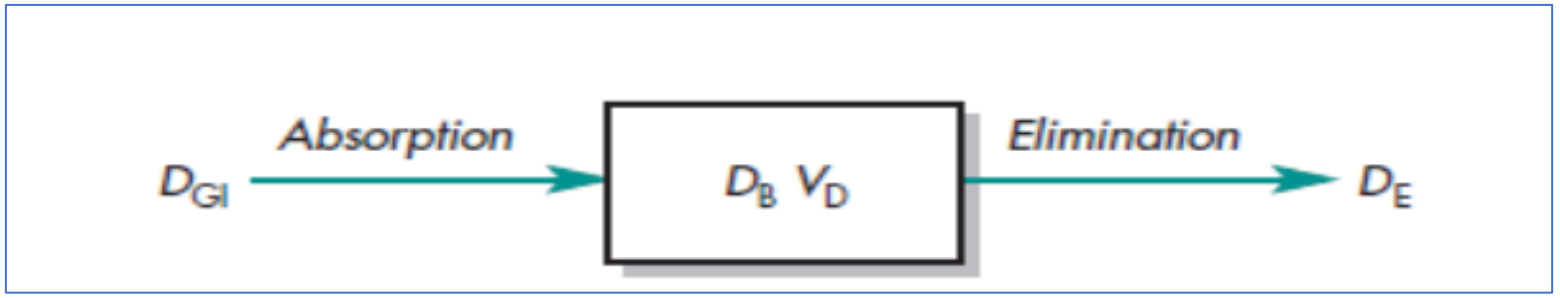
BIOPHARMACEUTICALS
LAB 1

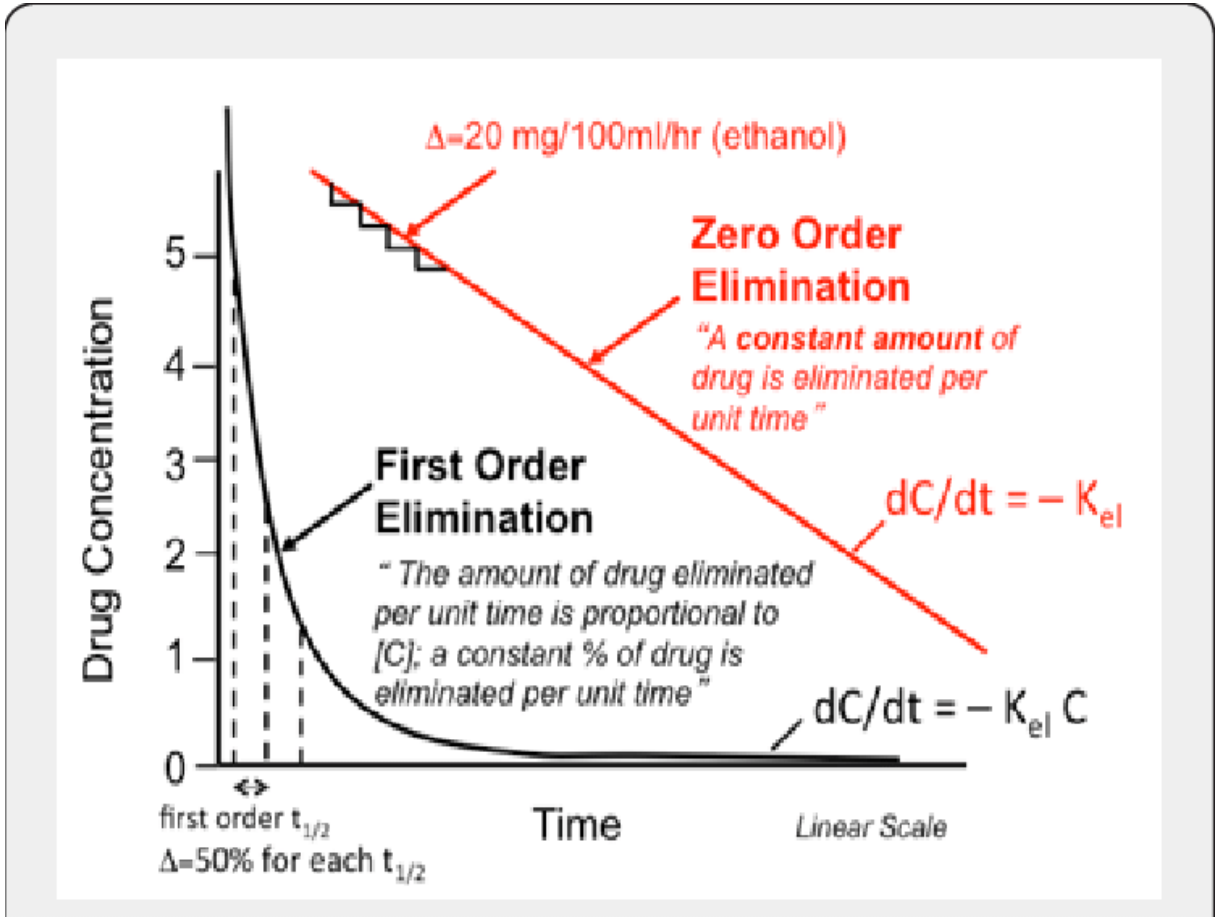
Kinetic orders

- In pharmacokinetics, the overall rate of drug absorption may be described as either a first-order or a zero order input process.
- Most pharmacokinetic models assume first-order absorption unless an assumption of