This question paper contains 3 printed pages.

SB—07—[illegible]22

FACULTY OF [illegible]IENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MAY/JUNE [illegible]022

(CBCS/New P[illegible]ern)

CHEMIST[illegible]

Paper–V[illegible]

(Organic Chemistry + In[illegible]anic Chemistry)

(Monday, 6-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time— 2½ *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Figures to the right indicate full marks.

1. Solve any *three* of the following :

(*a*) Define stereoisomerism ? Explain geometrical isomerism in complexes with co-ordination no. 6.

(*b*) Define Effective Atomic Number ? Calculate the EAN of the following complexes :

(1) $[COCNH_3)_6]^{+3}$

(2) $Fe(CN)_6]^{-4}$

(*c*) Define the following terminology :

(*i*) Complex ion;

(*ii*) Co-ordination sphere;

(*iii*) Co-ordination No.

(*iv*) Oxidation No.

(*v*) Ligands.

P.T.O.

(*d*) Explain the chemotherapeutic action of anti-cancer drug cis-platin.

(*e*) What is rheumatoid arthritis disease ? Give an example of anti-arthritis drugs for the treatment.

2. Solve any *three* of the following : 15

(*a*) Define Heterocyclic compounds. Explain molecular orbital picture of Furan.

(*b*) What are drugs ? Explain the following terms with suitable example :

(*i*) Antipyretic;

(*ii*) Analgesic;

(*iii*) Antibacterial;

(*iv*) Antimalarial.

(*c*) Give the classification of dyes based on methods of applications.

(*d*) What are alkaloids ? Give the general properties of alkaloid.

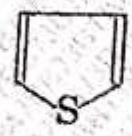
(*e*) What are herbicides ? Give the preparation and uses of the following pesticides :

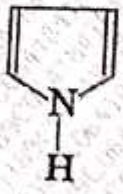
(1) Gammahexane;

(2) Chloranil.

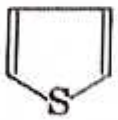
3. Solve any *two* of the following :

(*a*) Predict the products :

(*i*)  $+ I_2 \xrightarrow{H_2O} ?$

(*ii*)  $+ HNO_3 \xrightarrow{(CH_3CO)_2O} ?$

(*iii*)  $+ H_2 \xrightarrow[200°C]{Ni}$

(*iv*)  + $HgCl_2$ $\xrightarrow{CH_3COONa}$?

(*v*) $2\,CH \equiv CH + HCN \xrightarrow{\Delta}$?

(*b*) Explain aromatic character of pyridine. What happens when puridine is treated with :

(*i*) KOH;

(*ii*) $NaNH_2$

(*c*) Offer the synthesis and uses of the following drugs :

(*i*) Isoniazid;

(*ii*) Aspirin.

(*d*) Give the name of the diseases caused by the deficiency of the following vitamins :

(*i*) Vit.A

(*ii*) Vit.D

(*iii*) Vit.C

(*iv*) Vit.E

(*v*) Vit.K.

This question paper contains 2 printed pages]

SB—40—2022

FACULTY OF SCIENCE

B.Sc. (Second Year) (Fourth Semester) EXAMINATION

MAY/JUNE, 2022

(New Course)

CHEMISTRY

Paper-IX

(Physical and Inorganic Chemistry)

(Friday, 10-06-2022) **Time : 2.00 p.m. to 4.30 p.m.**

Time— 2½ Hours *Maximum Marks—40*

N.B. :— (*i*) Attempt *All* questions.

(*ii*) *All* questions carry equal marks.

(*iii*) Use of logarithmic table and non-programmable calculator is allowed.

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

(*i*) What are silicates ? Give its classification with example.

(*ii*) Give preparation, structure and applications of fullerene.

(*iii*) What are interhalogen compounds ? Give the preparation and structure of XY_7 type of interhalogen compound.

(*iv*) Give preparation structure and uses of F_2O.

(*v*) What are oxyacids of halogens ? Explain oxidation state, strength and stability of oxyacids of halogens.

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

(*i*) Derive the equation for rate constant of first order reaction. State its any *two* characteristics.

(*ii*) Explain any *two* methods of determining order of reaction.

P.T.O.

(*iii*) Discuss Arrhenius theory of electrolytic dissociation with its limitations.

(*iv*) State and explain Kohlrausch law. Give its any *two* applications.

(*v*) State and derive Lambert-Beers Law for light absorption by solution.

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

(*i*) Differentiate between order and molecularity of the reaction.

(*ii*) 0.5 Normal solution of salt placed between two platinum electrodes, 20 cm apart and area of cross section 4.0 cm^2 has a resistance of 25 ohms. Calculate the equivalent conductance of the solution.

(*iii*) Explain conductometric titration in case of precipitation titration. Give the advantages of conductometric titration.

(*iv*) A system is irradiated for 20 minutes and is found to absorb 4×10^{18} quantum per second. If the amount decomposed is 3×10^{-3} mole. Calculate the quantum efficiency of the reaction.

(Given $N_A = 6.023 \times 10^{23}$).

This question paper contains 3 printed pages]

W—25—2018

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2018

(CBCS Pattern)

CHEMISTRY

Paper XII

(Organic and Inorganic Chemistry)

(MCQ+Theory)

(Tuesday, 9-10-2018) Time : 10.00 a.m. to 12.00 noon

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Use same answer-book for Section A and Section B.

(*ii*) Attempt *all* questions.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

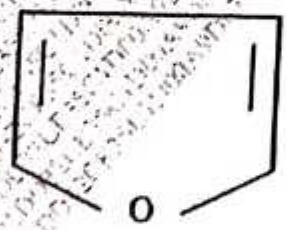
(*a*) Write resonance structure of pyrrole.

(*b*) How will you prepare pyridine from β-picoline ?

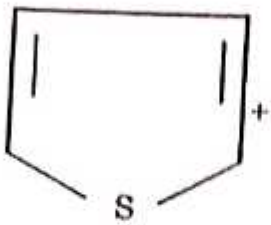
(*c*) Explain the term Antipyretics and Antifungal. Give *one* example of each.

(*d*) Write the structural formula of vitamin B_1. Mention its source and diseases caused by its deficiency.

(*e*) Predict the product (s) :

(*i*)  + $CH_3 - CH_2 - CH_2 - CH_2 - Li \rightarrow ?$

P.T.O.

(*ii*)  + HCHO + HCl $\xrightarrow{AlCl_3/\Delta}$?

(*f*) How will you convert pyridine to 2-amino pyridine ?

(*g*) Write Friedlander synthesis of quinoline.

(*h*) Define the following terms with *one* example :

(*i*) Antimalarials

(*ii*) Herbicides.

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

(*a*) Explain the synthesis and uses of the following drugs :

(*i*) Aspirin

(*ii*) Benzocaine.

(*b*) Give the synthesis and uses of the following pesticides :

(*i*) BHC

(*ii*) Monochrotophos

(*c*) How will you convert :

(*i*) Succinaldehyde to Furan

(*ii*) Furan to Pyrrole

(*iii*) Thiophene to 2-acetyl thiophene.

3. Answer any *one* of the following : 1×7=7

(*a*) Give the synthesis and uses of the following dyes :

(*i*) Alizarin

(*ii*) Congo-Red

(*iii*) Indigo.

(*b*) Discuss the chemical constitution of Nicotine.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(a) Explain the IUPAC nomenclature of coordination compound with reference to :

(i) Order of naming the ion

(ii) Order of naming the ligand

(iii) Name of the central metal ion.

(b) What are chelates ? Differentiate between metal complex and metal chelate.

(c) Describe Rubidium complexes used for the treatment of cancer.

