Question 5: Short Answer — 4 points

(a) For the correct calculated value: **1 point**

Accept one of the following:

- $k = \dfrac{0.693}{t_{1/2}} = \dfrac{0.693}{1.67\text{ hr}} = 0.415\text{ hr}^{-1}$
- $k = \dfrac{\ln[\text{A}]_0 - \ln[\text{A}]_t}{t} = \dfrac{\ln(0.160) - \ln(0.0800)}{1.67\text{ hr}} = 0.415\text{ hr}^{-1}$
- $k = \dfrac{\ln[\text{A}]_0 - \ln[\text{A}]_t}{t} = \dfrac{\ln(0.160) - \ln(0.0400)}{3.33\text{ hr}} = 0.416\text{ hr}^{-1}$
- $k = \dfrac{\ln[\text{A}]_0 - \ln[\text{A}]_t}{t} = \dfrac{\ln(0.160) - \ln(0.0200)}{5.00\text{ hr}} = 0.416\text{ hr}^{-1}$

For the correct units, consistent with the calculated value: **1 point**

hr^{-1}

Total for part (a) — 2 points

(b) For the correct answer and a valid justification: **1 point**

Step 1 is the rate-determining step. The rate law of elementary step 1 is $\text{rate} = k[N_2O_5]$, *which is consistent with the first order kinetics of the overall rate law.*

(c) For the correct answer: **1 point**

Remain the same. The rate constant, k, is independent of concentration and will remain the same at constant temperature.

Total for question 5 — 4 points