zero-order absorption improves the model significantly or has been verified experimentally.



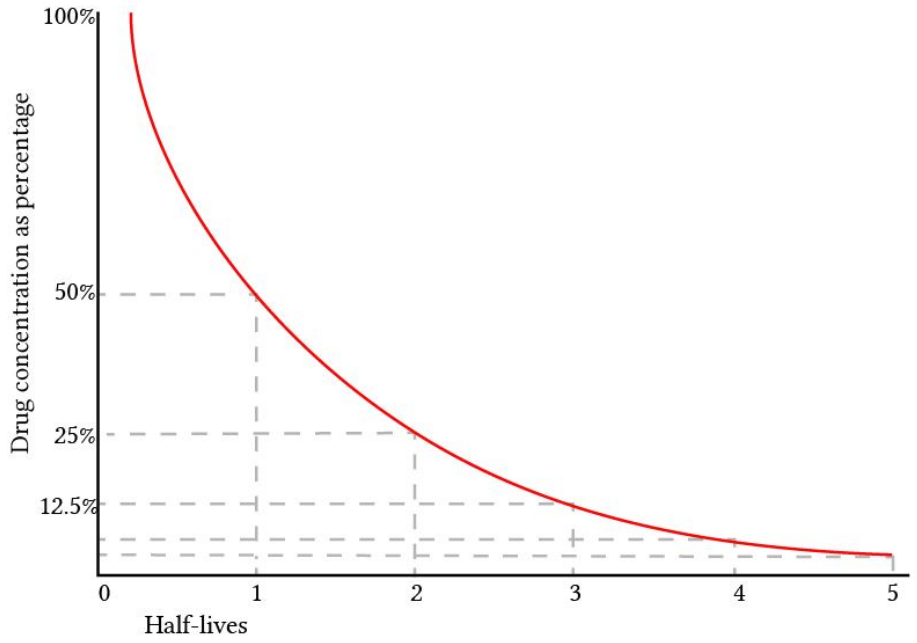
First order kinetic

- Here is a constant proportion (eg. A percentage) of drug is eliminated per unit time
- It is a concentration-dependent process (i.e. the higher the concentration, the faster the clearance).

