TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY (INDUSTRIAL AND ANALYTICAL OPTION)

BTAC 15S SEPT 2015

ACH 4201 Chemical Kinetics and Reaction Dynamics.

SPECIAL SUPPLEMENTARY EXAMINATION

SERIES:SEPT. 2017

TIME:2 HOURS

DATE:

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of FIVE questions. Answer Question one compulsory and any other two question

Do not write on the question paper.

Paper two

QUESTION ONE

a) At 35°C the rate constant of a certain reaction was 4.35×10^{-5} M^{-1} sec .and at 25°C the rate constant was 3.46×10^{-5} M^{-1} sec Calculate energy of activation. **5 marks**

b) State

i. different factors which contribute to enzymes performance **6 marks**

ii. Characteristic of second order reaction. **3 marks**

c) At a certain temperature the half life periods of a certain reaction are shown below. Determine

(i) Order of Reaction (ii) rate constant **6 marks**

Initials concentration in mols per litre.	6.67	13.33	26.67
Half life in sec	490	388	301

A. The reaction $SO_2CL_2 \longrightarrow SO_2 + CL_2$ follows the kinetics of first order reaction at 673 K.Calculate percentage of SO_2CL_2 that will decompose after 90 minutes given rate constant as 2.2×10^{-5} per minute **5 marks**

B. the following are experimental result were obtain for a certain reaction.

Proof if fits second order reaction (ii) determine concentration at 30 minutes **5 marks**

Time in min.	10	0	20	40
Concentration	0.800	1.00	0.6667	0.500

QUESTION TWO

a) With the help of concentration -time curve, briefly explain autocatalysis theory **6 marks**
b) Explain breifly
   i. Molecular reaction dynamics
   ii. Branched-chain explosion **6 marks**
c) Briefly explain different steps involve in chain reaction steps. **6 marks**
d) Define complex reaction **2marks**

QUESTION THREE

a) Explain transition state theory of reaction **5 marks**
b) $2O_{3(g)} \rightarrow 3O_{2(g)}$ determine the rate of disappearance of ozone given rate of appearance of Oxygen as 6.0×10^{-5} Ms^{-1} at a particular Instant **3 marks**
c) Derive the rate law that is consistent with rate of formation of phosgene. M is inert molecule.
   i. $Cl_2 + M \longrightarrow 2\,Cl + M$ (fast equilibrium, K_1)
   ii. $Cl + CO + M \longrightarrow ClCO + M$ (fast equilibrium, K_2)
   iii. $ClCO + Cl_2 \longrightarrow Cl_2CO + Cl$ (slow, k_3) **6 marks**
d) The initial rate of reaction A + B → C was measured at different intial concentr ations of A and B and following data were obtained. determine the value of rate constant. **6 marks**

Experiment number	[A](M)	[A](M)	Initial rate (M/s)
1	0.100	0.100	4.0 x 10-5
2	0.100	0.200	4.0 x 10-5
3	0.200	0.200	16.0 x 10-5

QUESTION FOUR

a) The following data was obtained for the hydrolysis of ethyl Ethanoate at 25°C **Calculate**

   i. Concentration after 8 minutes
   ii. Conversion percentage after 10 minutes **6 marks**

Time in minutes	0	5	9	13	20	33
Concentration in M	0.01	0.00755	0.00637	0.00541	0.00434	0.00320

b) Explain briefly the following type of reactions:-
   i. Branching chain
   ii. thermal explosions **6 marks**
c) The rate of the gas phase reaction between H_2 and I_2 is 2.5 x 10-3L/mols at 1 atm total pressure and 630K. Assuming the activation energy for the reaction is 163 kJ/mol, calculate the collision frequency between H_2 and I_2. **6 Marks**
d) State the role of catalyst in chemical reactions **2 marks**

QUESTION FIVE

A. Using experimental result explain how you will proof that reaction is of second order **3 marks**
B. Define sintering and explain how it deactivate catalyst **5 marks**
C. Explain how orientation affect the rate of reaction **5 Marks**

D. The initial rates was varied as a function of $[H^+]$ as follows From experimental result infer the order of reaction and concentration of $[H^+]$ when the initial reaction rate is 0.400 M **3 marks**

$[H^+]$ (M)	0.0500	0.100	0.200
Initial rate (M/s)	6.4×10^{-7}	3.2×10^{-7}	1.6×10^{-7}

E. At a certain temperature the half life periods of a certain reaction are shown below. Determine the Order of Reaction **4 marks**

Initials concentration in mols per litre.	6.67	13.33	26.67
Half life in sec	490	388	301