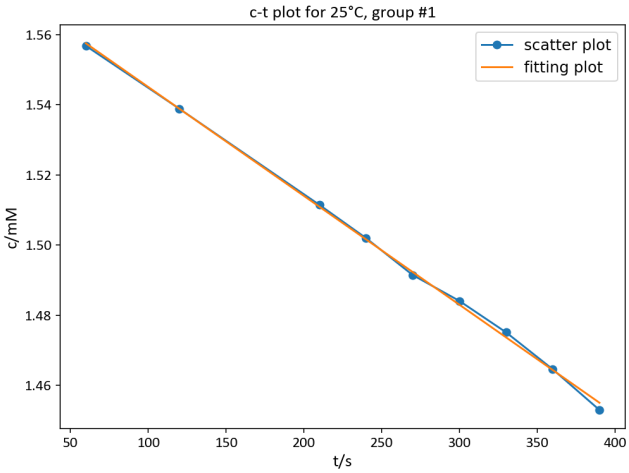
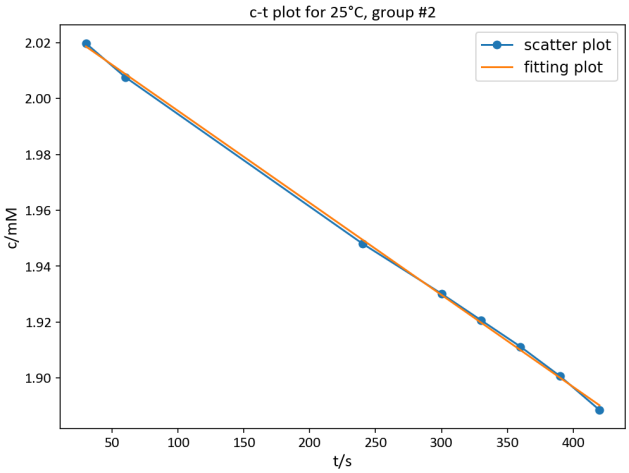
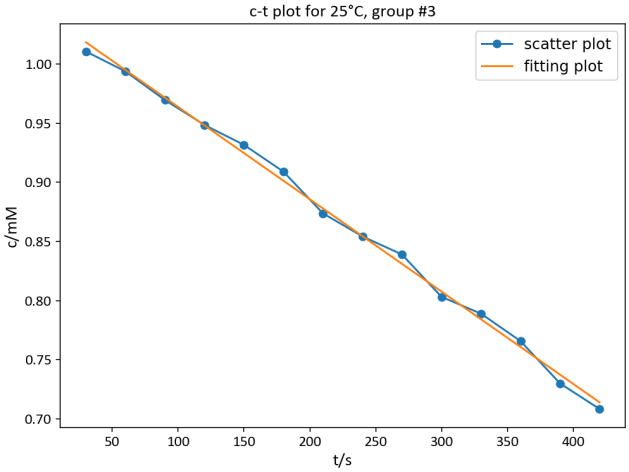
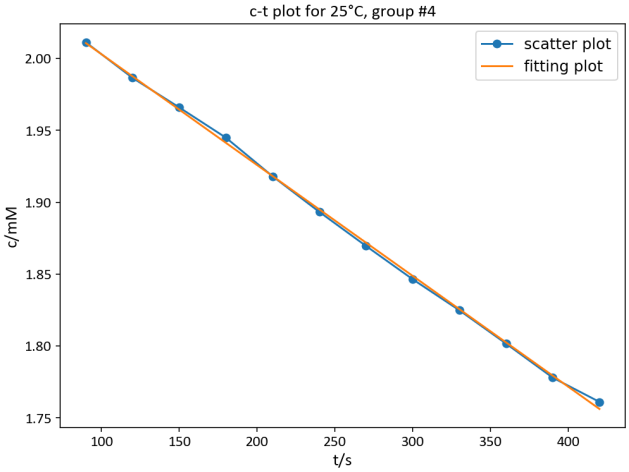
T = 25 °C





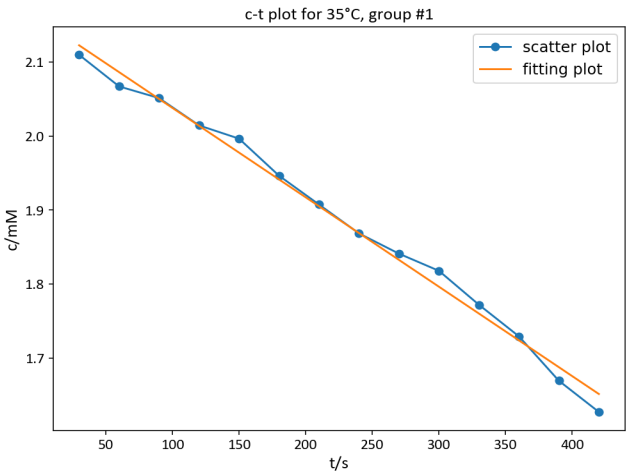
1 的反应速率为 3.103×10^{-4}，# 2 的反应速率为 3.291×10^{-4}

