



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST YEAR SECOND SEMESTER SUPPLEMENTARY EXAMINATION FOR
BACHELOR OF AGRICULTURAL EDUCATION AND EXTENSION

KST 104: FUNDAMENTALS OF CHEMISTRY

DATE: 22/7/2019

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

- The paper consists of **two** sections.
- Section **A** is **compulsory** (30 marks).
- Answer any **two** questions from section **B** (each 20 marks).

SECTION A (COMPULSORY)

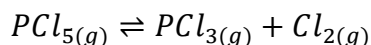
QUESTION ONE (30 MARKS)

- Define a primary standard as used in volumetric analysis. (3 marks)
- Differentiate between end point and equivalence point in titration. (3 marks)
- Explain why Water is liquid at relatively high temperature. (3 marks)
- Using suitable equations, explain how cation exchange resins remove hardness in water (3 marks)
- Describe three characteristics of a good standardizing agents. (3 marks)
- State three methods used to remove suspended matter in municipal water treatment (3 marks)
- By giving suitable examples explain why most acids and alkalis cannot be used as primary standard (3 marks)
- State the beer-Lambert law (3 marks)

- i) Using relevant chemical equations show how boiling removes temporary hardness. (3 marks)
- j) A sample of water was suspected to have chloride ions, using suitable chemical equations write a qualitative test for the presence of chloride ions. (3 marks)

QUESTION TWO (20 MARKS)

- a) Explain why water is referred as a universal solvent. (5 marks)
- b) Not any chemical reaction can be used in the volumetric analysis. State and explain five conditions to be met for chemical reaction to be used as the basis for titration (5 marks)
- c) Consider the following equilibrium process

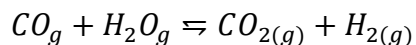


State and explain the direction of shift of equilibrium when

- i) More chlorine gas is added to reaction mixture (2 marks)
 - ii) Pressure of the gas is increased (2 marks)
 - iii) Catalyst is added to the reaction mixture (2 marks)
- d) Differentiate between hydrogen bonds and van der waals forces of attraction (4 marks)

QUESTION THREE (20 MARKS)

- a) What is portable water ?state five essential requirements for portable water. (6 marks)
- b) For the following reaction at a certain high temperature,

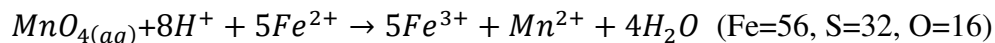


The concentration in a mixture are $CO_{(g)}$, 0.0600 mol/L; $H_2O_{(g)}$, 0.120mol/L; $CO_{2(g)}$, 0.150mol/L; and $H_2(g)$, 0.300mol/L. Calculate the value of the equilibrium constant at this temperature (5 marks)

- c) Using suitable drawing show sp hybridization in carbon. (5 marks)
- d) Classify the following as open, closed or isolated (4 marks)
- I) a tightly stoppered bottle of soda
 - II) The earth
 - III) Thermos flask
 - IV) Living things

QUESTION FOUR (20 MARKS)

- a) 20ml of 0.5M acidified KMnO₄ solution oxidized 25ml of Fe²⁺ in 40g/l of impure iron (II) sulphate to Fe³⁺_{aq} according to the equation below. Calculate the percentage impurities in the iron II sulphate.



- b) State and explain three causes of boiler scales. (6 marks)
- c) A certain gas expands from 250mL to 750mL very slowly at 25°C. If there is one mole of the gas in the chamber, calculate the work involved when the gas behaves ideally (4 marks)
- d) Explain why ice is less dense than water (3 marks)

QUESTION FIVE (20 MARKS)

- a) State and explain three characteristics of a chemical equilibrium (6 marks)
- b) State four unique qualities of carbon that enable it to form many compounds. (4 marks)
- c) Explain why hydrogen bonds don't have the same strength. (3 marks)
- d) State three disadvantages of ion exchange resins as a method of water purification (3 marks)
- e) Classify the following reactions as either addition, elimination, substitution or rearrangement (4mks)

