



EMBU UNIVERSITY COLLEGE

(A Constituent College of the University of Nairobi)

2015/2016 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

SEMESTER TWO EXAMINATIONS 2015/2016

FOURTH YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE

SCH 404: ORGANOMETALLIC COMPOUNDS

DATE: APRIL 12, 2016

TIME: 08:30-10:30

INSTRUCTIONS:

Answer Question ONE and ANY Other TWO Questions

QUESTION ONE

- a) Define the following terms and give specific examples where applicable
- i) Organometallic compounds (2 Marks)
 - ii) Carbonyls (2 Marks)
 - iii) Ferrocene (1 Mark)
- b) With suitable examples, give appropriate definitions of the following categories of carbonyls
- i) Bridged carbonyls (2 Marks)
 - ii) Polynuclear carbonyls (2 Marks)
 - iii) Monomeric carbonyls (1 Mark)

- c) Systematically name the following compounds
- $\text{Ni}(\text{CO})_4$ (2 Marks)
 - $\text{K}[\text{PtCl}_3(\text{C}_2\text{H}_4)]$ (indicate the ligand molecular unsaturation using the usual notation, η) (2 Marks)
 - $(\text{CO})_3\text{Fe}(\text{CO})_3\text{Fe}(\text{CO})_3$ (Hint: There are bridging ligands) (2 Marks)
- d) Complete the following equations (5 Marks)
- $\text{C}_2\text{H}_5\text{Cl} + 2\text{Li} \xrightarrow{\text{Benzene, lowtemp}} \text{X} + \text{Y}$
 - $\text{H}_2\text{CO} + \text{CH}_3\text{Li} \longrightarrow \text{M} \xrightarrow{\text{H}_2\text{O}} \text{A} + \text{G}$
- e) Describe the type of orbital interaction found between metal and the ligand to form organometallic compounds between the following ligands and a d-block element.
- Dinitrogen (2 Marks)
 - Phosphines (2 Marks)
 - Carbon monoxide (1 Mark)
- f) Carbonyl compounds have characteristic zero oxidation state of the central element. Discuss this observation and give two specific examples (5 Marks)

QUESTION TWO

Discuss the nomenclature of the following groups of organometallic compounds. In each case, give two illustrative examples

- Simple Organometallic compounds (6 Marks)
- Carbonyls (6 Marks)
- Organometallic compounds with σ - and Π -bonded ligands (8 Marks)

QUESTION THREE

Discuss the chemistry of organometallic compounds of lead with respect to;

- Four methods of preparation of selected compounds (12 Marks)
- Four properties of selected compounds (4 Marks)
- Type of bonding and a use of organometallic compounds of lead (4 Marks)

QUESTION FOUR

Give a brief account of the Wilkinson's catalysis with respect to

- a) Its preparation (4 Marks)
- b) Its properties with respect to its action with (10 Marks)
 - i) C_2H_4
 - ii) CS_2
 - iii) CO
- c) Catalysis in the hydrogenation of alkenes (6 Marks)

QUESTION FIVE

- i) Discuss, giving specific examples and reactions where applicable, the general properties of carbonyls with respect to action on (10 Marks)
 - a) Heat
 - b) Halogens
 - c) NO
 - d) $NaOH$
- ii) Discuss four methods of preparations of carbonyls (10 Marks)

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