(d) Write the formulae for the following using IUPAC norms :

(i) Hexaamine cobalt (III) sulphate

(ii) Hexaamine cobalt (III) pentachloro cadmate (II)

(iii) Potassium hexacyanoferrate (II).

(e) What is arthritis ? Explain the role of metal complex for the treatment of arthritis.

5. Solve any *two* of the following : 2×2=4

(a) Define ligand and coordination compound.

(b) Draw cis and trans isomers of the following compounds :

(i) $[Co(NH_3)_2(en)Cl_2]^+$

(ii) $[Pt(NH_3)_2NO_2Cl]$

(c) Give the names of *two* metal complexes used for the treatment of cancer.

(d) What is E.A.N. ? Calculate the EAN of $[Ni(NH_3)_6]^{+2}$.

This question paper contains 3 printed pages]

AO—25—2018

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

MARCH/APRIL, 2018

CHEMISTRY

Paper XII (CH-301)

(Organic and Inorganic Chemistry)

(Saturday, 17-3-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours *Maximum Marks—40*

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Chemical equations/Figures to the right indicate full marks.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) Explain the terms antibiotics and antituberculars. Give *one* example of each.

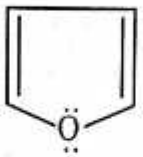
(*b*) Define the terms :

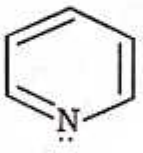
(*i*) Chromophores

(*ii*) Auxochromes and

give at least *two* examples of each.

(*c*) Predict the product(s) :

(*i*)  $+ NH_3 \xrightarrow[\Delta]{A_2O_3} ?$

(*ii*)  $+ H_2 \xrightarrow[Et\text{-}OH]{\Delta/Na} ?$

P.T.O.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) "All metal chelate are metal complexes but all metal complexes are not metal chelate." Explain.

(*b*) Show primary valencies, secondary valencies and coordination sphere in the following coordination compound :

$[Co(NH_3)_6]Cl_3$.

(*c*) Explain, how $CoCl_3.6NH_3$ compound is formulated as $[Co(NH_3)_6]Cl_3$ with the help of Werner's theory.

(*d*) Give the characteristics of Hard and Soft acids.

(*e*) What is Pearson's HSAB concept ?

5. Solve any *two* of the following : 2×2=4

(*a*) What is polymerisation isomerism ? Give its example.

(*b*) Give the IUPAC name of :

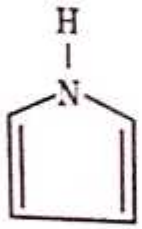
(*i*) $Na_2[ZnCl_4]$

(*ii*) $[Co(NH_3)_6][Cr(CN)_6]$.

(*c*) Calculate EAN of $[Co(NH_3)_6]^{3+}$. State its stability.

(*d*) Give examples of borderline acids.

5BA6111F2A5CA0004157D10053154976

(*iii*) 

$\xrightarrow[KI]{HI_2}$?

(*iv*) 

$\xrightarrow[\Delta/AlCl_3]{HCHO/HCl}$?

(*d*) What are alkaloids ? Give general physical properties of alkaloids.

(*e*) How will you convert furan to tetrahydrofuran ?

(*f*) How will you prepare pyridine from acetylene ?

(*g*) Write the structural formula of vitamin 'A'. Mention its sources and diseases caused by its deficiency.

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

(*a*) Explain the synthesis and uses of the following drugs :

(*i*) Benzocaine

(*ii*) Paracetamol.

(*b*) What are herbicides ? Give the synthesis and uses of the following pesticides :

(*i*) 2, 4, D.

(*ii*) D.D.T.

(*c*) Explain bromination of furan and amination reaction of pyridine with its mechanism.

3. Answer any *one* of the following : 1×7=7

(*a*) Discuss the constitution of ephedrine.

(*b*) What are colours ? Give the synthesis and applications of the following dyes :

(*i*) Orange-II

(*ii*) Phenolphthalein

(*iii*) Methyl orange.

This question paper contains 3 printed pages]

X—10—2019

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2019

(CBCS Pattern)

CHEMISTRY

Paper-XII (DSEC-V)

(Organic 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*) Figures to the right indicate full marks.

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

(*a*) What are molecular compounds ? How are they classified ? Differentiate between them.

(*b*) Give an account on chelation therapy.

(*c*) Define geometrical isomerism. Discuss different types of geometrical isomerism in co-ordination number six with suitable example.

(*d*) Discuss in brief the IUPAC nomenclature of co-ordination compounds with reference to :

(*i*) Name of negative ligands

(*ii*) Order of naming the ligands

(*iii*) Number of ligands

(*iv*) Name of central metal ion.

(*e*) Explain how gadolinium and technetium complexes used as Imaging agents ?

P.T.O.

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

(*a*) What are heterocyclic compounds ? How are they classified ?

(*b*) Give synthesis and uses of the following drugs :

(*i*) Paludrine

(*ii*) Paracetamol.

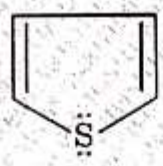
(*c*) Explain Witts theory and Armstrong theory of colour and chemical constitution with suitable example.

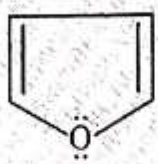
(*d*) Discuss the chemical constitution of Ephedrine.

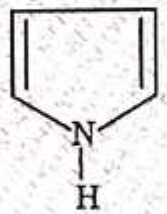
(*e*) What are Herbicides and Rodenticides ? Offer the synthesis and uses of DDT ?

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

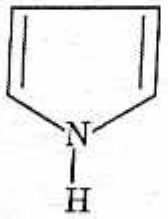
(*a*) Predict the product(s) :

(*i*)  + Conc. H_2SO_4 $\longrightarrow$

(*ii*)  + $2H_2$ $\xrightarrow{\text{Raney Ni}}$

(*iii*)  + HNO_3 $\xrightarrow{(CH_3CO)_2O}$

(*iv*)  + $HgCl_2$ $\xrightarrow{CH_3COONa}$

(*v*)  + HCN + HCl $\xrightarrow{\text{Anhydrous } AlCl_3}$

(*b*) How will you prepare pyridine from :

(*i*) Acetylene

(*ii*) β-picoline

(*iii*) Pentamethylene diamine hydrochloride

Give physical properties of pyridine.

(*c*) What are drugs ? Write qualities of good drug.

(*d*) What are water-soluble vitamins ? Write structure, sources and deficiency diseases of vit. A_1 and Vit. E.

This question paper contains 3 printed pages]

Y—28—2019

FACULTY OF SCIENCE

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

OCTOBER/NOVEMBER, 2019

(CBCS Pattern)

CHEMISTRY

Paper XII

(Organic 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*) Use same answer-book for Section A and Section B.

(*ii*) Attempt *All* questions.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

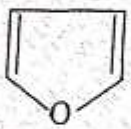
(*a*) Write resonance structure of thiophene.

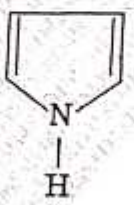
(*b*) How will you prepare pyridine from acetylene ?

(*c*) Explain the term Antidibetics and Antibiotics. Give *one* example of each.

(*d*) Write the structural formula of Vitamin C. Mention its source and diseases caused by its deficiency.

(*e*) Predict the product(s) :

(*i*)  $\xrightarrow{H_2 \mid Ni}$?

(*ii*)  + HCN + HCl $\xrightarrow{AlCl_3}$?

P.T.O.

(f) Explain basic character of pyridine.

(g) Write Fischer indole synthesis.

