) has the same pH as that of 0.070 M HCl? (M.W.: F:19.00; Cl:35.45)

5. In the reaction

$$2MnO_4^- + 5H_2O_2 + 6H^+ \rightarrow 2Mn^{2+} + 8H_2O + 5O_2$$

   what volume of 0.150 M $KMnO_4$ solution is needed to titrate 75.0 mL of a 0.150 M H_2O_2 solution? (M.W.: Mn:54.94; K: 39.10)