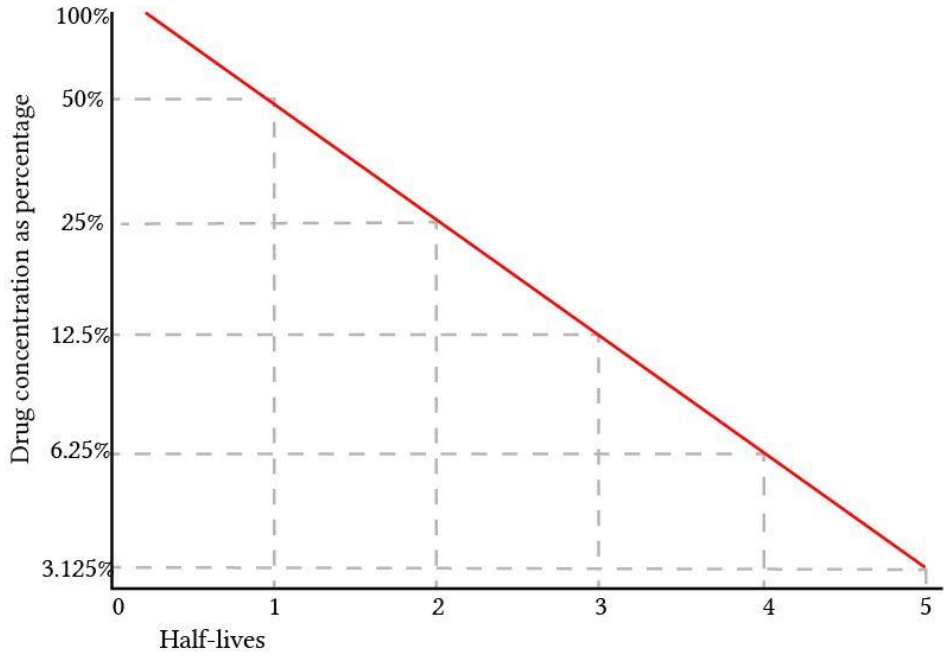


First order kinetic plot

First-order kinetics of elimination on a linear scale

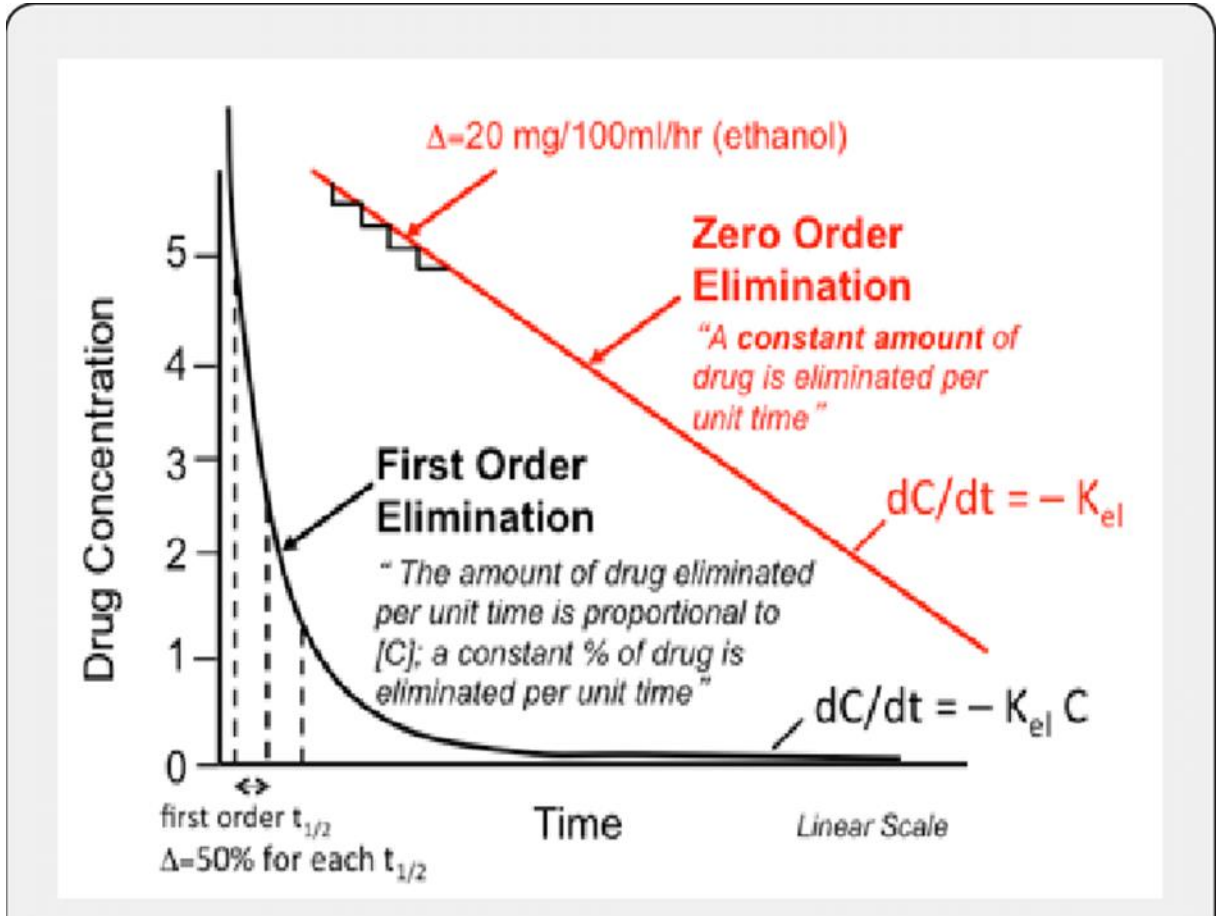


First order kinetics of elimination on a logarithmic scale



Zero order kinetic

- Here is a constant amount (eg. so many milligrams) of drug is eliminated per unit time
- Zero order elimination rate is independent of concentration.



