For fireflies

\[
\ln\left(\frac{\text{Flashes}}{\text{min}}\right) \quad X(\frac{1}{h})
\]

Slope = -5.995,6
Intercept = 21.929

For crickets

\[
\ln\left(\frac{\text{Chirps}}{\text{min}}\right) \quad X(\frac{1}{h})
\]

Slope = -6166,9
Intercept = 25

a) As temperature increases, flash rate and chirps rate increase; however, the increasing rates due to temperature increase are different. The temperature dependence is stronger for crickets due to its high activation energy.
b) For ant

\[ \text{Slope} = -0.96 \]
\[ \text{Intercept} = 2.9 \]

\[ \ln V = \frac{1}{k(T)} \]

\[ V = 6.4 \text{ cm/s} \]

At 40°C

\[ \ln V = 44.6 - 133.98 \times \frac{1}{213} \]

\[ V = 0.005 \text{ cm/s} \]

At -5°C

\[ \ln V = 44.6 - 133.98 \times \frac{1}{263} \]

c) Can be modeled by Arrhenius equation

d) For different insects the behavior of interest activates at different temperature ranges. More temperature experiment will help to clarify the activity region for each case.
\[ \text{P. 3-10.} \]

1) \[-y_{\text{C}_2\text{H}_6} = k_{\text{C}_2\text{H}_6} \]

2) \[A + B \rightarrow C \]
   \[-y_A = k_{A} C_A C_B \]

3) \[A \xrightarrow{k_1} B + 2C \]
   \[-y_A = k_1 C_A - k_2 C_B C \]

4) \[A \xrightarrow{k_3} B \]
   \[-y_A = k_3 C_A - k_2 C_B \]

5) \[A + B \xrightarrow{k_4} C + D \]
   \[-y_A = k_4 C_A C_B - k_5 C_C C_D \]

5)

1) \[-y_A = k C_B^2 C_A \]
2) \[-y_B = k C_D \]
3) \[-y_A = k C_N / C_B \]

\{ Actually, I personally don't think I could get any result from the information given from problem \}

C)

1) \[-y = \frac{k \text{CH}_3 \text{C}_6}{k_2 + \text{CH}_3 \text{C}_6} \]
2) \[-y = \frac{k \text{CH}_3 C_6}{k_2} \]
a) \[ K_c = \frac{C_{A_0}(X_{AE})}{C_{A_0}(1-X_{AE})^2} \]

\[ b = \frac{X_{AE}}{2(1-X_{AE})^2} \]

\[ X_{AE} = 0.3 \]

\[ C_{AE}/C_{A_0}(1-X_{AE}) = 0.4 = C_{BE} \]

\[ C_{CE} = 1.6 \quad \text{(m mole / l)} \]

b) \[ C_A = C_{A_0} \frac{1-X_A}{1+EX_A} \]

\[ \varepsilon = (3-1)-1 = 2 \]

\[ C_C = C_{A_0} \frac{3X_A}{1+EX_A} \]

\[ K_c = \frac{C_{CE}^3}{C_{AE}} \quad X_{AE} = 0.58 \]

\[ C_{AE} = 0.0593 \text{ m mole / l} \]

\[ C_{CE} = 0.246 \text{ m mole / l} \]
c) \[ N_A = N_{A_0} (1 - x_A) \]
\[ N_C = N_{C_0} 3 x_A \]
\[ C_A = \frac{N_A}{V} \quad C_C = \frac{N_C}{V} \quad C_{A_0} = \frac{P_0}{RT} \]
\[ C_A = C_{A_0} (1 - x_{A_0}) \]
\[ C_C = C_{C_0} 3 x_C \]
\[ K_C = \frac{C_C^3}{C_A} \]
\[ X_{A_0} = 0.3793 \]
\[ C_{A_0} = 0.1825 \]
\[ C_{C_0} = 0.359 \]

d) Should be the same as part b.
<table>
<thead>
<tr>
<th>Batch</th>
<th>CSTR</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0$</td>
<td>$\tilde{z} = \frac{C_0}{R} \ln(1+3x)$</td>
</tr>
<tr>
<td>$1$</td>
<td>$\tilde{z} = \frac{1}{R} \ln\left(\frac{1}{1-x}\right)$</td>
</tr>
<tr>
<td>$1-R$</td>
<td>$\tilde{z} = \frac{x}{R} \ln\left(\frac{x}{1-x}\right)$</td>
</tr>
<tr>
<td>$2$</td>
<td>$\tilde{z} = \frac{1}{R} \left[\frac{(1+3x)x}{1-x} - 3 \ln\left(\frac{1}{1-x}\right)\right]$</td>
</tr>
</tbody>
</table>

- $\tilde{z} = \frac{C_0}{R} x$  
- $\tilde{z} = \frac{x(1+3x)}{R(1-x)}$  
- $\tilde{z} = \frac{x(1+3x)^2}{R(1-x)^2}$