M.Sc.-I/CHEM-101C/18

M. Sc. 1st Semester Examination, 2018

CHEMISTRY

(Inorganic Chemistry)

Paper : CHEM-101C

Course ID : 11451

Time: 2 Hours **Full Marks: 40**

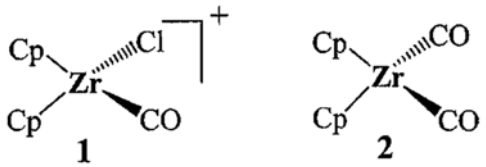
The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

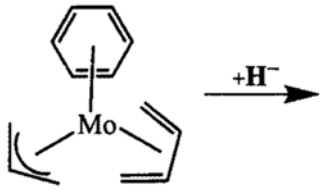
1. Attempt *any five*: 2×5=10

(a) Which compound would you expect to be more stable, $Rh(\eta^5\text{-}C_5H_5)_2$ or $Ru(\eta^5\text{-}C_5H_5)_2$? Give a plausible explanation.

(b) Among the given two complexes (1) and (2), which will show a lower carbonyl stretching frequency?



(c) Write down the final product of the reaction.



(d) Why is NO important in biology?

(e) How many microstates are possible for Co^{+2}?

(f) Draw structure of porphyrin.

(g) Write one important function of Vitamin B_{12}.

2. Attempt *any four*: 5×4=20

(a) (i) Which property is measured in TGA? How many peaks are observed in TGA plot of $CuSO_4.5H_2O$?

(ii) Derive the relation between stepwise formation constant and overall formation constants. 2+3=5

(b) (i) Point out the difference of Fischer carbene and Schrock carbene. What is the use of carbene complexes?

(ii) Draw the electron sharing pattern of metal and carbyne ligand of Fischer and Schrock carbyne complexes. (2+1)+2=5

(c) (i) Mention the criteria for β-hydride elimination.

(ii) What is agostic alkyls?

(iii) Identify the order according to increasing stability of the following organometallic compounds: $TiMe_4$, $Ti(CH_2Ph)_4$, Ti(i-Pr)$_4$ and $TiEt_4$. 2+1+2=5

(d) (i) Write active site structure of Peroxidase.

(ii) Explain the activity of Cyt P_{450}. 2+3=5

(e) (i) What are ROS?

(ii) Write mechanism of function of SOD. 2+3=5

(f) (i) Which type of spinal is Mn_3O_4? Explain.

(ii) '$Cu(OAC)_2$ shows anomalous magnetic moment'. Explain.

(iii) Write down J-T theorem. 2+2+1=5

3. Attempt *any one*: 10×1=10

(a) (i) Define fluxionality. Which instrumental technique is mainly used to determine fluxionality?

(ii) The compound (η^1-allyl)$Mn(CO)_5$ on heating release a gas and forms a new compound which also obeys the 18 electron rule. Identify this new compound and schematically draw its room temperature ^1H NMR. Will there be any changes in its NMR spectrum when measured at high temperature? Explain.

(iii) Following 18e rule as a guide, determine X in the following complexes:

$[\eta^5\text{-CpOs(CO)}_x]_2$ (One Os-Os bond)

$[Ni(CO)_3(NO)]_x$ (Consider NO as linear) (1+1)+(2+2+2)+(1+1)=10

(b) (i) Name two monooxygenase enzymes. Write activity of Xanthene Oxidase.

(ii) In an Ni^{2+} complex the absorption bands arising from d-d transition occur at 10750, 17500, 28200 cm^{-1}. Assign the bands from Orgel diagram. Which transition is responsible for the colour of the complex?

(iii) Give one example of optically active pure inorganic complex.

(iv) '$[Co(H_2O)_6]^{2+}$ becomes blue upon addition of HCl.' –Explain. (1+2)+3+2+2=10

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