First vs zero Order

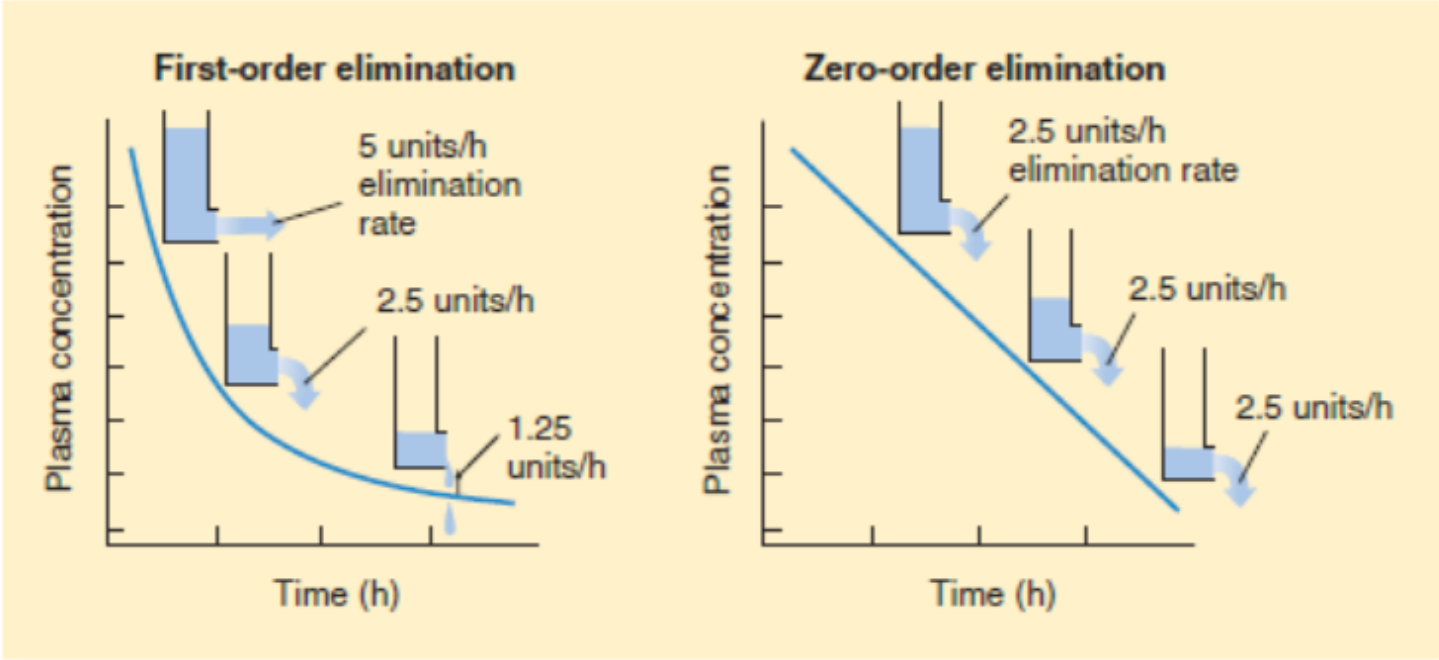


FIGURE 1–3 Comparison of first-order and zero-order elimination. For drugs with first-order kinetics (left), rate of elimination (units per hour) is proportional to concentration; this is the more common process. In the case of zero-order elimination (right), the rate is constant and independent of concentration.

