Serial No. PCH-16- **ISLAMIC UNIVERSITYOF SCIENCE & TECHNOLOGY**

DEPARMENT OF CHEMISTRY

M Sc. (3rd Semester) (Mid term) **Max. Marks: 30**

Course Title: Organometallic chemistry (PCH-CC-301) **Time: 40min**

Rollno:

1. Which one of the following is not a sigma bonded complex?
   a) Grignard reagent
   b)Frankland’s reagent
   c) n-butyllithium
   d) Dibenzene chromium
2. Which of the following is not an organometallic compound ?
   a) $Zn(C_2H_5)_2$
   b) $Pb(CH_3)_4$
   c) $Pb(C_2H_5)_4$
   d) All are correct
3. In an organometallic complex, what would you expect the formal charge on cyclooctatetraene to be in its η^2 mode?
   a) 0
   b) +2
   c) -1
   d) -2
4. Organometallic catalysts are usually what?
   a) Gaseous
   b) Heterogeneous
   c) Ineffective
   d) Homogeneous
5. Why would you expect a greater degree of backbonding with alkene complexes for complexes with an Iridium centre than for a complex with a Cobalt centre?
   a) Iridium has a greater number of valence electrons than Cobalt and therefore has more electrons to donate into the C=C \pi$\pi^*$ orbital.
   b) Iridium has valence 5d electrons that are more radially extended than the Cobalt 3d electrons, they therefore overlap better with the C=C \pi$\pi^*$ orbitls on the alkene.
   c) The iridium centre is a heavier atom and therefore has a higher effective nuclear charge.
   d) The iridium centre is commonly octahedrally coordinated, this is not a close packed coordination geometry and therefore allows easy association of alkenes.
6. What is a common feature of 'activated' catalytic organometallic complexes?
   a) Are not very selective.
   b) Coordinative and electronic unsaturation.
   c) Coordinative saturation.
   d) Electronic saturation.
7. What effect does having an electron rich centre have on reductive elimination steps?
   a) It catalyses them.
   b) It hinders them.
   c) It increases their favourability.
   d) It makes them go trans rather than cis.
8. How many electrons do alkyl groups typically contribute to the valence electron count?
   a) 0
   b) 1
   c) 2
   d) 3
9. The reaction: $Mn(CO)_5Me + CO \rightarrow Mn(CO)_5(COMe)$ is an example of
   a) a ligand addition
   b) a β-elimination
   c) an oxidative addition
   d) an alkyl migration
10. The conversion of $Mn_2(CO)_9(PPh_2H)$ to $Mn_2(CO)_8(\mu\text{-}PPh_2)(\mu\text{-}H)$ is best described in terms of loss of CO in association with:
    a) an oxidative addition
    b) a substitution reaction
    c) α-hydrogen abstraction
    d) β-hydrogen elimination.

11. In a metal alkyl compound, which σ-bonded R group could undergo β-hydrogen elimination?
    a) Et
    b) CH_2Ph
    c) CH_2CMe_3
    d) Me

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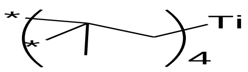
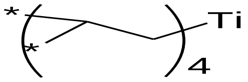
12. Which compound is most likely to undergo oxidative addition of H_2?
    a) $RhCl(PPh_3)_3$
    b) $Fe(CO)_5$
    c) $[RhI_4(CO)_2]^-$
    d) $[HFe(CO)_4]^-$
13. The degree of association of aluminum alkyls, AlR_3,in inert solvents is in the sequence are:
    a) Me > Et > Pr > Bu^t
    b) Me > Pr > Et > Bu^t
    c) Et > Me > Pr > Bu^t
    d) Pr > Et > Me > Bu^t
14. The sigma bonded organomettalic of transition metal are generally less stable than those of the main group elements because:
    a) Coordinatively unsaturated
    b) Transfer of hydrogen atom from β-carbon of alkyl chain
    c) Both A and B
    d) None of the above
15. The reaction
    $2Li + MgR_2 \longrightarrow 2LiR + Mg$ is of type.
    a) Transmettalation
    b) Carbanion- Halide exchange
    c) Metallation
    d) None of the above
16. The incorrect statement about Zeise's salt is:
    a) Zeise salt is diamagnetic
    b) The oxidation state of Pt in Zeises salt is +2
    c) All Pt-Cl bond length in Zeises are equal
    d) C-C bond length of ethylene moiety in Zeises salt is larger than that of ethylene molecule.
17. The greater stability of A



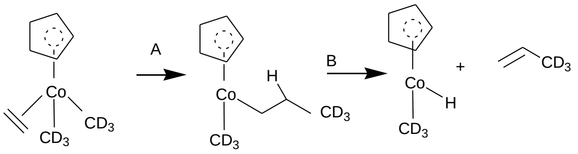
compare to that of B



due to:

    a) Hypercongugation is present in A
    b) β elimination is not possible in complex A
    c) A steric protection of titanium from reacting species in complex A
    d) The stronger nature of Ti-C bond in complex A

18.



The type of reaction A and B are:
    a) Migratory insertion & β elimination
    b) Migratory insertion & Reductive E.
    c) Reductive E. & β elimination
    d) None of the above
19. Which among the following compound will not undergo oxidation addition with CH_3I
    a) $Ir(Pph_3)_2(CO)Cl$
    b) $[RhI_2(CO)_2]^-$
    c) $\eta^5CpTi(CH_3)Cl$
    d) $[\eta^5CpRh(CO)_2]$
20. Against each statement, mark the appropriate type of reaction or reactions from the list (O.A, R.E, M.I, & β-H transfer)
    a) Cis-orientation of the participating ligands is a must (R.E & M.I)
    b) This reaction does not occur for d^0 metal complexes.(O.A)
    c) This reaction is enthalpy favoured and entropy prohibited.(M.I)
    d) A vacant coordination site on the metal center is a prerequisite. (O.A & β-H Transfer)
    e) The more electron rich the metal center, the more facile is the reaction. (O.A)
    f) There is an increase in the electron count of the metal complex by two units during this reaction.(O.A & β-H Transfer)

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