

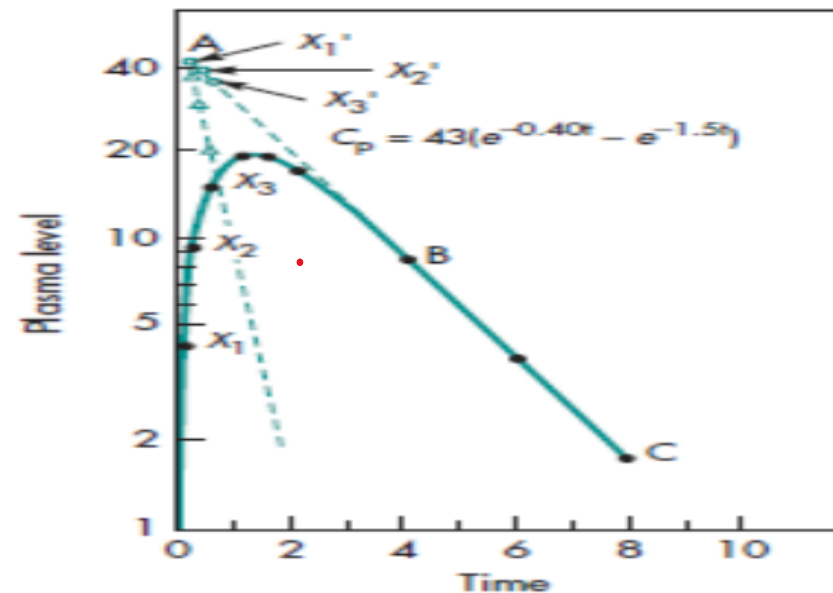
Lab 5 part 2

## Determination of Absorption Rate Constants from Oral Absorption Data

# Method of Residuals



- Slope is equal to  $-k/2.303$ .
- So  $K_a = -2.303 * \text{slope}$

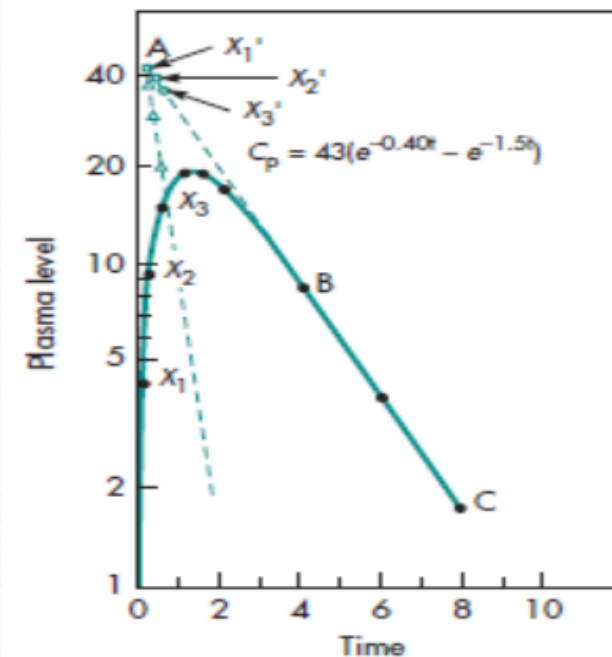




# Method of Residuals



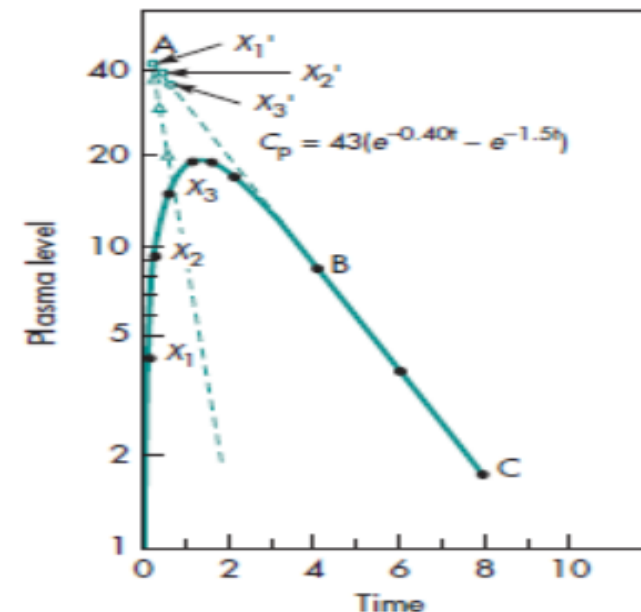
- The **value for  $k_a$**  can be obtained by **using the method of residuals** or a **feathering technique**, by the following procedure:
  1. **Plot the drug concentration versus time** on **semilog paper** with the concentration values on the logarithmic axis.
  2. **Obtain the slope of the terminal phase** (line BC,) by extrapolation.