(h) Define the following terms with *one* example each :

(i) Sedatives

(ii) Rodenticides.

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

(a) Explain the synthesis and uses of the following drugs :

(i) Sulphadiazine

(ii) Tolbutamide

(b) Give the synthesis and uses of the following pesticides :

(i) DDT

(ii) Carbaryl

(c) How will you convert :

(i) Furan to 2-Nitrofuran

(ii) Pyrrole to Pyrrole-2-Sulphonic acid

(iii) *n*-butane to thiophene.

3. Answer any *one* of the following : 1×7=7

(a) Explain qualities of good dye and write Witt's theory, Armstrong's theory of colour and chemical constitution.

(b) Discuss the chemical constitution of Ephedrine.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(a) What are the postulates of Werner's theory of coordination ?

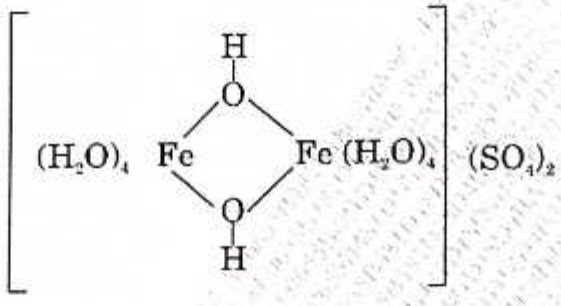
(b) Define ligands and give their classification with suitable example.

(c) Explain in detail gold complexes for the treatment of rheumatoid arthritis.

(*d*) Give the IUPAC name of the following coordination compounds :

(*i*) $[Ag(NH_3)_2]Cl$

(*ii*) $[Pt(NH_3)_4]\ [PtCl_4]$

(*iii*) 

(*e*) Write a short note on Imaging agents.

5. Solve any *two* of the following : 2×2=4

(*a*) What are coordination isomerisms ? Give its suitable example.

(*b*) Calculate EAN of :

(*i*) $[Fe(CN)_6]^{4-}$

(*ii*) $[Cu(CN)_4]^{3-}$

(*c*) Distinguish between Double salt and Coordination compound.

(*d*) What is cancer ?

This question paper contains 3 printed pages]

Y—29—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CGPA Pattern)

CHEMISTRY

Paper XII (CH-301)

(Organic 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*) Figures to the right indicate full marks.

Section (A) Organic Chemistry

1. Answer any *five* of the following : 5×2=10

(*a*) Write resonance structure of pyrrole.

(*b*) Give physical properties of pyridine.

(*c*) Define anaesthetics and anti-inflammatory drugs with suitable example.

(*d*) Give structure of vitamin C. Mention its sources and deficiency diseases.

(*e*) How will you prepare pyrrole from acetylene ?

(*f*) Explain Gattermann-Koch reaction of furan.

(*g*) How will you prepare quinoline by Skraup synthesis ?

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

(*a*) Explain the synthesis of following drugs :

(*i*) Sulphanilamide

(*ii*) Aspirin.

P.T.O.

(*b*) What are insecticides ? Give synthesis and uses of D.D.T. and B.H.C.

(*c*) Explain following reactions of pyridine :

(*i*) Amination

(*ii*) Reduction

(*iii*) Oxidation.

3. Answer any *one* of the following : 1×7=7

(*a*) What are alkaloids ? Give occurrence, extraction and general properties of alkaloids.

(*b*) Give synthesis and uses of the following dyes :

(*i*) Phenolphthalein

(*ii*) Methylorange

(*iii*) Alizarin.

4. Solve any *three* of the following : 3×3=9

(*a*) What are molecular compounds ? How are they classified ?

(*b*) Write the name of the following complexes :

(*i*) $K_3[Fe(CN)_6]$

(*ii*) $[CO(en)_2Cl_2]SO_4$

(*iii*) $[Pt(NH_3)_4]$ [Pt. Cl_4]

(*c*) Define geometrical isomerism and draw Cis and Trans form of the following complexes :

(*i*) $[Pt(NH_3)_2Cl_2]$

(*ii*) $[(OCNH_3)_4Cl_2]^+$

(*d*) Explain hard and soft bases with suitable examples.

(*e*) Write a short note on electrostatic interaction.

5. Solve any *two* of the following : 2×2=4

(*a*) Give the classification of ligands

(*b*) Explain Ionization Isomerism with suitable example.

(*c*) What is symbiosis ?

(*d*) Calculate EAN of the following :

(*i*) $[CO(NH_3)_6]^{+3}$

(*ii*) $[Ni(CN)_4]^{-2}$.

This question paper contains : printed pages]

SB—08—2022

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) EXAMINATION

JUNE/JULY, 2022

(CBCS/Old Pattern)

CHEMISTRY

Paper XII

(Organic and Inorganic Chemistry)

(Monday, 6-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time—2½ Hours *Maximum Marks—40*

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Figures to the right indicate full marks.

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

(*a*) What are chelates ? How are they classified ? Differentiate between metal chelate and ionic complex.

(*b*) Explain different types of optical isomerism in co-ordination number six with suitable example.

(*c*) Write a note on anti-arthritis drugs.

(*d*) Define EAN. Write the name and calculate the EAN of the following complex ions : $[Fe(CN)_6]^{-4}$ and $[Ni(CN)_4]^{-2}$.

(*e*) Describe rubedium complexes used for the treatment of cancer.

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

(*a*) Explain resonance and molecular orbital structure of furan.

(*b*) What are functional drugs ? Explain the terms antipyretic, analgesics, anaesthetic antidiabetic drugs with *one* example of each.

(*c*) What are dyes ? Give qualities of good dye ?

(*d*) Give the chemical constitution of Nicotine.

(*e*) What are insecticides ? Give synthesis and uses of B.H.C. and 2, 4-D.

P.T.O.

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

(*a*) How will you prepare thiophene from :

(*i*) Acetylene

(*ii*) *n*-butane ?

Give physical properties of thiphene.

(*b*) What happens when pyridine is treated with the following :

(*i*) Fuming H_2SO_4

(*ii*) Br_2

(*iii*) *n*-butylithium

(*iv*) H_2/Ni

(*v*) C_6H_5COOOH

(*c*) What are chemotherapeutic drugs ? Explain the terms antimalarials, antibacterials, antifungals and antibiotics with *one* example of each.

(*d*) What are vitamins ? How are they classified ?

This question paper contains 3 printed pages]

AO—37—2018

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

MARCH/APRIL, 2018

CHEMISTRY

Paper XIII

(Physical & Inorganic Chemistry)

(Tuesday, 20-3-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Use only *one* answer book for both Sections A & B.

(*ii*) Use of calculator is allowed.

(*iii*) Attempt *all* questions.

(*iv*) Use of Logarithmic table is allowed.

(Section A : Physical chemistry) 5×2=10

1. Answer any *five* of the following :

(*i*) State and explain Henry's law.

(*ii*) Explain consecutive reactions.

(*iii*) Show that in third order reaction time for half change is inversely proportional to initial concentration.

(*iv*) State and explain Nernst distribution law.

(*v*) Discuss the effect of force constant on bond energy.

(*vi*) Explain Raman effect.

(*vii*) Explain dimerization anthracene.

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

(*a*) Explain the kinetics of reversible reaction.

(*b*) Explain theory and principle of vibrational spectra of simple harmonic oscillator.

P.T.O.

(*c*) The pure rotational spectrum of gaseous molecule consists of series of equally spaced lines separated by 4.2 cm^{-1}. Calculate the bond length of molecule.

Reduced mass = 1.3×10^{-26} kg, $h = 6.626 \times 10^{-34}$ Js, $c = 3 \times 10^8$ m/s.

