Name: MOHIT SINGH Entry No. 2015ME10661

CML 100-Minor I 2015-2016 - Semester II

13th February 2016 Marks: 25 Time: 1 hour

(At. No. for Mn= 25, Fe =26)

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(1) *Explain in brief*; (1x5=5)

(a) Why $Os_7(CO)_{21}$ exist, whereas the valence isoelectronic $Fe_7(CO)_{21}$ has never been isolated?

(b) Why $Na_4[Cr(CO)_4]$ has the extraordinary low CO of 1462 cm^{-1} with respect to free CO (νCO = 2143 cm^{-1})?

(c) When binding of CO to a metal is suggested as isocarbonyl coordination?

(d) Why metals in (d^1, d^2, d^3, d^9 and d^{10} electronic configurations) have lesser number of metal carbonyls?

(e) How many M-M bonds will occur, if a species $(\eta 5\text{-}C_5H_5)_2Fe_2$ does exist?

(2) Which is the simplest organic molecule that can form with the combination of C, H, N and O. (1)

(3) Considering $Fe_2(CO)_7$ is a stable species, propose at least ***two possible structure*** for this molecule. (2)

(4) Why $[MnBr_4]^{2-}$ is coloured despite Mn^{2+} is in d^5 configuration? (1)

(5) Write ***three main differences*** between the *haemoglobin* and *myglobin* in terms of their structures or activity. (3)

(6) Propose a '***catalytic cycle***' for the synthesis of acetic acid (CH_3COOH) from methanol using suitable iridium catalyst. (5)

(7) Draw a crystal field splitting diagram for *an octahedral (d^6) complex species* showing electron distribution in respective t_{2g} and e_g orbitals. (4)

(8) Given below is the proposed catalytic cycle describing the *Hydroformylation reaction*, is one of the largest industrial processes (millions of tons annually), for conversion of ***propylene*** or ***methyl ethylene*** with $HCo(CO)_3$ as active catalyst into the corresponding aldehyde. Identify the reactions occurring at the steps (a), (b), (c) & (d) and (e) & (f). (4)