**Tutorial Sheet**

**Equilibrium, Kinetics and Thermodynamics**

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1. Differentiate between stable and metastable state/equilibrium using a suitable diagram.
2. State the 4 laws of thermodynamics.
3. Do the numericals given in PPT.
4. Azomethane decomposes into nitrogen and ethane at high temperatures according to the following equation:



**(a)** By plotting the data, show that the reaction is first-order.

**(b)** From the graph, determine *k.*

**(c)** Using *k,* find the time (in hours) that it takes to decrease the concentration to 0.100 *M.*

**(d)** Calculate the rate of the reaction when [(CH3)2N2] = 0.415 *M.*

1. An increase in temperature from 23°C to 36°C increases the rate constant of a certain reaction by 50.0%. What is the activation energy of the reaction?
2. If the activation energy of a reaction is 9.13 kJ, then what is the percent increase in the rate constant when the temperature is increased from 27oC to 69oC?
3. Given the following reactions and their equilibrium constants,



1. In each of the following pairs, choose the substance with a lower entropy.

(a) H2O(l) at 10oC, H2O(l) at 30oC

(b) C (graphite), C (diamond)

(c) Cl2(l), Cl2(g), both at room temperature

1. In each of the following pairs, choose the substance with a lower entropy.

(a) glucose (s), glucose (aq)

(b) Hg(l), Hg(g), both at room temperature