

(II) Find out the statement which is incorrect with reference to electronic transition

- (i) Initial and final electronic states belong to different symmetry.
- (ii) Initial and final electronic states belong to same symmetry.
- (iii) Direct product of representations of the initial and final electronic states may contain totally symmetric representation.
- (iv) Direct product of representations of the initial and final electronic states may have a representation that belongs to dipole moment operator.

(III) Number of Microstates in  $f^1 d^1$  electronic configuration is

- (i) 45
- (ii) 70
- (iii) 120
- (iv) 140

(IV) The UV-Vis absorption spectrum of aqueous solution of  $[\text{Ni}(\text{H}_2\text{O})_6](\text{ClO}_4)_2$  shows three main absorption bands at 385, 658 and 1175 nm. Identify 10Dq value.

- (i)  $8510 \text{ cm}^{-1}$
- (ii)  $15200 \text{ cm}^{-1}$
- (iii)  $20000 \text{ cm}^{-1}$
- (iv)  $26000 \text{ cm}^{-1}$

Internal Assessment-10

2022

M.Sc.

3<sup>rd</sup> Semester Examination

CHEMISTRY

PAPER – CEM-302 (Inorganic Special)

Full Marks: 50

Time : 2 Hours

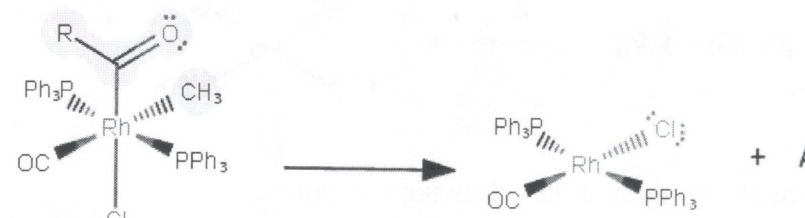
(CEM 302-Advanced Inorganic Chemistry-I)

1. Answer any **four** questions

2×4 = 8

(a) What is Ziegler-Natta catalyst? Write its application.

(b) Identify A.

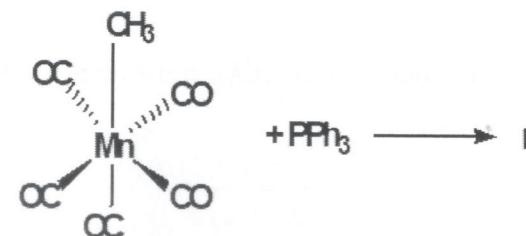


(c) Find out ground state term symbol for the electronic configuration of Co(III) (diamagnetic) in  $[\text{Co}(\text{NH}_3)_6]^{3+}$ .

(d) Correct energy ordering of Ground State Functions in Oh symmetry field of  $d^3$  electronic configuration is

- (i)  ${}^3A_{2g} < {}^3T_{2g} < {}^3T_{1g}$
- (ii)  ${}^4A_{2g} < {}^4T_{2g} < {}^4T_{1g}$
- (iii)  ${}^3A_{2g} < {}^3T_{1g} < {}^3T_{2g}$
- (iv)  ${}^4T_{1g} < {}^4T_{2g} < {}^4A_{2g}$

(e) Identify D



(f) Discuss the role of  $\text{Cu}^{2+}$  ion in Wacker process.

2. Answer any **four** questions

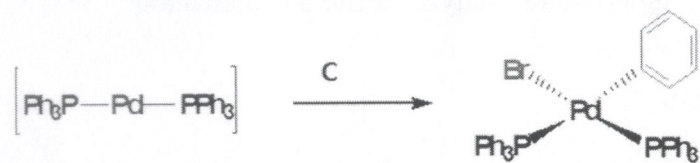
4×4 = 16

(a) a) Among the following which compound will not undergo oxidative reaction with  $\text{CH}_3\text{I}$ . Explain with reason.

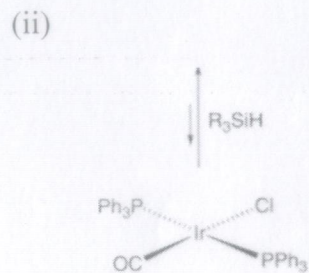
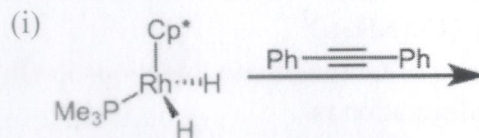
i)  $\text{Ir}(\text{PPh}_3)_2\text{COCl}$  ii)  $\text{RhI}_2(\text{CO})_2$  iii)  $\text{Cp}_2\text{TiClCH}_3$  iv)  $\text{CpRh}(\text{CO})_2$

(b) i) Write a short note on migratory insertion reaction. 2

ii) Identify C. 2



(c) Write the product of the following reactions.



(d) Draw a MO diagram for tetrahedral  $\text{AB}_4$  molecule by SALC method.

(e) Establish the relation  $\chi(\alpha) = \frac{\sin(l+0.5)\alpha}{\sin \alpha/2}$

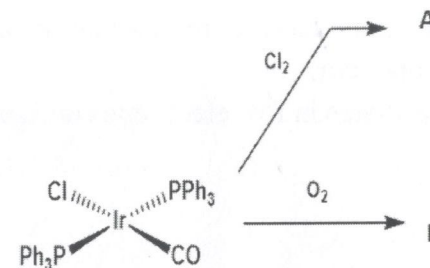
(f) Draw the MO diagram for the  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ . Identify HOMO and LUMO

3. Answer any **two** questions

2×8 = 16

(a) (i) Draw the catalytic cycle of Monsanto's acetic acid synthesis.

(ii) Identify A and B. 5+3



(b) (i) Write the mechanism of the hydroformylation reaction. (ii) What do you mean by Agostic interaction? Illustrate with example.

5+3

(c) Evaluate the genesis of Group Theoretical Notation(s) of the Ground State Term of  $d^2$  electronic configuration and hence their energy ordering (if any).

(d) (1) Write the catalytic cycle using Wilkinson's catalyst. Explain with mechanism. 4

(2) Tick the correct answer.

(I) Intense blue colour in Prussian Blue is more correctly described as

- (i) d-d charge transfer transition in Fe(II) and Fe(III).
- (ii) Ligand to Metal Charge transfer transition.
- (iii) Metal to Metal Charge Transfer Transition.
- (iv) Intervalence Charge Transfer Transition.