KISII UNIVERSITY
UNIVERSITY EXAMINATIONS

**FIRST YEAR EXAMINATION FOR THE AWARD OF
THE DEGREE OF MASTER OF SCIENCE IN ANALYTICAL CHEMISTRY
SECOND SEMESTER 2021/2022
(FEBRUARY-JUNE, 2022)**

CHEM 819: ADVANCED CHEMICAL KINETICS

STREAM: Y1 S2　　　　　　　　　　**TIME:　　3 HOURS**

DAY: THURSDAY, 9.00 AM – 12.00 PM　　　**DATE:　　26/05/2022**

INSTRUCTIONS:

1. Do not write anything on this question paper.
2. Answer Any SIX Questions from the paper.
3. You should have a scientific calculator.

1. Derive the second order rate equation for reaction in which unequal amounts of reactants are used.　　　　　　　　　　[10Marks]

2. Discuss consecutive reactions with suitable examples.　　　[10 Marks]

3. Derive michaelis-Moetein equation for enzyme catalyzed reactions.

   [10 Marks]

4. Discuss the Langmuir isotherms as used in gaseous heterogonous catalysis.

   [10 Marks]

5. Critically analyze the transition state theory of reaction rates.   [10 Marks]

6. Show that for chain reaction $K_1 + K_{-1} = \frac{aK_1}{x_e}$ where K_1 and K_{-1} are rate constants for the forward and backward reactions.   [10Marks]

7. The number of photons absorbed can be determined by chemical actinometry. Careful experiments have shown that at 300 nm the quantum efficiency for the decomposition of uranyl oxalate is 0.570. In a particular experiment the incident light passing through an empty cell led to decomposition of 6.201×10^{-3} moles of the oxalate in 2 hours. When the cell contained acetone and irradiation continued for 10 hours it was found that 1.40×10^{-3} moles of acetone were decomposed and the light that passed through the cell decomposed 2.631×10^{-2} moles of the oxalate. Determine the quantum efficiency for the acetone decomposition?   [10 Marks]

8. Discuss the application of steady state approximation in determination of complex reactions orders with a suitable example.   [10 Marks]

9. Derive the third order rate equation for a reaction of the type A+B+C with unequal reactant concentrations.   [10 Marks)