Concentration vs time curve

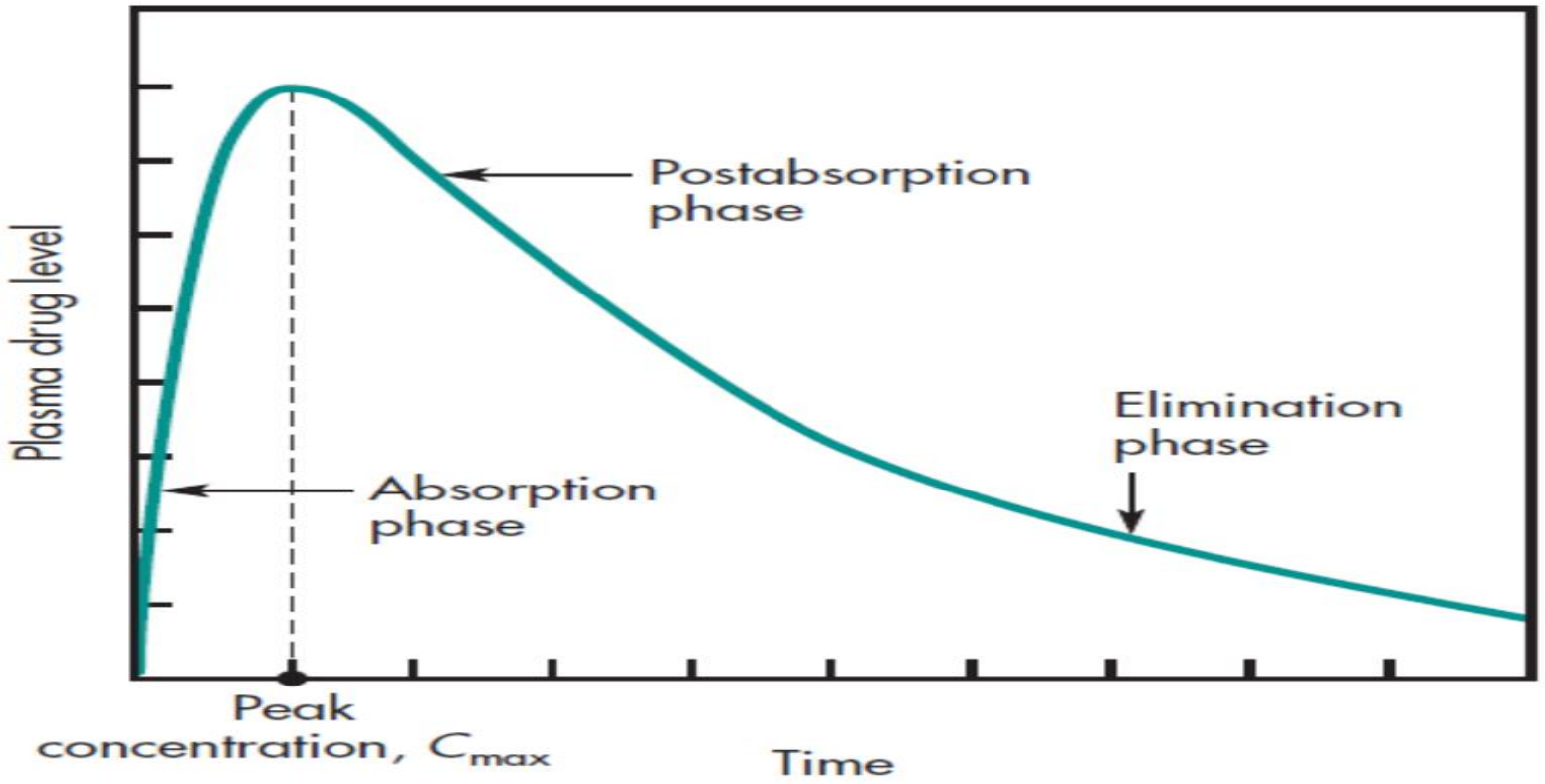
