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X—11—2019

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) (Regular) EXAMINATION

OCTOBER/NOVEMBER, 2019

(Regular Pattern)

CHEMISTRY

Paper-XIII

(Physical Chemistry and Inorganic Chemistry)

(Friday, 15-11-2019)   **Time : 10.00 a.m. to 12.00 noon**

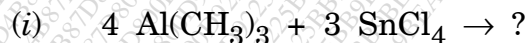*Time—2 Hours*   *Maximum Marks—40*

N.B. :— (i) Attempt *All* questions.

   (ii) Use of logarithmic table and non-functional calculator is allowed.

1. Answer any *three* of the following :   3×5=15

(a) What are organo-metallic compounds ? Explain electron deficient and transition metal organometallic compounds with suitable example.

(b) Complete the following reactions :

(i) $4 \ Al(CH_3)_3 + 3 \ SnCl_4 \rightarrow$?

(ii) $SnCl_4 + 4C_2H_5Cl + 8Na \rightarrow$?

(iii) $4C_6H_5MgCl + SnCl_4 \rightarrow$?

(iv) $3(CH_3)_4Sn + SnCl_4 \rightarrow$?

(v) $2C_2H_5Br + Sn \rightarrow$?

P.T.O.

    (c)   (i)   Explain bonding and structure of organolithium compounds.

         (ii)   Give any *two* applications of organolithium compound.

    (d)   What are polynuclear metal carbonyls ? Give its characteristics and examples.

    (e)   (i)   Write *two* methods of preparation and properties of $Ni(CO)_4$.

         (ii)   Draw the structure of $Co_2(CO)_8$.

2.   Answer any *three* of the following :   3×5=15

    (a)   Derive expression for energy and discuss energy level of simple harmonic oscillator in vibrational spectra.

    (b)   Describe pure rotational Raman spectra.

    (c)   Discuss kinetics of consecutive reaction.

    (d)   Derive an expression for Nernst distribution law when solute undergoes association and dissociation.

    (e)   When pure rotational spectra of HCl molecule, the distance between two successive lines was found to be 20 cm^{-1}. Calculate bond length of H-Cl molecule (Reduced mass = 1.62×10^{-24} gm).

3.   Answer any *two* of the following :   2×5=10

    (a)   What is effect of isotopic substitution on rotational spectra ? Explain with diagram.

    (b)   Explain quantum theory of Raman effect.

    (c)   Discuss kinetics of dimerisation of anthracene.

(*d*)   When benzoic acid was shaken with mixture of benzene and water at constant temperature, the following results were obtained :

Concentration of acid in Benzene (C_1)	Concentration of acid in water (C_2)
0.24	0.015
0.55	0.022
0.93	0.029

Comment on the result.