LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST SEMESTER 2025/2026 ACADEMIC YEAR

FOURTH YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE (GENERAL)

CHEM 414: ENVIRONMENTAL CHEMISTRY II

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

DAY: TUESDAY [11.30 – 13.30 P.M] ***DATE: 27/01/2026***

THIS QUESTION PAPER CONSISTS OF THREE (3) PAGES

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INSTRUCTIONS TO CANDIDATES

Answer All Questions**.** Question 1 *carries **30 marks**,* while the other questions *carry **20 marks** each*

QUESTION ONE (30 MARKS)

(a) Define the terms below

(i) Free radicals **(1 Mark)**

(ii) Ozone hole **(1 Mark)**

(iii) Photochemical smog **(1 Mark)**

(iv) Greenhouse effect **(1 Mark)**

(v) Catalytic converter **(1 Mark)**

(b) List **two** important aspects of the atmosphere **(2 Marks)**

(i) What is the purpose of $Pb(C_2H_5)_4$ in an internal combustion engine? Show the reactions involved. **(4 Marks)**

(ii) List the different categories of noise. **(3 Marks)**

(c) List the gases below in order of increasing Global Warming Potential(GWP); CH_4, CFC, N_2O and CO_2 **(2 Marks)**

(i) Distinguish between BOD and COD in waste water treatment. **(2 Marks)**

(ii) State three chemical reactions in which very small particles in the atmosphere are involved **(3 Marks)**

(d) (i) Describe using a diagram, the electrodialysis technique for industrial waste water treatment. **(5 Marks)**

(ii) What is environmental biochemistry? **(2 Marks)**

(iii) Write an equation showing the wavelength range in which ozone is depleted in the atmosphere **(2 Marks)**

QUESTION TWO (20 MARKS)

a) Describe the method of electrostatic precipitators for the control of particulate emission. **(6 Marks)**

b) (i) Briefly describe the mechanism of toxicity of arsenic to the environment and living things. **(7 Marks)**

(ii) Briefly describe the **5** basic steps of wastewater treatment **(7 Marks)**

QUESTION THREE (20 MARKS)

a) By use of a diagram describe the institutional structure of the Kenya Water Sector as proposed by Water Act 2016. **(6 Marks)**

b) (i) Carbon monoxide at 90° C and 6 atm is 90 ug/m3. Express this concentration in ppm. The molecular weight of CO is 28 (g/mol) and 1 mole = 22.4 L at STP. **(5 Marks)**

(ii) State **three** objectives of conducting an environmental impact assessment (EIA) **(3 Marks)**

c) Write equations to show how NOx and SOx contribute to acid rain. **(6 Marks)**