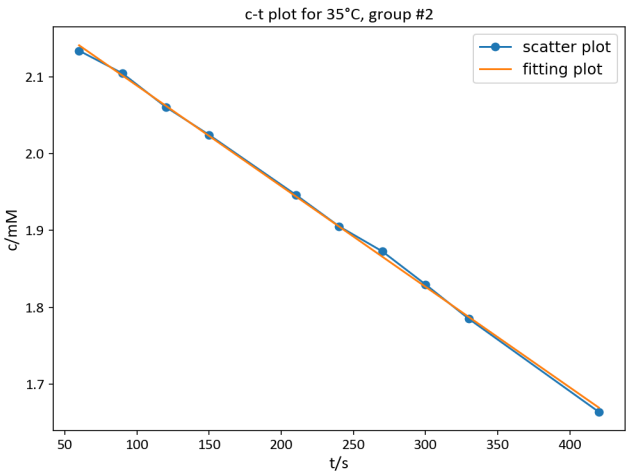




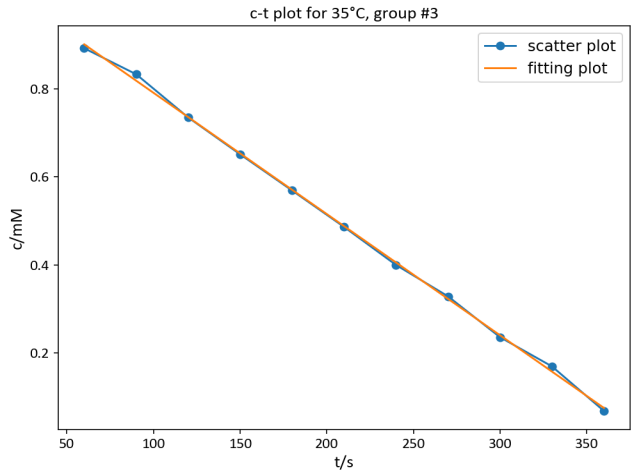
3 的反应速率为 7.806×10^{-4}，# 4 的反应速率为 7.714×10^{-4}

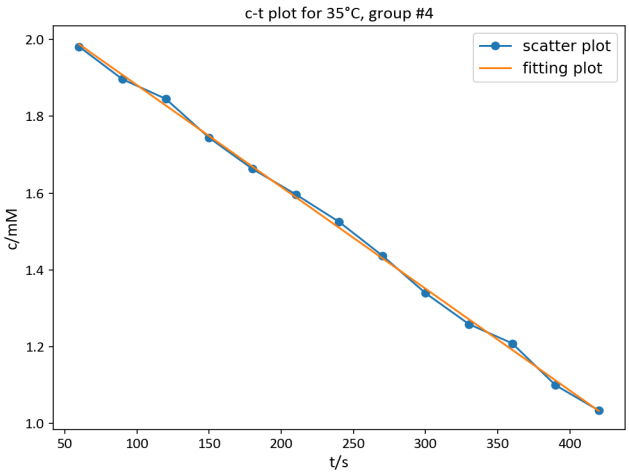
T = 35 °C





1 的反应速率为 1.208×10^{-3}，# 2 的反应速率为 1.310×10^{-3}





3 的反应速率为 2.751×10^{-3}，# 4 的反应速率为 2.652×10^{-3}

丙酮的反应级数

由 (9-6) 可知, $p = lg\frac{v_4}{v_2} / lg\frac{0.3355}{0.1687}$

- T = 25°C

  $p = lg\frac{7.714\times10^{-4}}{3.291\times10^{-4}} / lg\frac{0.3355}{0.1687} = 1.24 \approx 1$

- T = 35°C

  $p = lg\frac{2.652\times10^{-3}}{1.310\times10^{-3}} / lg\frac{0.3355}{0.1687} = 1.03 \approx 1$

氢离子的反应级数

由 (9-7) 可知, $r = lg\frac{v_4}{v_1} / lg\frac{0.3548}{0.1862}$

- T = 25°C

  $r = lg\frac{7.714\times10^{-4}}{3.103\times10^{-4}} / \frac{0.3548}{0.1862} = 1.41 \approx 1$

- T = 35°C

  $r = lg\frac{2.652\times10^{-3}}{1.208\times10^{-3}} / lg\frac{0.3548}{0.1862} = 1.22 \approx 1$

碘的反应级数

同理可知, $q = lg\frac{v_4}{v_3} / lg\frac{27.82}{14.97}$

- T = 25°C

  $q = lg\frac{7.714\times10^{-4}}{7.806\times10^{-4}} / lg\frac{27.82}{14.97} = -0.019 \approx 0$

- T = 35°C

  $q = lg\frac{2.652\times10^{-3}}{2.751\times10^{-3}} / lg\frac{27.82}{14.97} = -0.059 \approx 0$

反应速率常数**k**

$v = kc^p(A)c^q(I_2)c^r(H^+)_{p=1,q=0,r=1} = kc(A)c(H^+) \quad \therefore k = v \div (c(A)c(H^+))$

- T = 25℃

  对 #1, $k = \frac{3.103\times10^{-4}}{\frac{9}{15}\times0.1862\times\frac{5}{15}\times0.3355} = 0.0248$

  同理，对 #2, $k = 0.0275$, 对 #3, $k = 0.0328$, 对 #4, $k = 0.0324$.

- T = 35℃

  对 #1, $k = \frac{1.208\times10^{-3}}{\frac{9}{15}\times0.1862\times\frac{5}{15}\times0.3355} = 0.0967$

  同理，对 #2, $k = 0.109$, 对 #3, $k = 0.116$, 对 #4, $k = 0.111$.

反应的活化能

由Arrhenius关系式 $E_a = 2.303R\frac{T_1T_2}{T_2-T_1}\cdot lg\frac{k_2}{k_1}$

现选取 $T = 25^\circ C$ 的 #4 和 $T = 35^\circ C$ 的 #3 进行计算

$T_1 = 26.57^\circ C = 299.72K, T_2 = 37.08^\circ C = 310.23K; k_1 = 0.0324, k_2 = 0.116$

$\therefore E_a = 93835.45\ J/mol$