**Use Separate answer Scripts for each group**

# B.Sc. (Honours)Examination, 2018

**Semester-III**

**Chemistry (Allied)**

**Course: BACH-31**

**Time: Four Hours** **Full Marks: 60**

Questions are of value as indicated in the margin.

## Group-A (Marks: 20)

**( Inorganic Chemistry )**

Answer***any two***questions.

1. a) Define 'central atom' in coordination chemistry? Give examples. 2+1
   b) Define 'bridging ligand'. Give two examples of $\mu_2$- and/or $\mu_3$-bridge coordination molecules. 2+2
   c) Define 'flexidentate ligand'. Give example(s) two how some ligand act as flexidentate characteristics. 2+1

2. a) Show the possible coordination mode of ethylenediamine, ethylenediaminetetraacetic acid anion and glycinate ion. 2+2+2
   b) Give IUPAC Nomenclature (***any four***): 4
      i) $[Co(NO_2)_3(NH_3)_3]$
      ii) $[CoCl(NH_3)_5]^{2+}$
      iii) $[Ru(NH_3)_5(N_2)]Cl_2$
      iv) $K_4[Ni(CN)_4]$
      v) $K_4[Fe(CN)_6]$
      vi) $[Fe(CO)_5]$
      *(Note: IUPAC = International Union of Pure and Applied Chemistry)*

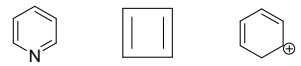
3. a) Write notes on (Note: provide examples): ***any two***. 3+3
      i) Inert pair effect.
      ii) Existence of variable valence in transition metal compounds.
      iii) Charge transfer complexes
   b) Explain the possibilities of high-spin and low-spin with $d^3$, $d^4$, $d^5$ and $d^6$ configuration in octahedral geometry (Note: you should answer with the help of crystal field theory). 4

## Group-B (Marks: 20)

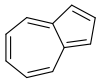
**( Organic Chemistry )**

Answer***any two***questions.

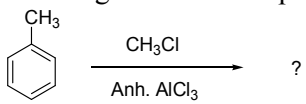
1. a) Explain Hückel's rule of aromaticity and classify the following molecules according to their aromatic, anti-aromatic and non-aromatic character. 2+1+1+1




   b) 'Benzene contains three double bonds but give substitution reaction' explain the observation. 3
   c) Why the following molecule is having high dipole moment? 2



2. a) Predict the product(s) of the following reaction with probable mechanistic path. 2+3

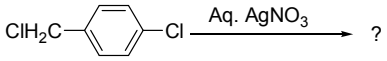



   b) Write short notes on (***any one***): 5
      (i) Orientation in benzene ring, (ii) Dye test.

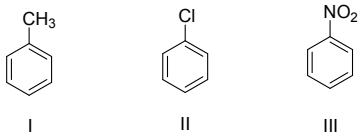
**P.T.O.**

3. a) Explain why the incoming groups are coming in the different position with respect to the existing group? 1+1+2


b) Why the behaviour of two chlorines are different and which one will react in the following molecule? 2+1




c) Arrange the following molecules in increasing order to their rate of electrophilic substitution reaction. 2+1




## Group-C (Marks: 20)
### ( Physical Chemistry )

Answer ***any four*** questions.

7. a) Express the rate of the following reaction in terms of all the reactants and product: 2

$$N_2 + 3H_2 \rightarrow 2NH_3$$

b) On which factors rate constant of a reaction depends. 1

c) What is molecularity of a reaction? Why molecularity should always be in integer? 2

8. a) Derive rate law for a zero order reaction. Find its time of completion. What is the unit of zero order rate constant? 1+1+1

b) Find the expression of $t_{y_2}$ for a first order reaction. 2

9. a) Show that, reaction having order less than one can proceed to completion. 2

b) Catalyst accelerates the forward and backward rate of a reaction to an equal extent – explain. 2

c) Draw activation energy curve for an endo-thermic reaction. 1

10. Discuss the variation of specific conductance and equivalent conductance with dilution, with proper explanation. 5

11. a) What are the two types of electrochemical cell? Give one example in each case. 2

b) What is electrode potential and how does it generate? 2

c) EMF of any electrochemical cell should be positive – explain. 1

12. a) Using the relation $\Delta G = -nFE$ derive the expression for $\Delta H$ and $\Delta S$. 2

b) For the Weston cell, the EMF is 1.01845 Volts at 20 $^{o}$C. If the temperature coefficient of the cell is $-4\times10^{-5}$ Volt/deg, calculate the value of $\Delta G$, $\Delta H$ and $\Delta S$ for the cell reaction. 3

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