3. Answer any *one* of the following : 1×7=7

(*i*) Show that in case of microwave spectrum, the molecule consists of lines with separation of 2B cm^{-1}.

(*ii*) (*a*) Derive an expression for distribution law when solute undergoes association.

(*b*) The following data were obtained at 298 K for the distribution of I_2 between H_2O and CCl_4. I_2 in H_2O (mole dm^{-3}) × 10^2, I_2 in CCl_4 (mole dm^{-3}).

1.18	1.005
2.35	2.01
3.58	3.015
4.67	4.01

Verify that data obey Nernst distribution law and calculate K_D in favour of CCl_4.

(Section B : Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) How are organoaluminium compounds prepared from :

(*i*) Grignard reagent

(*ii*) Organomercury and

(*iii*) Phenyl lithium.

(*b*) What are the applications of organolithium compounds ?

(*c*) Write any *three* properties of organotin compounds.

(*d*) Give the properties of $Ni(CO)_4$.

(*e*) Explain metal-carbon bonding in metal carbonyl.

5. Solve any *two* of the following : 2×2=4

(*a*) Draw the structure of $Fe_2(CO)_9$ and $Ir_4(CO)_{12}$.

(*b*) How are tetramethyl titanium and tetraphenyl titanium prepared ?

(*c*) What are organometallic compounds ? Give its suitable example.

(*d*) Define transition metal organometallic compounds. Give its example.

This question paper contains 3 printed pages]

W—40—2018

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2018

CHEMISTRY

Paper XIII

(Physical and Inorganic Chemistry)

(Thursday, 11-10-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Use only one answer-book for both Sections A and B.

(*ii*) Use of calculator is allowed.

(*iii*) Attempt *all* questions.

(*iv*) Use of Logarithmic table is allowed.

Section A

(Physical & Inorganic)

1. Answer any *five* of the following : 5×2=10

(*i*) State and explain Nernst distribution law.

(*ii*) Explain chain reaction with suitable example.

(*iii*) Explain the term partition chromatography.

(*iv*) What are third order reaction ? Give *two* examples.

(*v*) What are the factors that affect the width of spectral lines ? Explain any *one* factor.

(*vi*) Explain $\sigma \rightarrow \sigma^*$ and $\pi \rightarrow \pi^*$ transitions.

(*vii*) Explain consecutive reactions.

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

(*a*) Derive the equation for rate constant of third order reaction.

P.T.O.

(*b*) Prove that frequency separation between successive lines in pure rotational Raman spectrum is 4B cm^{-1}.

(*c*) The vibrational frequency of a diatomic is 2880 cm^{-1}. Calculate force constant. The atomic masses are 56×10^{-27} kg and 1.5×10^{-27} kg. ($c = 3 \times 10^8$ m/s)

3. Answer any *one* of the following : 7×1=7

(*i*) Derive an expression for energy of transition from $J \rightarrow J + 1$ level in rigid diatomic rotator. Show allowed transition with the help of energy level diagram.

(*ii*) (*a*) Derive an expression for Nernst distribution law when solute undergoes dissociation. 3

(*b*) In the distribution of an organic solute between water (C_1) and chloroform (C_2), the following results were obtained : 4

C_1 (mole.dm^{-3}) 0.190, 0.368

C_2 (mole.dm^{-3}) 0.42, 1.538

Determine the molecular state of solute in chloroform.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) Give any *three* methods of preparation of $Ni(CO)_4$.

(*b*) Explain the structure of $Ni(CO)_4$.

(*c*) Write the application of organotitanium compounds.

(*d*) What is the action of :

(*i*) alkyl iodide

(*ii*) halogen and

(*iii*) carbon dioxide.

on organolithium compounds.

(*e*) Give the methods of preparation of organotin compounds.

5. Solve any *two* of the following : 2×2=4

(*a*) Draw the structure of Al_2Me_6. What is its IUPAC name ?

(*b*) Classify ionic and covalent organo-metallic compounds of the following :

Butyl sodium, Dimethyl cadmium, Phenyl sodium, Diphenyl zinc.

(*c*) Give any *two* applications of organotin compounds.

(*d*) Write the IUPAC name of $Fe_2(CO)_9$ and $Co_2(CO)_8$.

This question paper contains 3 printed pages]

Y—45—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CGPA Pattern)

CHEMISTRY

Paper-XIII

(Physical Chemistry and Inorganic Chemistry)

(Tuesday, 15-10-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Use same answer-book for Section-A and Section-B.

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

(*iii*) Attempt all questions.

Section A

(Physical Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) Discuss kinetics of Anthracene.

(*b*) Write a note on concept of potential energy curve.

(*c*) Discuss *two* applications of distribution law.

(*d*) Write a note on multiple extraction.

(*e*) Give the limitations of Nernst distribution law.

(*f*) Define third order reaction and derive its unit.

(*g*) Define opposing reactions and give its *two* examples.

(*h*) Prove that half life period of third order reaction is inversely proportional to square of initial concentration.

P.T.O.

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

(*a*) In 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.).

(*b*) Explain Frank-Condon principle for electronic transition.

(*c*) Derive Kinetics of opposing reaction.

3. Answer any *one* of the following : 1×7=7

(*a*) Derive energy equation of diatomic molecule as simple harmonic oscillator and find its spectral distance with energy diagram.

(*b*) (*i*) Derive an expression for Nernst distribution law when solute undergoes association.

(*ii*) For distribution of an organic solute between water (C_1) and chloroform (C_2). The following results were obtained :

C_1	0.0160	0.0237
C_2	0.338	0.753

Determine the molecular state of the solute in chloroform.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) How are organoaluminium compounds prepared from :

(*i*) Grignard reagent

(*ii*) Phenyl lithium

(*iii*) Organomercury compound.

(*b*) What are organometallic compounds ? Describe covalent organometallic compounds with suitable example.

(c) Give any *three* applications of organolithium compounds.

(d) Explain the metal-carbon bonding in metal carbonyl.

(e) What is the action of the following on $Ni(CO)_4$?

(i) Br_2

(ii) H_2SO_4

(iii) Heat.

5. Solve any *two* of the following : 2×2=4

(a) What are the applications of organotin compounds in agriculture ?

(b) How will you prepare ethyl lithium from :

(i) C_2H_5Cl

(ii) $(C_2H_5)_2Hg$

(c) What is the action of the following on $Al(CH_3)_3$:

(i) HX

(ii) O_2/H_3O^+

(d) Draw the structures of :

$Fe_2(CO)_9$ and $Ir_4(CO)_{12}$.

This question paper contains 3 printed pages]

Y—43—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Fifth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CBCS Pattern)

CHEMISTRY

Paper XIII

(Physical and Inorganic Chemistry)

(Tuesday, 15-10-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours *Maximum Marks—40*

N.B. :— (*i*) Use same answer-book for Section A and Section B.

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

(*iii*) Attempt *all* questions.

Section A

(Physical Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) Define opposing reaction and give its *two* examples.

(*b*) Prove that half life period of third order reaction is inversely proportional to square of initial concentration.

(*c*) Define third order reaction and derive its unit.

(*d*) Give the limitations of Nernst distribution law.

(*e*) Write a note on multiple extraction.

(*f*) Discuss *two* applications of distribution law.

(*g*) Write a note on concept of potential energy curve.

(*h*) Discuss kinetics of Anthracene.

P.T.O.

2×5=10

2. Answer any *two* of the following :

(*a*) Explain Franck-Condon principle for electronic transition.

(*b*) In pure rotational spectra of H-Cl 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)

(*c*) Derive kinetics of opposing reactions.