# Method of Residuals



3. Take any points on the upper part of line BC (eg,  $x_1'$ ,  $x_2'$ ,  $x_3'$ , ...) and drop vertically to obtain corresponding points on the curve (eg,  $x_1$ ,  $x_2$ ,  $x_3$ , ...).
4. Read the concentration values at  $x_1$  and  $x_1'$ ,  $x_2$  and  $x_2'$ ,  $x_3$  and  $x_3'$ , and so on.
5. Plot the values of the differences at the corresponding time points  $\Delta_1$ ,  $\Delta_2$ ,  $\Delta_3$ , ... .
6. A straight line will be obtained with a slope of  $-ka/2.303$ .



# Example

Drug concentrations in the blood at various times are listed in table. Assuming the drug follows a one compartment model.

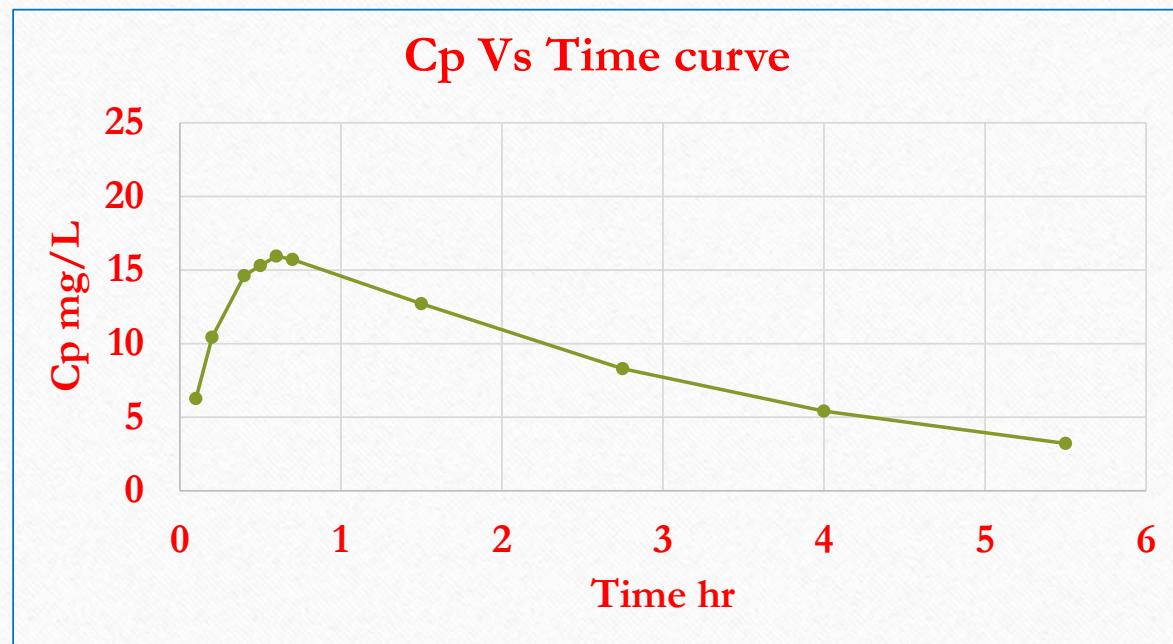
Find the  $k_a$  value by the method of residuals.

