LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

1ST SEMESTER 2022/2023 ACADEMIC YEAR

THIRD YEAR EXAMINATION FOR THE DEGREES OF BACHELOR OF SCIENCE (GEN), BACHELOR OF EDUCATION (SCIENCE)

CHEM 313: CHEMICAL KINETICS

STREAM: R ***TIME: 2 HRS***

DAY: TUESDAY [11.30AM – 13.30] ***DATE: 13/12/2022***

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

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INSTRUCTIONS: - ATTEMPT ALL QUESTIONS

Question one carries 30 marks all the others are 20 marks each.

QUESTION ONE.

a) Define the following terms: -

(i) Chemical kinetics (1 mark)

(ii) The rate law (1 mark)

(iii) Enzyme catalysis (1 mark)

(iv) Steady-state hypothesis (1 mark)

(v) Molecularity of a reaction. (1 mark)

b) Distinguish between

(i) Activated complex and intermediate. (2marks)

(ii) Reversible and parallel reactions (2 marks)

(iii) Catalytic poison and negative catalysis (2marks)

c)

(i) Derive the units of the rate constant for a reaction that has an overall order of two? (3marks)

(ii) The half-life of a substance in a first order reaction is 15 minutes. Calculate the rate constant. (3 marks)

(iii) What is autocatalysis? Give an example of a chemical reaction. (2 marks)

d)

(i) Explain in detail how a heterogeneous catalyst increases the speed of a reaction. (3 marks)

(ii) Explain with an example, a zero order reaction and write the rate law for it. (3 marks)

(iii) State five methods of determining the order of a reaction. (5 marks)

QUESTION TWO

a)

(i) By use of an illustration, explain Lindeman's theory. (5 marks)

(ii) For a first order reaction t1/2 is 100 sec. How long will it take for the reaction to be completed 75%? (7 marks)

(iii) Discuss the collision theory and its disadvantages and transition state theory giving its advantages. (8 marks)

QUESTION THREE

a) The rate for a first order reaction at 35° C is doubled for a 10° C rise Find the energy of activation for the reaction. (7 marks)

b) For an Arrhenius reaction, the value of A and Ea are 4 X 10^{13} sec-1 and 98.6 $kJmol^{-1}$ respectively. If the reaction is first order, at what temperature will its half-life period be 10 minutes? (7 marks)

c) Describe the mechanism of enzyme catalysis and briefly explain its 6 characteristics. (6 marks)