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Bsc. Civil Engineering (Kenyatta University)



**KENYATTA UNIVERSITY**  
**UNIVERSITY EXAMINATIONS 2010/2011**  
**INSTITUTE OF OPEN, DISTANCE AND E-LEARNING**  
**SECOND SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE**  
**SCH 305: CHEMICAL KINETIC**

**DATE:** Saturday 9<sup>th</sup> July, 2011

**TIME:** 2.00 p.m. – 4.00 p.m.

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**INSTRUCTIONS**

*Answer ALL questions.*

- Q1. (a) Explain the meaning of the following terms as used in chemical kinetics:
- (i) Rate of reaction
  - (ii) Order of reaction
  - (iii) Molecularity of a reaction
  - (iv) Mechanism of a reaction
  - (v) Branching chain reaction [10 marks]
- (b) Derive the kinetic equation for a second order reaction in a single substance and show that the half-life is independent of the initial reactant concentration.
- [10 marks]
- $A + A \rightarrow \text{products}$
- Q2. (a) Give an expression of the Arrhenius kinetic equation and explain what the different terms represent. [5 marks]
- (b) For the decomposition of nitrogen IV Oxide
- $$2\text{NO}_{2(g)} \rightarrow 2\text{NO}_{(g)} + \text{O}_{2(g)}$$
- the specific rate constant K, was determined to be  $0.522\text{mol}^{-1}\text{s}^{-1}$  at  $319^{\circ}\text{C}$  and  $1.700\text{mol}^{-1}\text{LS}^{-1}$  at  $354^{\circ}\text{C}$ .
- Determine the activation energy between these two temperatures. [5 marks]
- Q3. (a) List the methods available for the determination of the order of a chemical reaction. [4 marks]

- (b) The decomposition of a compound in solution gave the following data at 57.4°C.

Initial concentration (mol dm <sup>-3</sup> )	1.10	2.48
t <sub>½</sub> sec (Half-life)	885	174

Calculate the value of the order of the reaction and the specific rate constant.

[6 marks]

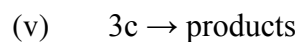
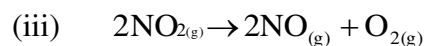
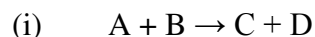
- Q4. (a) Derive the kinetic equation for a first order reaction. [10 marks]
- (b) At 500°C a certain compound rearranges to B by a first order process. The rate constant for this rearrangement is  $6.7 \times 10^{-4} \text{ s}^{-1}$ .

If the initial concentration of A is 0.05M,

- (i) What will be the molarity of A after 30 minutes? [5 marks]
- (ii) How many minutes will it take for the concentration of A to drop to 0.01M?

[5 marks]

- (c) Write the rate Law expressions for the following reactions:



[10 marks]

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