7

3. Answer any *one* of the following :

(*a*) Derive energy equation of diatomic molecule as simple harmonic oscillator and find its spectral distance with energy diagram.

(*b*) (*i*) Derive an expression for Nernst distribution law when solute undergoes association.

(*ii*) 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.

Section B

(Inorganic Chemistry)

3×3=9

4. Solve any *three* of the following :

(*a*) Give any *three* methods of preparation of organolithium compounds.

(*b*) Explain the structure and bonding of organotin compound with suitable example.

(*c*) What is the action of the following on $Al(CH_3)_3$:

(*i*) HCl

(*ii*) $O_2 | H_3O^+$

(*iii*) C_2H_5Li.

(*d*) Define mononuclear carbonyls. Give its characteristics.

(*e*) Explain the structure and bonding in $Ni(CO)_4$.

5. Solve any *two* of the following : 2×2=4

(*a*) Explain ionic organomettalic compounds with suitable example.

(*b*) Draw the structure of $(CH_3)_3SnF$.

(*c*) Give any *two* applications of organotitanium compounds.

(*d*) Predict the product(s) :

(*i*) $Ni(CO)_4 + H_2SO_4 \rightarrow ?$

(*ii*) $Ni(CO)_4 + 4NO \rightarrow ?$

This question paper contains 3 printed pages]

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.

This question paper contains 2 printed pages]

SB—18—2022

FACULTY OF SCIENCE

B.Sc. (Fifth Semester) EXAMINATION

JUNE/JULY, 2022

(CBCS/Old Pattern)

CHEMISTRY

Paper XIII (B1)

(Physical Chemistry and Inorganic Chemistry)

(Wednesday, 8-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time—2½ *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 organometallic compounds ? Explain ionic and covalent organometallic compound with suitable example.

(*b*) How will you prepare organo-aluminium compounds from :

(*i*) Phenyl lithium

(*ii*) Grignard reagent

(*iii*) Organomercury compound

(*iv*) Ethene

(*v*) Alkyl halide.

(*c*) (*i*) Write any *three* methods of preparation of organotitanium compounds.

(*ii*) Explain bonding and structure of organotitanium compound.

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

(*e*) (*i*) Explain the structure and bonding in $Ni(CO)_4$.

(*ii*) Draw the structure of $Fe_3(CO)_{12}$.

P.T.O.

NT

3×5=15

2. Answer any *three* of the following :

(*a*) Derive an expression for moment of inertia of diatomic molecule as rigid rotator.

(*b*) Explain Frank-Codon principle with the help of potential energy diagram.

(*c*) The fundamental vibrational frequency of a molecule is 2890 cm^{-1}. Calculate force constant of this molecule.

(Reduced mass is 1.626×10^{-27} kg)

(*d*) Define third order reaction and derive rate equation of third order reaction for equal concentrations.

(*e*) State and explain Nernst distribution law and give its limitation.

2×5=10

Answer any *two* of the following :

(*a*) Determine force constant and derive its qualitative relation with bond energy.

(*b*) Discuss electronic transition among the σ, π, and n molecular orbital.

(*c*) Discuss kinetics of opposing reactions.

(*d*) When phenol is distributed in water and chloroform gave the following result :

Concentration in Aqueous Solution (C_1)	0.094	0.103	0.254
Concentration in Cloroform (C_2)	0.254	0.761	0.1850

Comment on result ?

This question paper contains 3 printed pages]

V—16—2017

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2017

CHEMISTRY

Paper XIV (CH-303)

(Organic and Inorganic Chemistry)

(Saturday, 7-10-2017) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Figures to the right indicate full marks.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) Define the following terms :

(*i*) Hypochromic effect and Blue shift.

(*ii*) Auxochrome and its examples.

(*b*) Calculate the λ_{max} :

(*i*) 1, 2-dimethylcyclohexadiene.

(*ii*) But-3-en-2-one.

(*c*) Give the general properties and importance of proteins.

(*d*) What happens when :

(*i*) Glycine treated with formaldehyde.

(*ii*) Glycine reacts with acetyl chloride.

(*e*) How will you synthesize dipeptide by NH_2-protecting group agent using carbobenzoxyl chloride.

P.T.O.

(*f*) What do you mean by shielding and deshielding of a proton ? Give its examples.

(*g*) Predict the number of 'PMR' signals of :

(*i*) Ethylamine

(*ii*) Diethyl ether.

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

(*a*) What do you mean by functional group region ? How will you interpret 'IR' spectra of the following organic compounds :

(*i*) Acetone

(*ii*) Benzoic acid

(*iii*) Acetaldehyde.

(*b*) Draw α-amino acid structure and explain dipolar nature of amino acid. How will you obtain ester from glycine ?

(*c*) What is cationotropic rearrangement ? Explain Bayer-Villiger rearrangement with mechanism.

3. Answer any *one* of the following : 1×7=7

(*a*) An organic compound with molecular formula 'C_3H_6O' gave the following data :

UV : transparent λ_{max} 295 nm

IR : 2975, 2825 – 2715, 1725 and 1415 cm^{-1}

PMR (δ_{ppm}) : δ1.31 (*t* – 3H)

: δ2.45 (*q* – 2H)

: δ9.7 (*t* – 1H)

Deduce the structure and name of organic compound.

(*b*) What are addition polymerization ? Give *two* examples. Discuss the anionic polymerization reaction with mechanism. Give synthesis and importance of :

(*i*) glyptal

(*ii*) polyurethanes.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

   (*a*) Explain inner and outer orbital complexes with suitable example.

   (*b*) Explain splitting of *d* orbital in tetragonal (elongated octahedral) complexes.

   (*c*) Calculate CFSE in octahedral complexes having d^1, d^2 and d^3 configuration.

   (*d*) Describe electronic spectra of $[Ti(H_2O)_6]^{3+}$ complex ion.

   (*e*) Describe Orgel energy level digram for d^1 and d^9 configuration.

5. Solve any *two* of the following : 2×2=4

   (*a*) How size of *d* orbitals affect the magnitude of 10 Dq ?

   (*b*) State Jahn-Teller theorem.

   (*c*) What are the limitations of crystal field theory ?

   (*d*) What is LMCT ? Give their example.

This question paper contains 3 printed pages]

W—16—2018

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

OCTOBER/NOVEMBER, 2018

CHEMISTRY

Paper – XIV

(Organic and Inorganic Chemistry)

(Monday, 8-10-2018) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) What are peptides ? How are they classified ?

(*b*) How will you synthesize dipeptide by N-protecting group agent using tosyl chloride ?

(*c*) How will you prepare α-amino acids by Gabriel's synthesis ?

(*d*) Explain the terms :

(*i*) Equivalent and non-equivalent protons with examples.

(*ii*) Shielding and deshielding effect

(*e*) Define the terms :

(*i*) Chromophore and Auxochrome

(*ii*) Bathochromic shift and Hypsochromic shift.

(*f*) Predict the number of "PMR" signals of :

(*i*) Acetaldehyde,

(*ii*) Ethyl acetate.

P.T.O.

(g) Calculate the λ_{max} of :

(i) Cyclohex–2, 4-dienone

(ii) 2, 4, 6, Octatriene.

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

(a) What is cationotropic rearrangement ? Explain pinacol-pinacolone rearrangement with mechanism.

(b) What are fundamental vibrations of I.R. spectroscopy ? Give its examples.

(c) Explain in detail physical properties and importance of proteins.