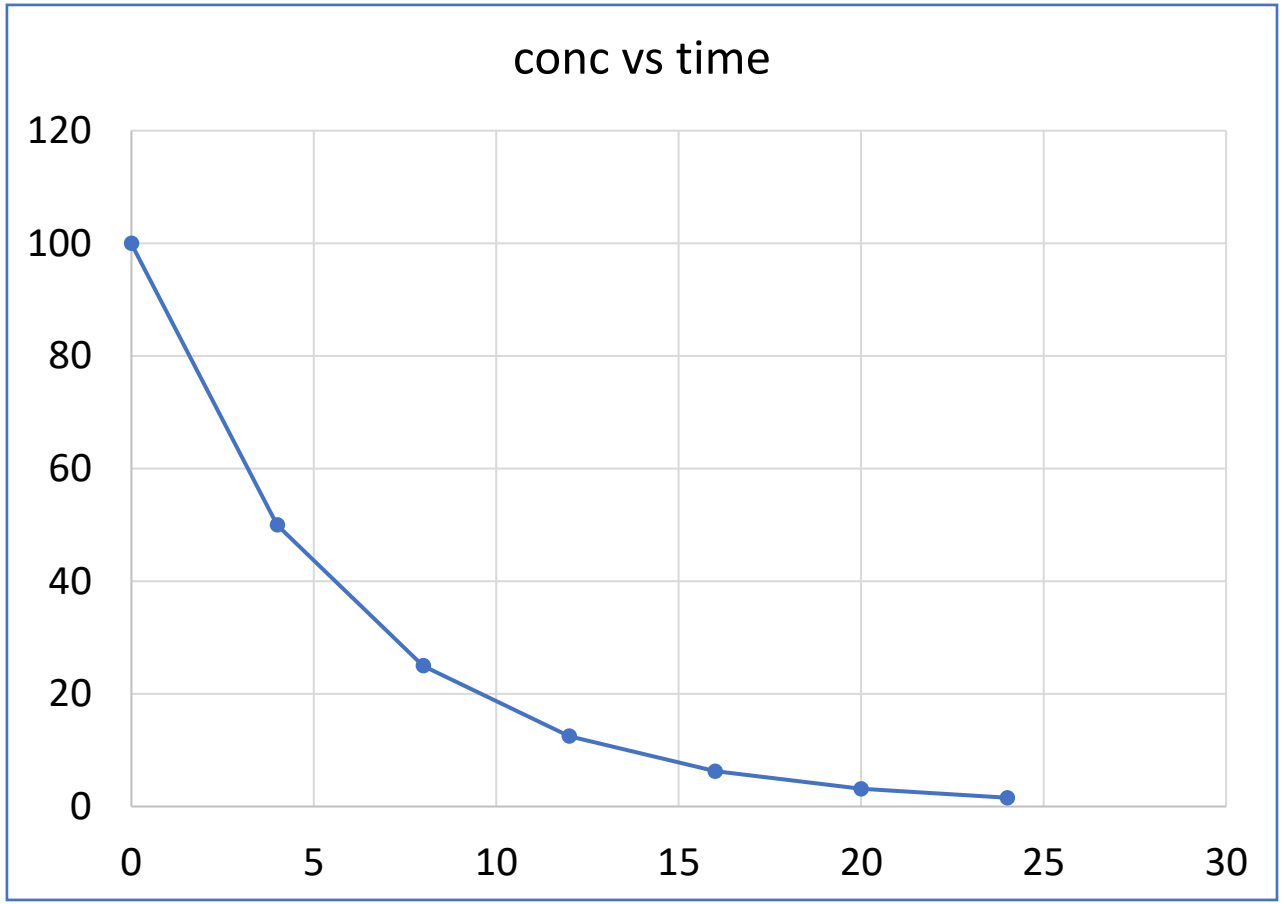


