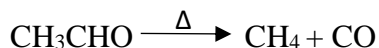
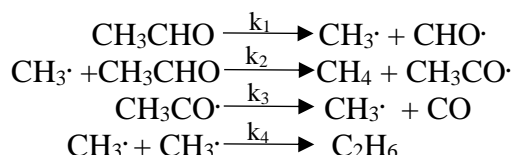


Assignment 9
Indian Institute of Science Education and Research
CHM202: Energetics and dynamics of chemical reactions
Instructor: Dr. Arijit K. De

Ques 1. The overall reaction for the pyrolysis of acetaldehyde is:



A sequence of elementary steps proposed to explain the decomposition as follows:



Apply the steady state approximation to the intermediates and obtain an expression for the decomposition of CH_3CHO .

Ques. 2 If v is the volume of a gas adsorbed on the surface of a solid, then show that a plot of p/v versus p , where p is the gas pressure in the Langmuir adsorption isotherm, gives a straight line. Also show that for small coverage, a plot of $\ln(\theta/p)$ versus θ gives a straight line.

Ques. 3 The adsorption of a gas follows the Langmuir isotherm with $K = 1.25 \text{ kPa}^{-1}$ at 25°C . Calculate the pressure (in Pa) at which gas achieve the fractional surface coverage of 20%.

Ques. 4 At 0°C and 1 atm pressure, the volume of nitrogen gas required to cover a sample of silica gel, assuming Langmuir monolayer adsorption, is found to be $130 \text{ cm}^3 \text{ gm}^{-1}$ of the gel. Calculate the surface area per gram of silica gel. Given that the area occupied by a nitrogen molecule is 0.162 nm^2

Ques. 5 Suppose it is known that ozone adsorbs on a particular surface in accordance with a Langmuir isotherm. How could you use the pressure dependence of the fractional coverage to distinguish between adsorption (a) without dissociation, (b) with dissociation into $\text{O} + \text{O}_2$, (c) with dissociation into $\text{O} + \text{O} + \text{O}$?

Ques. 6 A certain solid sample adsorbs 0.63 mg of CO when the pressure of the gas is 36.0 kPa and the temperature is 300 K. The mass of gas adsorbed when the pressure is 4.0 kPa and the temperature is 300 K is 0.21 mg. The Langmuir isotherm is known to describe the adsorption. Find the fractional coverage of the surface at the two pressures.