CHEM 226

KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

SPECIAL EXAMINATION

SECOND YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELORIN ANALYTICAL CHEMISTRY
SECOND SEMESTER 2021/2022
(JULY, 2022)

CHEM 226: WATER CHEMISTRY

STREAM: Y2 S2 **TIME: 2 HOURS**

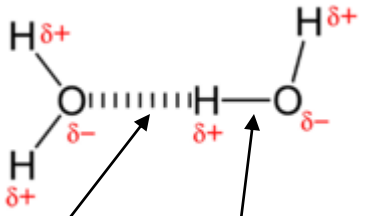
DAY: FRIDAY, 12.00 PM – 2.00 PM **DATE: 27/05/2022**

INSTRUCTIONS:

1. ***Do not write anything on this question paper.***
2. ***Answer ALL Questions in section A and any TWO Questions in Section B.***

SECTION A

1. Explain why do strong intermolecular forces produce such anomalously high boiling points and other unusual properties, such as high enthalpies of vaporization and high melting points (5 marks)
2. Explain the benefits of the fact that ice is less dense than liquid water with respect to aquatic life and how the anomalous expansion of water impacts on automobiles and households. (5 marks)
3. Considering CH_3OH, C_2H_6, Xe, and $(CH_3)_3N$, which can form hydrogen bonds with themselves? Draw the hydrogen-bonded structures. (6 marks)
4. The compounds and elements C_{60} (buckminsterfullerene), NaCl, He, Ar, and N_2O have been arranged in order of increasing boiling points: He (−269°C) < Ar (−185.7°C) < N_2O (−88.5°C) < C_{60} (>280°C) < NaCl (1465°C).Explain. (5 marks)
5. Name the special properties of water (4 marks)



6. Name the labeled parts of the structure (2 marks)
7. What is "HARD WATER" (2 marks)
8. State the factors that determine whether a substance is a solid or liquid (2 marks)
9. Name the attractive intermolecular forces referred as "Van der waals forces" (3 marks)
10. Explain the following terms: (12 marks)
    i) Cohessive forces
    ii) Viscocity
    iii) Solvolysis
    iv) Hydrolysis
    v) Alcoholysis
    vi) Ammonolysis

11. Explain why solutions of Ca^{2+} and Mg^{2+} in the presence of carbonate leave deposits, but Na^{+} does not. (4 marks)

SECTION B

12 (a). Write the net ionic equation for the removal of calcium ions by precipitation with carbonate in the lime-soda process. (2 marks)

(b). Could sodium ions be removed in the same way as magnesium ions in the lime-soda process (*i.e.*, by addition of hydroxide) for individuals concerned about their sodium intake? Briefly, explain your reasoning. (6 marks)

(c) State the uses Detergents (2marks)

13. Explain the problems with hard water (10 marks)

14. Discuss the Some Strategies to "Soften" Hard Water (10 marks)