time (hr)	Cp (mg/L)
0.1	6.267
0.2	10.43
0.4	14.62
0.5	15.3
0.6	15.95
0.7	15.72
1.5	12.72
2.75	8.3
4	5.421
5.5	3.223



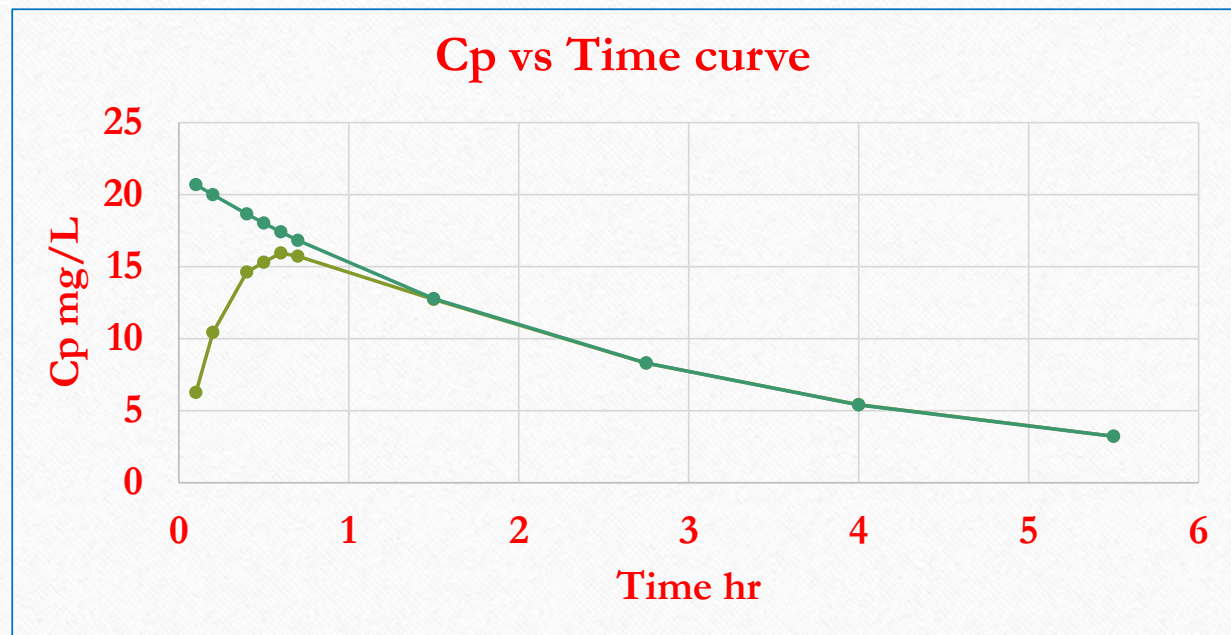
## Step 1 plotting

time (hr)	Cp (mg/L)
0.1	6.267
0.2	10.43
0.4	14.62
0.5	15.3
0.6	15.95
0.7	15.72
1.5	12.72
2.75	8.3
4	5.421
5.5	3.223



