a. Is the inhibitor competitive or noncompetitive?

b. Find K_I.

3.6. During a test of kinetics of an enzyme-catalyzed reaction, the following data were recorded:

E_0 (g/l)	T (˚C)	I (mmol/ml)	S (mmol/ml)	V (mmol/ml-min)
1.6	30	0	0.1	2.63
1.6	30	0	0.033	1.92
1.6	30	0	0.02	1.47
1.6	30	0	0.01	0.96
1.6	30	0	0.005	0.56
1.6	49.6	0	0.1	5.13
1.6	49.6	0	0.033	3.70
1.6	49.6	0	0.01	1.89
1.6	49.6	0	0.0067	1.43
1.6	49.6	0	0.005	1.11
0.92	30	0	0.1	1.64
0.92	30	0	0.02	0.90
0.92	30	0	0.01	0.58
0.92	30	0.6	0.1	1.33
0.92	30	0.6	0.033	0.80
0.92	30	0.6	0.02	0.57

a. Determine the Michaelis–Menten constant for the reaction with no inhibitor present at 30°C and at 49.6°C.

b. Determine the maximum velocity of the uninhibited reaction at 30°C and an enzyme concentration of 1.6 g/l.

c. Determine the K_I for the inhibitor at 30°C and decide what type of inhibitor is being used.

3.7. An enzyme ATPase has a molecular weight of 5×10^4 daltons, a K_M value of 10^{-4} *M,* and a k_2 value of $k_2 = 10^4$ molecules ATP/min molecule enzyme at 37°C. The reaction catalyzed is the following:

$$\text{ATP} \xrightarrow{\text{ATPase}} \text{ADP} + \text{P}_i$$

which can also be represented as

$$\text{E} + \text{S} \underset{k_2}{\overset{k_1}{\rightleftharpoons}} \text{ES} \xrightarrow{k_2} \text{E} + \text{P}$$

where S is ATP. The enzyme at this temperature is unstable. The enzyme inactivation kinetics are first order:

$$\text{E} = \text{E}_0 e^{-k_d t}$$

where E_0 is the initial enzyme concentration and $k_d = 0.1\ \text{min}^{-1}$. In an experiment with a partially pure enzyme preparation, 10 μg of total crude protein (containing enzyme) is added to a 1 ml reaction mixture containing 0.02 *M* ATP and incubated at 37°C. After 12 hours the reaction ends (i.e., $t \to \infty$) and the inorganic phosphate (P_i) concentration is found to be 0.002 *M*, which was initially zero. What fraction of the crude protein preparation was the enzyme? *Hint*: Since [S] >> K_m, the reaction rate can be represented by

$$\frac{d(\text{P})}{dt} = k_2[\text{E}]$$