

Bago University
Department of Chemistry
First Semester Examination, March 2019

Third Year BSc
(Chemistry Specialization)
Answer any six Questions

Chem-3101
Inorganic Chemistry III
Time Allowed: (3) hours

1. (a) Fill in the blanks with the correct word(s), unit(s), and etc., as necessary.
 - (i) The rate of hydrolysis is dependent on the —— of the metal carbon bond.
 - (ii) In metal olefin complexes, the metal is —— to the nodal plane.
 - (iii) The thermodynamic stability of a compound is measured by its ——.
 - (iv) The σ and —— bondings are mutually supplement each other.
 - (v) Anionic carbonyl complexes are called carbonylate ——.
 - (vi) Chemical fragments whose frontier orbitals have similar symmetries, energies and shapes as well as same number of electrons are called —— fragments.
- (b) Select the correct statement(s), word(s), unit(s) and etc., given in the followings.
 - (i) Organometallic compounds are those in which the (hydrogen, carbon, nitrogen) atom of organic groups are bound to metal atoms.
 - (ii) The thermodynamic stability of a organometallic compound is measured by its (standard enthalpy, enthalpy change, standard free energy of formation).
 - (iii) Wilkinson's catalyst is used in the (halogenations, chlorination, hydrogenation) of alkenes.
 - (iv) The carbonyls with an overall positive charge are called (carbonylate anions, carbonyl cations, carbonyl hydride).
 - (v) The scrambling processes are observed and studied by (NMR spectroscopy, IR spectra, UV radiation).
 - (vi) The highest occupied molecular orbital of carbon monoxide, the (σ_{2p} , π_{2p} , π_{2p}^*) orbital holds two electrons.
2. (a) Sketh the appropriate orbitals that are suitable for both σ -and π -type bonding in a transition metal olefin complex.
(b) Suggest a reason why the thermal stability of organometallic compounds varies so greatly.
3. (a) Outline the mechanism of Wacker Process.
(b) Explain why thermal stabilities of the Group IV organoderivatives vary in the order $MH_4 < RMH_3 < R_3MH$.
4. (a) Explain briefly about some properties of mononuclear metal carbonyls.
(b) Draw the structures of $Fe_2(CO)_9$, $Ru_3(CO)_{12}$ and $Ir_4(CO)_{12}$.

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5. (a) Predict the principal product in each of the following reactions:
- (i) $\text{Na} + \text{C}_2\text{H}_5\text{Br} \rightarrow$
 - (ii) $\text{C}_6\text{H}_5\text{CH}_2\text{Cl} + \text{Li} \rightarrow$
 - (iii) $\text{C}_6\text{H}_5\text{CH}_3 + \text{Hg}(\text{OAc})_2 \rightarrow$
 - (iv) $\text{CH}_3\text{MgCl} + \text{HgCl}_2 \rightarrow$
 - (v) $n\text{-BuLi} + \text{Ph}_3\text{SnCH}_2\text{CH}=\text{CH}_2 \rightarrow$
 - (vi) $\text{AuCl}_3 + \text{CO} \rightarrow$
- (b) Give an explanation of the reactivity of the trialkyls of Al, Ga, In toward Me_3N , Me_3P and Me_3As .
6. (a) What are the methods used for the preparation of carbonylate compounds? And give the examples.
- (b) Which of the following carbonyl compounds satisfy the noble gas formalism?
- (i) $\text{Mn}_2(\text{CO})_{10}$
 - (ii) $\text{Co}_2(\text{CO})_8$ bridge isomer
 - (iii) $\text{Ru}_3(\text{CO})_{12}$
7. (a) What are isolabal fragments?
- (b) Describe the some important reactions of carbonylate compounds.