## Step2 Extrapolation

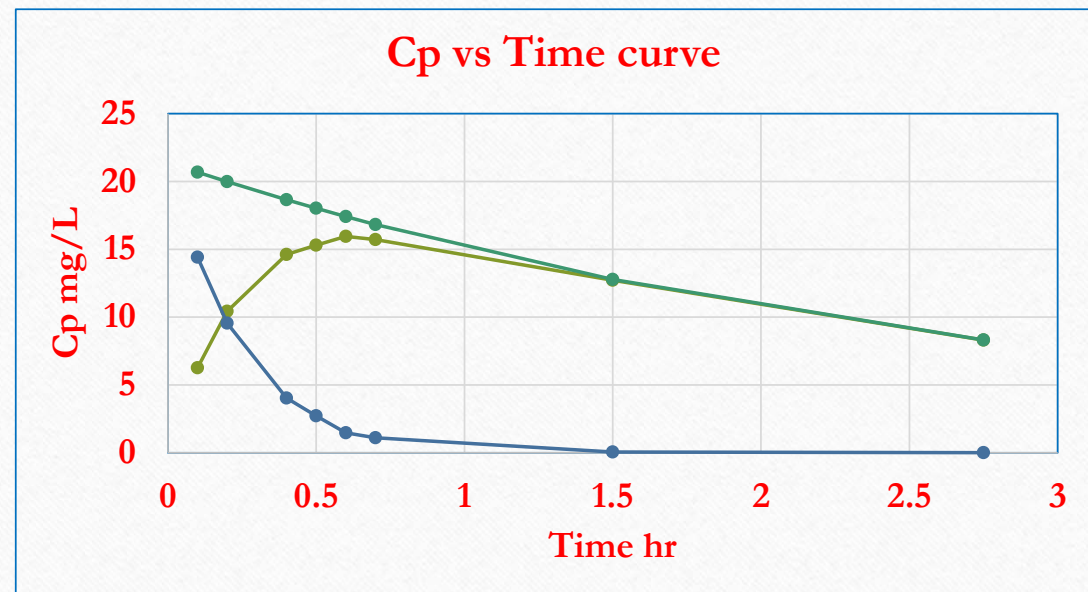
time (hr)	Cp (mg/L)	Cp <sub>late</sub> (mg/L)
0.1	6.267	20.687
0.2	10.43	19.987
0.4	14.62	18.658
0.5	15.3	18.027
0.6	15.95	17.417
0.7	15.72	16.828
1.5	12.72	12.779
2.75	8.3	8.312
4	5.421	5.407
5.5	3.223	3.227





## Step3 Residual plotting

time (hr)	Cp (mg/L)	Cp <sub>plate</sub> (mg/L)	Residual (mg/L)
0.1	6.267	20.687	14.42
0.2	10.43	19.987	9.557
0.4	14.62	18.658	4.038
0.5	15.3	18.027	2.727
0.6	15.95	17.417	1.467
0.7	15.72	16.828	1.108
1.5	12.72	12.779	0.059
2.75	8.3	8.312	0.012
4	5.421	5.407	-
5.5	3.223	3.227	-

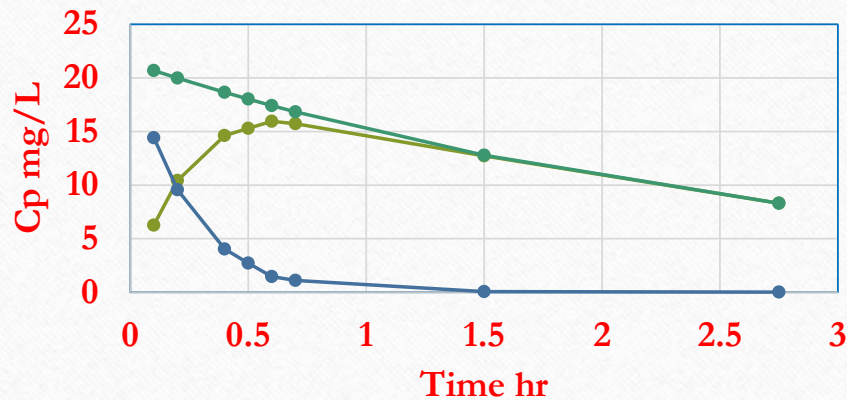




## Step3 Math calculation

time (hr)	Cp (mg/L)	Cp <sub>plate</sub> (mg/L)	Residual (mg/L)
0.1	6.267	20.687	14.42
0.2	10.43	19.987	9.557
0.4	14.62	18.658	4.038

Cp vs Time curve



$$K_a = -2.303 * \text{slope}$$

$$\begin{aligned} \text{slope} &= (\log R_{cp2} - \log R_{cp1}) / (t_2 - t_1) \\ &= (\log 9.55 - \log 14.42) / (0.2 - 0.1) \\ &= -0.178 / 0.1 \\ &= -1.78 \end{aligned}$$

$$\begin{aligned} \text{So } k_a &= -2.303 * -1.78 \\ &= 4.11 \end{aligned}$$

THANK YOU FOR  
YOUR ATTENTION