EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE

SECOND SEMESTER 2012-2013

CH 305 ORGANOMETALLIC CHEMISTRY AND NON AQUEOUS SOLVENTS
(Repeat)

Answer all questions **Time allowed: ONE Hour**

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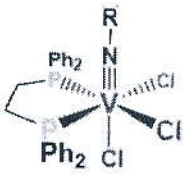
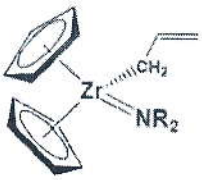
1. a) Indicate the ligands in the following compounds are monohapto, dihapto, trihapto, or pentahapto ligands.

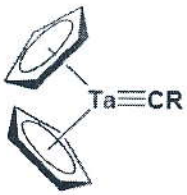
i)



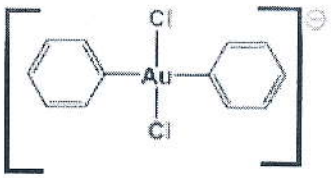
ii)



iii)



iv)



(20 marks)

b) For each of the following pairs of complexes, which will have the highest average CO infrared stretching frequency? Explain briefly.

i) $[Ni(CO)_4]$ and $[V(CO)_6]^-$

ii) $[Cr(CO)_3(PMe_3)_3]$ and $[MnCl(CO)_5]$

(30 marks)

c) Explain the difference in the CO stretching frequencies observed in IR spectra of the following compounds:

$Ni(CO)_4$	$[Co(CO)_4]^-$	$[Fe(CO)_4]^{2-}$
2057 cm^{-1}	1886 cm^{-1}	1786 cm^{-1}

(30 marks)

Contd...

d) Indicate whether the following organometallic compounds obey EAN rule or not (Atomic number: Mn=25, Cr = 24, Fe = 26, Co = 27)

i) $[Fe_2(CO)_9]$ ii) $[Co(CN)_5]^{3-}$ iii) $[Co(CH_3)_3Cl_3]^{3-}$ iv) $[Mn_2(CO)_{10}]$

(20 marks)

2. a) Although the 17 electron species $V(CO)_6$ has not been found to dimerize to give $V_2(CO)_{12}$, the latter has been found to form along with $V(CO)_6$ and remain stable at extremely low temperatures when a V/CO mixture in the ratio 1:102 was condensed into a pure CO matrix at 6-12 K. Infrared spectral analysis of $V_2(CO)_{12}$ showed three bands at 2014, 2050 and 1850 cm^{-1}. Given that this dimer obeys the 18 electron rule and vanadium has a coordination number of eight, propose a structure for the same.

(30 marks)

b) Explain the following observations.

i) Metal-liquid ammonia solution can be considered as a source of electrons.

ii) Strength ammonia can be differentiated in water, but cannot be in acetic acid.

(20 marks)

c) Give balanced equations for the following reactions:

i. $SiCl_4$ with liquid NH_3

ii. BF_3 with liquid NH_3

iii. C_2H_5OH with anhydrous H_2SO_4

(30 marks)

d) $BaCl_2$ is highly soluble in water, but it could be prepared in liquid ammonia. Explain the above statement with the help of balanced equations.

(20 marks)

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