3. Answer any *one* of the following : 1×7=7

(a) An organic compound with molecular formula "C_4H_8O" gave the following spectral data :

U. V. : Transparent λ_{max} 283 nm

I.R. : 2955, 2830 and 1715 cm^{-1}

P.M.R. : $\delta_{1.3}$ (t, 3H)

$\delta_{2.6}$ (q, 2H)

$\delta_{2.2}$ (s, 3H)

Deduce the structure and name of organic compound.

(b) What are addition polymerization ? Give its example. Explain cationic polymerization with mechanism. Give the synthesis and importance of :

(i) Polyurethane

(ii) Glyptal.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(a) Explain inner and outer orbital complexes with suitable example.

(b) Describe the splitting of *d* orbitals in tetrahedral complexes.

(*c*) Calculate CFSE in octahedral complexes having d^1, d^2 and d^3 electronic configuration.

(*d*) What is hole formulation ? Explain it with suitable example.

(*e*) Explain electronic spectra of $[Ti\ (H_2O)_6]^{+3}$ complex ion.

5. Solve any *two* of the following : 2×2=4

(*a*) Give an account of spectrochemical series.

(*b*) What are limitations of VBT of coordination compound ?

(*c*) Explain :

$$\Delta t = -\frac{4}{9}\Delta_o$$

(*d*) Write a note on LMCT.

This question paper contains 3 printed pages]

AO—16—2018

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MARCH/APRIL, 2018

CHEMISTRY

Paper XIV (CH-303)

(Organic and Inorganic Chemistry)

(Friday, 16-3-2018) Time : 10.00 a.m. to 12.00 noon

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

(*ii*) Figures to the right indicate full marks.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) Calculate the λ_{max} :

(*i*) 2, 4-dimethyl-1, 3-Pentadiene

(*ii*) But-2-enal.

(*b*) Define the terms :

(*i*) Wavelength and wavenumber

(*ii*) Chromophore and its examples.

(*c*) What are peptides ? How are they classified ?

(*d*) What happens when :

(*i*) Action of heat on glycine

(*ii*) Methyliodide reacts with glycine.

(*e*) Explain equivalent and non-equivalent protons. Give its examples.

(*f*) Predict the number of PMR signal of :

(*i*) Acetone

(*ii*) Mesitylene.

P.T.O.

(*g*) Give the following colour test of proteins :

(*i*) Heller's test

(*ii*) Millon's test.

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

(*a*) What are molecular rearrangements ? Describe the pinacol-pinacolone rearrangement with mechanism.

(*b*) What are amino acids ? How will you prepare glycine from :

(*i*) Chloroacetic acid

(*ii*) Formaldehyde.

(*c*) What do you mean by fingerprint region ? How will you distinguish primary, secondary and tertiary alcohols using IR spectra ?

3. Answer any *one* of the following : 1×7=7

(*a*) What are homopolymers and heteropolymers ? Give *two* examples of each. Discuss the cationic addition polymerization reaction with mechanism. Give the synthesis and importance of :

(*i*) Neoprene

(*ii*) Bakelite.

(*b*) An organic compound with molecular formula 'C_8H_{10}' gave the following spectral data :

U.V. : Transparent above λ_{max} 200 nm

IR : 2925, 1620, 1550, 1415 cm^{-1}.

PMR(δ) ppm : $\delta_{1.2}$(t – 3H, J – 7.0 Hz)

: $\delta_{2.3}$(q – 2H, J – 7.02 Hz)

: $\delta_{7.4}$(s 5H, J – 7.1 Hz)

Deduce the structure and name of organic compound.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

   (*a*) What are the postulates of crystal field theory ?

   (*b*) Explain splitting of *d* orbitals in tetrahedral complexes.

   (*c*) What are the limitations of valence bond theory ?

   (*d*) Calculate the spectroscopic ground state term symbol of d^1 configuration.

   (*e*) Write a note on selection rule for $d - d$ transition.

5. Solve any *two* of the following : 2×2=4

   (*a*) Explain the factors affecting the magnitude of 10 Dq with respect to nature of ligand.

   (*b*) Calculate the number of unpaired electron in the following complexes :

   (*i*) $[Fe(CN)_6]^{-3}$

   (*ii*) $[FeF_6]^{-3}$.

   (*c*) Why have low spin complexes of tetrahedral geometry not yet been obtained ? Explain.

   (*d*) Explain, $[Ti(H_2O)_6]^{+3}$ show purple colour.

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This question paper contains 3 printed pages]

Y—19—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CGPA Pattern)

CHEMISTRY

Paper-XIV

(Organic and Inorganic Chemistry)

(Thursday, 14-11-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours *Maximum Marks—40*

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

Section A

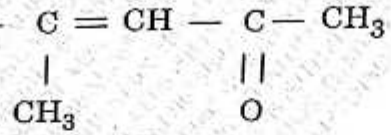
(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

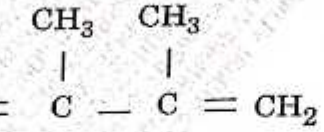
(*a*) Explain $\Pi \rightarrow \Pi^*$ transitions.

(*b*) Calculate the λ_{max} :

(*i*)



(*ii*)



(*c*) Explain deshielding of a proton with an example.

(*d*) Predict the number of PMR signals of :

(*i*) Acetone

(*ii*) Cyclobutane.

P.T.O.

(e) What is the action of formaldehyde and acetaldehyde on glycine.

(f) Give the following colour test of protein :

(i) Biuret test

(ii) Xanthoprotic test.

(g) What are peptides ? How are they classified ?

2×5=10

2. Answer any *two* of the following :

(a) How will you interpret IR spectra of the following compounds :

(i) Phenol

(ii) Acetone

(iii) Ethyne.

(b) Explain Fries rearrangement with mechanism.

(c) How will you synthesis α-amino acid by Gabriel's phthaliamide synthesis ? What is the action of nitrous acid on glycine ?

1×7=7

3. Answer any *one* of the following :

(a) Discuss the anionic addition polymerisation with mechanism. Give the synthesis and uses of :

(i) Bakelite

(ii) Polymethyl methacrylate.

(b) An organic compound with molecular formula C_3H_8O gave the following spectral data :

UV : Transparent above λ_{max} 210 nm

IR : 3400 (Broad), 2890, 1050 cm^{-1}

PMR (δ PPM) : δ 1.2 (t, J = 7.5 Hz, 3H)

δ 2.6 (Sextet, J = 7.5 Hz, 2H)

δ 3.5 (t, J = 7.5 Hz, 2H)

δ 4.5 (S, 1H, exchangeable with D_2O)

Deduce the structure of the compound.

Section B

(Inorganic Chemistry)

3×3=9

4. Solve any *three* of the following :

(*a*) Explain outer orbital complex of coordination number six with example.

(*b*) Give the postulates of crystal field theory.

(*c*) Define CFSE ? Calculate CFSE of d^6 configuration in high spin octahedral complex.

(*d*) What are selection rules for electronic spectra ?

(*e*) Calculate the spectroscopic ground state term symbol of d^4 configuration.

2×2=4

5. Solve any *two* of the following :

(*a*) Give the limitation of valence bond theory.

(*b*) Explain the effect of oxidation state of metal ion on magnitude of crystal field splitting.

(*c*) Calculate the number of unpaired electrons in octahedral complex of Co^{3+} and Fe^{3+}, in strong field ligand.

(*d*) Draw Orgel diagram for d^1 and d^9 system.

This question paper contains 3 printed pages]

Y—17—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CBCS Pattern)

CHEMISTRY

Paper-XIV–A_1

(Organic and Inorganic Chemistry)

(Thursday, 14-11-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 Hours *Maximum Marks—40*

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) State and explain Lembert's law.

