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PG (CBCS)
M.Sc. Semester-II Examination, 2020
CHEMISTRY
PAPER: CEM-203
(INORGANIC CHEMISTRY - II)

Full Marks: 20 **Time: 1 Hour**

Answer any *two* questions of the following: **2×10=20**

1. Any two of the following:
   (a) Write down the four important principles to construct the character table for a point group of symmetry.
   (b) NMR-spectroscopy is a useful technique to monitor fluxional behaviour - Justify.
   (c) What do you mean by 'Agostic interaction'?
   (d) Draw the orbital overlap diagram in Schrock's carbine complex.
2. Any two of the following:
   (a) What do you mean by Berry pseudo rotation?
   (b) Show the different bonding modes of dinitrogen in dinuclear transition metal-dinitrogen complexs.
   (c) Why do square planer complexes sometimes violate 18-electron rule? Explain with an example.
   (d) The structure of cyclobutadiene itself is rectangular, while it is close to square in the coordination compound – comment.
3. (a) How do transition metal orbitals interact with the molecular orbitals of an allyl ligand?

   (b) What is Creutz-Taube complex? Why was the chemistry of these complexes studied?

4. (a) Discuss the phenomenon of 'Carbonyl scrambling' in $[FeCp(CO)_2]_2$ complex.

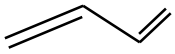
   (b) Calculate the styx number of $[B_6H_6]^{-2}$.

5. (a) What is boron neutron capture therapy? Give at least two examples of 1^{st} and 2^{nd} generation BNCT AGENTS.

(Turn over)

(b) Write the products of each of following reactions;

(i) $RhCl_3 + C_2H_4 \xrightarrow{CH_3CH_2OH / H_2O}$?

(ii) $HCo(CO)_4$ +  ?

(iii) $Cr(CO)_6$ + PhLi ⟶ ?

(iv) $[Ir(CO)Cl(PPh_3)_2$ + C_{60} ⟶ ?

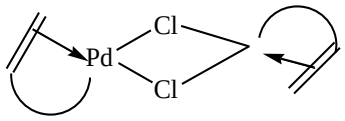
6. (a) The change of CO stretching frequency in the IR spectrum of compound (1) and (2) given below:

$[IrCl(CO)(PPh_3)_2]$ $\bar{\upsilon}_{CO}$: 1967 cm^{-1}

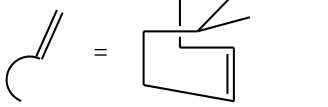
$[IrCl_3(CO)(PPh_3)_2]$ $\bar{\upsilon}_{CO}$: 2075 cm^{-1}

Why does the position of $\bar{\upsilon}_{CO}$ in the IR spectrum shift?

(b) Write the products of each of following reactions;

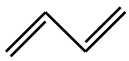
(i) 

+ KO_2 ⟶ ?

Where  =

(ii) $RuCl_3 (H_2O)_3 \xrightarrow[(ii)\ Aq.\ HCl,\ 25°C]{(i)\ N_2H_4 / H_2O}$?

(iii) $[Pt(NH_3)_2Cl_2] \xrightarrow[(ii)\ CH_3COOH]{(i)\ AgNO_3}$?

(iv) $RuCl_3.nH_2O$  excess ⟶ ?
2- methoxy ethanol/ 90°C

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