FIGURE 8-4 Plasma level–time curve for a drug given in a single oral dose. The drug absorption and elimination phases of the curve are shown.

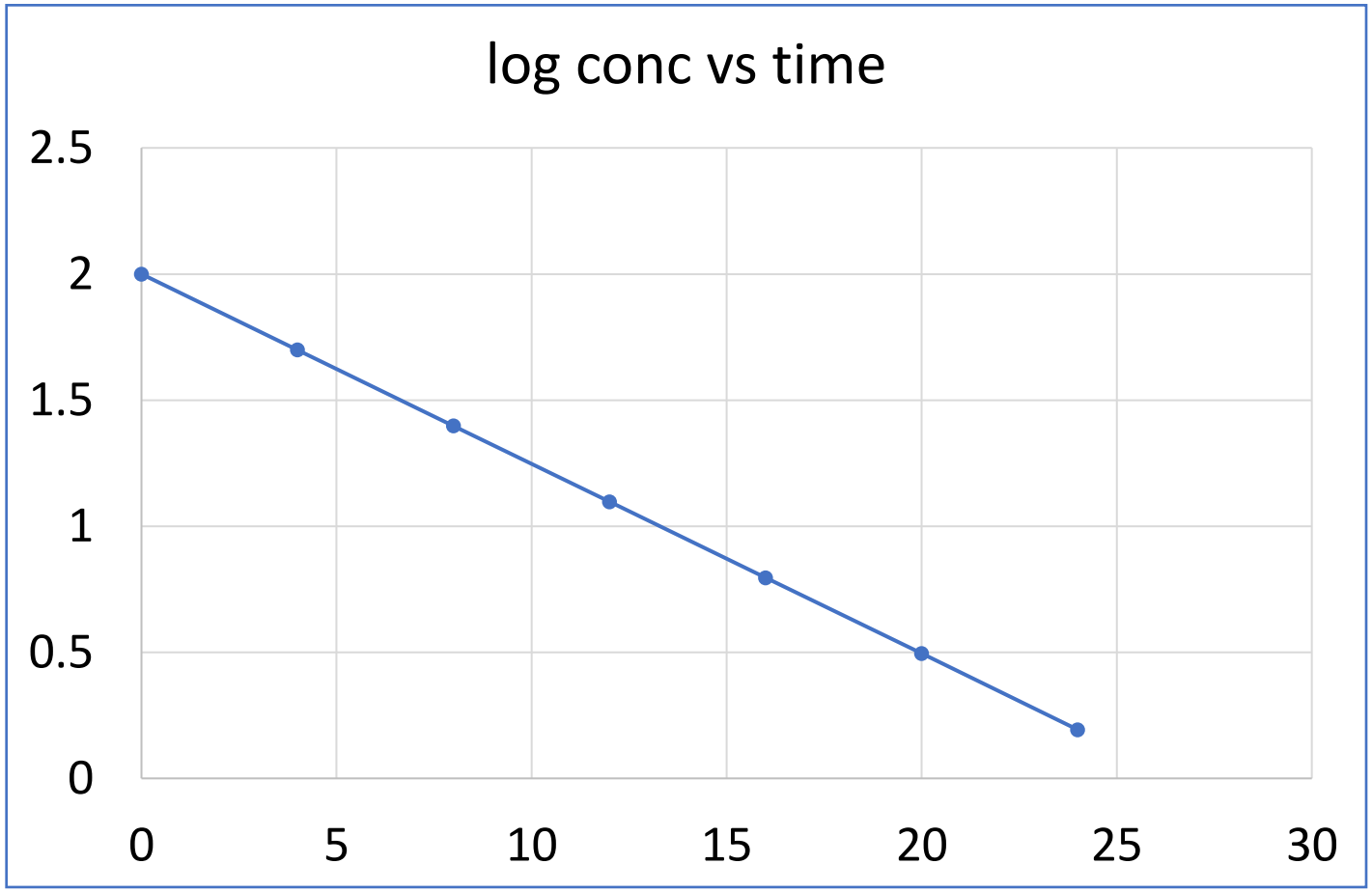
Concentration vs time curve

time	conc
0	100
4	50
8	25
12	12.5
16	6.25
20	3.13
24	1.56



Log concentration vs time curve

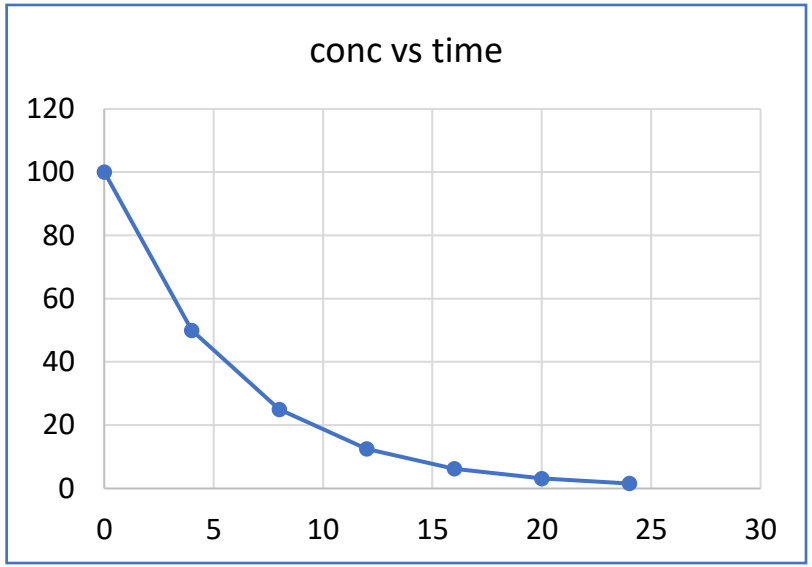
time	conc	log conc.
0	100	2
4	50	1.69897
8	25	1.39794
12	12.5	1.09691
16	6.25	0.79588
20	3.13	0.495544
24	1.56	0.193125



Calculation of *k*e from curve

- K e= - 2.303* slope
- slope= $(c_2-c_1)/(t_2-t_1)$

time	conc
0	100
4	50
8	25
12	12.5
16	6.25
20	3.13
24	1.56



for example Ke at 16 hr:

slope= (6.25-12.5)/16-12)

=-1.56 mg/ml/hr

So ke =-2.303*-1.56 = 3.59 mg/ml/hr

Homework

Following table represents series plasma conc. of drug X over 12 hr period.

1. Plot the conc- time curve
2. What is the order of kinetic?
3. What is the value of Ke at the end of period?

time (hr)	drug conc.
0	100
2	95
4	90
6	85
8	80
10	75
12	70


THANK YOU