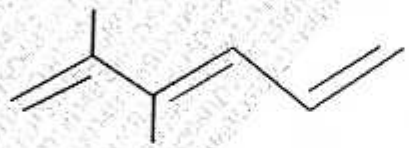
(*b*) Explain $\sigma \rightarrow \sigma^*$ and $n \rightarrow \sigma^*$ transitions.

(*c*) Predict the number of PMR signals of :

(*i*) Methanol

(*ii*) Ethylamine.

(*d*) Calculate the λ_{max} of :

(*i*) 

(*ii*) 

P.T.O.

(e) Define coupling constant and wavelength.

(f) What are peptides ? How are they classified ?

(g) Explain N-terminus and C-terminus protecting agents.

(h) What are equivalent and non-equivalent protons ?

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

(a) Explain Favorskii rearrangement with mechanism.

(b) How will you distinguish between Ethane, Ethene, Ethyne by using I.R. Spectroscopy ?

(c) Predict the products :

(i) $H_2N{\cdot}CH_2{\cdot}COOH + Ba(OH)_2 \xrightarrow{\Delta}$

(ii) $H_2NCH_2COOH + 4[H] \xrightarrow{LiAlH_4}$

(iii) $H_2NCH_2COOH + CH_3COCl \xrightarrow[\Delta]{Base}$

(iv) $H_2NCH_2\ COOH + HNO_2 \xrightarrow{(NaNO_2+HCl)}$

(iv) $H_2N{\cdot}CH_2{\cdot}COOH + H{-}\overset{\overset{O}{\|}}{C}{-}H \longrightarrow$

3. Answer any *one* of the following : 1×7=7

(a) Deduce the structure and name of an organic compound with molecular formula $C_2H_4O_2$ and having the following spectral data :

UV : Transparent λ_{max} 210 nm (E_{max} 50).

IR : 3100 – 2975 cm^{-1} (Broad),

1715 – 1720 cm^{-1}.

PMR (δppm) : $\delta_{2.1}$ (S, 3H)

$\delta_{11.7}$ (S, 1H) Exchangeable with D_2O.

(*b*) (*i*) Explain Shielding and deshielding effect with suitable example.

(*ii*) Deduce the structure of compound based on the following PMR spectral data :

Molecular formula : C_2H_5Br

PMR(δ_{ppm}) : $\delta_{1.7}$ (*t*, 3H)

$\delta_{3.4}$ (*q*, 2H).

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) What are outer orbital complexes ? Explain with suitable example.

(*b*) Define CFSE and calculate CFSE in octahedral complexes having d^4 and d^5 configurations in weak ligand field.

(*c*) Explain the following factors affecting the magnitude of crystal field splitting :

(*i*) Nature of the ligands

(*ii*) Oxidation state of the metal ion.

(*d*) Calculate the spectroscopic ground state term symbol of d^1 configuration.

(*e*) Describe orgel energy level diagram for d^1 and d^9 configuration.

5. Solve any *two* of the following : 2×2=4

(*a*) Draw and explain the shapes of d-orbitals.

(*b*) What are the limitations of VBT ?

(*c*) How size of d-orbitals affect the magnitude of 10D*q* ?

(*d*) Write a note on metal to ligand charge transfer (MLCT).

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Y—18—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CBCS Pattern)

CHEMISTRY

Paper-XIV-A2 (Elective)

(Organic and Inorganic Chemistry)

(Thursday, 14-11-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *all* questions.

(*ii*) Figures to the right indicate full marks.

Section A

(Organic Chemistry)

1. Answer any *five* of the following : 5×2=10

   (*a*) Explain in brief about absolute alcohol.

   (*b*) Give any two by-products of alcohol industry. Explain them in brief.

   (*c*) Explain the preparation of fermentation medium.

   (*d*) Explain in brief about synthetic adhesives.

   (*e*) Give general properties of starch.

   (*f*) Explain reaction and dispersed dyes.

   (*g*) Give the synthesis and uses of monochrotophas.

   (*h*) Give the synthesis and uses of Indole-3-acetic acid.

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

   (*a*) Give objects of sizing, sizing ingredients and their function.

   (*b*) Give advantages of phosphatic fertilizers.

   (*c*) Using zeolite how will you convert :

   (*i*) Benzene to phenol

   (*ii*) Benzene to benzoquinone

   (*iii*) Benzoquinone to hydroquinone.

P.T.O.

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3. Answer any *one* of the following : 1×7=7

(*a*) Explain in detail by-products of sugar industry.

(*b*) What are fertilizers ? Explain the advantages of Nitrogenous fertilizers.

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) Explain the different types of copolymers.

(*b*) Describe the polymers with Ti-O backbone.

(*c*) Give any *three* preparations of fluorocarbon.

(*d*) What is nanocluster ? How can metal nanoclusters be produced ?

(*e*) Discuss properties and applications of nanowires.

5. Solve any *two* of the following : 2×2=4

(*a*) What is polymerisation ? Explain with example.

(*b*) Write a short note on silicone resins.

(*c*) Give one preparation of polyphosphonitrilic chlorides and describe the properties of phosphonitrilic chloride.

(*d*) Discuss the properties of single-walled carbon nanotubes.

This question paper contains 3 printed pages]

SB—01—2022

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MAY/JUNE, 2022

(CBCS Pattern)

CHEMISTRY

Paper–XIV

(Organic and Inorganic Chemistry)

(Thursday, 2-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time— 2½ *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

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

(*a*) What are inner orbital complexes ? Explain with suitable example.

(*b*) What is crystal field splitting ? Explain crystal field splitting of *d*-orbitals in octahedral complexes.

(*c*) Give the postulates of crystal field theory.

(*d*) Draw orgel energy level diagram for d^1 and d^9 state.

(*e*) Calculate ground state term symbol of d^3 configuration.

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

(*a*) How will you interpret IR spectra of the following :

(*i*) Ethene

(*ii*) Benzene

(*iii*) Phenol.

(*b*) Explain non-equivalent proton with example and predict the number of NMR signal of :

(*i*) Acetone

(*ii*) Ethyl benzene

(*iii*) Diethyl ether.

P.T.O.

(c) Explain Favorskii rearrangement with mechanism.

(d) Define homopolymer ? Give the synthesis of Neoprene.

(e) The organic compound having molecular formula C_8H_5N shows following spectral data :

UV–Transparent above 210 nm.

IR–2975 cm^{-1}

2210 cm^{-1}

PMR (δ ppm)

δ 1.1, *t*, 3H

δ 3.5, *q*, 2H

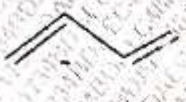
deduce structure and name of organic compound.

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

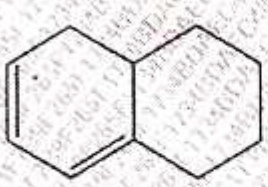
(a) Explain shielding and deshielding effect with suitable example.

(b) Define bathochromic and hypsochromic shift. Calculate λ_{max} of :

(i)



(ii)



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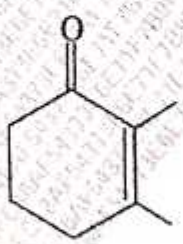


(c) Explain cationic polymerisation reaction with mechanism.

(*d*) Deduce the structure of compound based on the following PMR spectral data :

Molecular formula–C_2H_7N

PMR (δ ppm) :

δ1.2, *t*, 3H

δ 2.7, *q*, 2H

δ 4.5, *s*, 2H

This question paper contains 2 printed pages]

SB—05—2022

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

MAY/JUNE, 2022

(CBCS/New Pattern)

CHEMISTRY

Paper–XV

(Physical & Inorganic Chemistry)

(Saturday, 4-6-2022) **Time : 10.00 a.m. to 12.30 p.m.**

Time— 2½ *Hours* *Maximum Marks*—40

N.B. :— (*i*) Attempt *All* questions.

