



MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FOURTH YEAR SUPPLEMENTARY EXAMINATION FOR THE DEGREE OF

BACHELOR EDUCATION SCIENCE

SCH 400: TRANSITION METAL CHEMISTRY

DATE: 23/7/2019

TIME: 2:00 – 4:00 PM

INSTRUCTIONS:

ANSWER YOUR QUESTIONS IN ANSWER BOOKLET PROVIDED.

ANSWER QUESTION ONE [COMPULSORY] AND ANY OTHER TWO QUESTIONS.

QUESTION ONE (30 MARKS)

- a) List the FOUR stages involved in extractive metallurgy 4 marks
- b) List the uses of group 5 transition elements 5 marks
- c) Give ONE use of V_2O_5 . Describe a method used to prepare it 3marks
- d) Show that the dichromate and chromate equilibrium is pH dependent. 3 marks
- e) Describe one extraction method of manganese from its ores 6 marks
- f) Give reasons for the following why most Zn and Cd are normally not considered as transition elements 3 marks
- g) Explain why $K_2[PtCl_6]$ is a well-known compound whereas the corresponding nickel compound is not known. 3 marks
- h) State why the atomic radii of the 2nd and 3rd transition series elements are almost equal. 3 marks

QUESTION TWO (20 MARKS)

- a) Discuss d-block elements with reference to the following: 8 marks
 - a) Electronic configuration
 - b) Magnetic properties
 - c) Complex compound formation

- d) Catalytic properties
- b) Briefly describe the following processes 12 marks
- i). Pyrometallurgy
 - ii). Hydrometallurgy
 - iii). Electrometallurgy

QUESTION THREE (20 MARKS)

- a) Discuss the biological and chemical usefulness of iron 8 marks
- b) Discuss rusting of iron as an electrochemical reaction and prevention methods 12 marks

QUESTION FOUR (20 MARKS)

- a) Give TWO differences between organometallic and coordination compounds 4 marks
- b) Give FOUR examples of Organometallic Compounds of transition metals, their structures and functions 8 marks
- c) With relevant examples, describe any FOUR methods of synthesizing organometallic compounds li 8 marks

QUESTION FIVE (20 MARKS)

- a) Briefly describe the mechanism involved in the polymerization of an alkene over the Ziegler-Natta catalyst $\text{TiCl}_4/\text{AlEt}_3$. Would you expect a regular or an irregular polymer? Explain your answer. 12 marks
- b) Outline the key steps used in the Kroll process through which Zirconium is produced commercially 8 marks