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RAJARATA UNIVERSITY OF SRI LANKA
FACULTY OF APPLIED SCIENCES

B.Sc. (Special) Degree in Chemistry
Third Year - Semester I Examination – Nov/Dec 2016
CHE 3205 – Advanced Inorganic Chemistry I

Answer any Four (04) questions **Time: Two (02) hours**

(100 marks)

01.

a. Name the three(03) main principles in electron absorption spectroscopy (10 marks)

b. Determine the spin multiplicity of the following systems

# unpaired electrons, n =	0	1	2	3	4

Where the spin, $S = \frac{n}{2}$

Spin multiplicity is equal to, $S = 2s + 1$ (05 marks)

c. Name two schemes used to describe energy level diagrams (10 marks)

02.

a. Describe **back bonding** with respect to $W(CO)_6$**(Hint : It is not necessary to use molecular orbital diagrams)** (10 marks)

b. What is a bridging ligand? (02 marks)

c. State the 18 electron rule and determine if the following complexes obey the 18 electron rule

i. $[Ni(CO)_4]$
ii. $[Fe(CO)_5]$
iii. $[Cr(CO)_6]$
iv. $[Mn_2(CO)_{10}$

(10 marks)

d. What is a Spector Ligand and what is an Actor Ligand? (03 marks)

03.

a. Tetrahedral d^{10} – complex $[Pd(pph_3)_4]$ undergoes 2e-oxidative addition reaction with Br_2 to give a four co-ordinated neutral complex (P). Draw the possible structures for P. **(Hint: No explanations needed)** (05 marks)

b. Consider the following dissociative equilibrium,

$$NiL_4 \longrightarrow [NiL_3] + L$$

The rate of dissociation is faster for ligand (L) =PPh_3 than when L=$PMePh_2$ explain.

Hint: cone angle for PPh_3 and $PMePh_2$ are 145° and 138° (10 marks)

c. The complex $[RhH(CO)(PPh_3)]$ reversibly loses the PPh_3 ligands to give an intermediate 14-electrons. Write the reaction sequence for this dissociation process. (10 marks)

04. What are the structural changes you would you expect for a 2e-oxidative addition process of a d^8 metal center? **(Hint: no examples needed)** (25 marks)

05. $[TiMe_4]$ decomposes above -50°C, but the chelate $[TiMe_4(Me_2PCH_2CH_2PME_2)]$ is stable at room temperature explain? (25 marks)

06. What are the characteristics of a ligand substitution reaction? Discuss the reaction mechanism for the substitution of a carbonyl ligand of $[W(CO)_6]$ by a PPh_3 molecule (25 marks)