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AI—44—2017

FACULTY OF SCIENCE

M.Sc. (Second Year) (Fourth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2017

(Revised Course)

INORGANIC CHEMISTRY

Paper XVII, [CH-541/1]

(Organometallic Catalysis and Fluxanality)

(Saturday, 11-11-2017)

Time : 2.00 p.m. to 5.00 p.m.

Time—3 Hours

Maximum Marks—75

N.B. :— (i) All questions are compulsory.

(ii) Figures to the right indicate full marks.

1. Solve any *three* out of five : 15
 - (a) Describe the process of ammonia synthesis.
 - (b) Write chemistry of Wilkinson's catalyst.
 - (c) Explain the chemistry of LiAlH_2 and its commercial applications.
 - (d) Comment on use of organometallic compounds of Ru(II) as catalyst.
 - (e) Discuss the fluxionality of cyclopentadienyl complexes.
2. Solve any *three* out of five : 15
 - (a) Discuss the physic-chemical principle of SO_2 oxidation.
 - (b) How surface area and temperature is related to rate of catalytic reaction ?
 - (c) Describe the method to detect stereochemical non-rigidity.
 - (d) Explain the term hydrosilation reaction with suitable example.
 - (e) Discuss the chemistry of sodium borohydride.

P.T.O.

3. Answer the following :

(A) Distinguish between Chemisorption and desorption. 8

Or

Discuss the salient features of Fischer Tropsch synthesis.

(B) Write method of preparing zeolite and commercial applications. 7

Or

Discuss the mechanism of Birch Clemmenson reaction.

4. Answer the following :

(A) Discuss the mechanism of polymerization of alkene using catalyst. 8

Or

What are the different catalytic steps involved in hydrogenation ?

(B) Classify different types of zeolites with examples. 7

Or

Explain the term hydroformylation with suitable examples.

5. (A) Choose the *correct* option from the given alternatives : 5

(i) In most heterogeneous catalytic systems the catalyst is in the :

- (a) Gaseous phase
- (b) Solid phase
- (c) Liquid phase
- (d) Emulsion phase

(ii) molecules of trigonal pyramidal geometry exhibit a low energy fluxional behaviour called Berry pseudorotation.

- (a) PF_3
- (b) $\text{Fe}_2(\text{CO})_9$
- (c) $\text{Co}_2(\text{CO})_8$
- (d) $\text{Fe}(\text{CO})_5$

- (iii) Selectivity of Zeolite catalysts can be increased by changing the :
- (a) Si/Al ratio
 - (b) Concentration of Si atom
 - (c) Increasing the Si atom
 - (d) Increasing the Al and Si atom
- (iv) In Berry pseudorotation molecules with trigonal pyramidal geometry exhibit low energy fluxional behaviour.
- (a) $\text{Co}_2(\text{CO})_8$
 - (b) $\text{Mo}(\text{Cp})_2$
 - (c) $\text{Fe}(\text{CO})_5$
 - (d) $\text{Mn}_2(\text{CO})_{10}$
- (v) In the case of the Suzuki coupling, the ligands are transferred from the organoboron species to the complex.
- (a) Divalent Pd
 - (b) Trivalent Pd
 - (c) Monovalent Pd
 - (d) Mix valent Pd

(B) Write brief notes on (any two) :

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- (i) Epoxidation
- (ii) Surface migration in catalytic reaction
- (iii) Fluxionality in trigonal bipyramidal complex.