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

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

(*a*) What are boranes ? Explain any *two* properties of diboranes.

(*b*) Explain the structure and bonding in diborane.

(*c*) What are carboranes ? How are they classified ?

(*d*) Discuss the role of Haemoglobin in living organism and draw the structure of porphymine ring.

(*e*) Discuss the biological role of alkaline earth metal.

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

(*a*) Derive Nernst equation for the *emf* of reversible cell and its application to oxidation half cell.

(*b*) What is Gibb's free energy ? Derive an expression for variation of change in free energy with temperature and pressure. Hence at constant temperature and constant pressure.

(*c*) Obtain an expression thermodynamically for law of mass action.

(*d*) Define Ebullioscopic constant :

Acetone boils at 56.38°C and a solution of 1.41 gm of organic solid in 20 gm of acetone boils at 56.88°C. If K for acetone per 1000 gm is 1.67. Calculate the mass of one mole of the organic solid.

P.T.O.

(e) The equilibrium constant *kp* for a reaction is 3.0 at 400°C and 4.0 at 500°C. Calculate the value of ΔH° for the reaction. ($R = 8.314\ JK^{-1}\ mole^{-1}$).

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

(a) Explain the construction and working of calomel electrode. Give its advantages.

(b) What is chemical potential ? Discuss the variation of chemical potential with temperature.

(c) Describe the determination of molecular weight of a solute from relative lowering of vapour pressure.

(d) A zinc rod is placed in 0.1 m solution of zinc sulphate at 25°C. Assuming that the salt is dissociated to the extent of 85 percent at this dillution, calculate the potential of the electrode at this temperature ($E^{++}_{zn}/Zn = -0.76V$).

This question paper contains 3 printed pages]

AA—01—2022

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2022

(NEW/CBCS COURSE)

CHEMISTRY

Paper-XIV(A1)

(Organic and Inorganic Chemistry)

(Thursday, 1-12-2022) **Time : 10.00 a.m. to 12.00 noon**

Time—Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

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

(*a*) Give the postulates of valence bond theory.

(*b*) Define CFSE ? Calculate CFSE for d^4, d^5, d^6 and d^7 configuration of octahedral complex in weak ligand field.

(*c*) Explain John-Teller effect in octahedral complex of Cu^{2+} ion.

(*d*) Write the different types of electronic transitions.

(*e*) What is *d-d* transition ? Give its selection rule.

P.T.O.

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

(*a*) How will you interpret IR spectra of the following :

(*i*) Ethyne

(*ii*) Acetone

(*iii*) Benzaldehyde.

(*b*) Explain equivalent proton with example and predict the number of NMR signal of :

(*i*) Cyclobutane

(*ii*) Methanol

(*iii*) Ethylamine.

(*c*) Explain pinacol-pinacolone rearrangement with mechanism.

(*d*) Define copolymers ? Write the synthesis of nylon 6, 10.

(*e*) The organic compound having molecular formula C_4H_8O shows following spectral data :

UV – Transparent above λ_{max} 280 nm

IR – 2955 cm^{-1}

1715 cm^{-1}

PMR – (δ_{ppm})

$\delta_{1.3}$, *t*, 3H

$\delta_{2.3}$, *q*, 2H

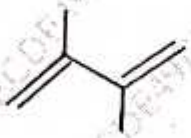
$\delta_{2.1}$, *s*, 3H

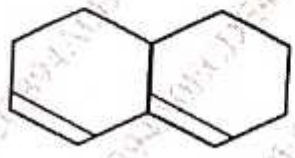
deduce structure and name of organic compound.

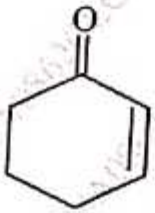
3. Answer any *two* of the following : 2×5=10

(*a*) Define chemical shift and give the advantages of TMS ?

(*b*) Define chromophore and auxochrome. Calculate λ_{max} of :

(*i*) 

(*ii*) 

(*iii*) 

(*c*) What is condensation polymerisation ? Give the synthesis of bakelite.

(*d*) Deduce the structure of compound based on the following PMR Spectral data.

Molecular formula : C_7H_8

PMR (δ_{ppm}) : $\delta_{2.7}$, *s* 3H

$\delta_{7.2} - 7.8$, *m*, 5H

This question paper contains 3 printed pages]

AA—03—2022

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) EXAMINATION

NOVEMBER/DECEMBER, 2022

(CBCS/Old Pattern)

CHEMISTRY

Paper-XIV-A1

(Organic and Inorganic Chemistry)

(Thursday, 1-12-2022) **Time : 10.00 a.m. to 12.00 noon**

Time— Two Hours *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Figures to the right indicate full marks.

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

(*a*) What are outer orbital complex ? Explain with suitable example.

(*b*) Explain crystal field spliting of *d*-orbital in terahedral complex.

(*c*) Explain John-Teller distrotion effect in octahedral complex of Cu^{2+} ion.

(*d*) What is *d-d* transition ? Write its selection rule.

(*e*) Discuss electronic spectrum of $[Ti(H_2O)_6]^{3+}$ complex.

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

(*a*) Interpret IR spectrum of the following compounds :

(*i*) 1-propanol.

P.T.O.

(*ii*) 2-propanol.

(*iii*) *t*-butyl alcohol.

(*b*) Explain equivalent proton with example and predict number of PMR signal of :

(*i*) Acetone.

(*ii*) Cyclobutane.

(*iii*) Methanol.

(*c*) Write the chemical reaction of α-amino acid due to —COOH group.

(*d*) The organic compound having molecular formula C_6H_6O shows the following spectral data :

UV : λ_{max} = 280 nm.

IR : 3600 – 3200 cm^{-1},

3050 cm^{-1},

1600 cm^{-1}, 1540 cm^{-1}, 1500 cm^{-1}

PMR : (δ ppm)

δ 7.2 – 7.8, m, 5 H

δ 11.5, S, 1H

Deduce the structure of compound.

(*e*) Explain Steven's rearrangement reaction with mechanism.

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

(*a*) Explain different types of electronic effect.

(*b*) What are peptide ? How are they classified ?

(*c*) Explain deshielding effect with suitable example.

(*d*) Deduce the structure of compound based on the following PMR spectral data molecular formula : $C_4H_8O_2$.

PMR : (δ ppm)

δ 0.9, *t*, 3H

δ 2.1, *q*, 2H

δ 3.9, S, 3H.

This question paper contains 2 printed pages]

Y—33—2019

FACULTY OF SCIENCE

B.Sc. (Third Year) (Sixth Semester) (Backlog) EXAMINATION

OCTOBER/NOVEMBER, 2019

(CGPA Pattern)

CHEMISTRY

Paper-XV

(Physical and Inorganic Chemistry)

(Monday, 14-10-2019) **Time : 10.00 a.m. to 12.00 noon**

Time—2 *Hours* *Maximum Marks*—40

N.B. :— (*i*) *All* questions are compulsory.

(*ii*) Use of logarithmic table and calculator is allowed.

(*iii*) Use one answer-book for both sections.

Section A

(Physical Chemistry)

1. Answer any *five* of the following : 5×2=10

(*a*) What is reversible cell ? Give its example.

(*b*) Define single electrode potential and oxidation potential.

(*c*) Calculate the electrode potential of a copper plate dipped in a solution of 0.1 m Cu^{++} ion solution at 25° C. The standard electrode potential of copper is 0.34V.

(*d*) State any *two* statements of third law of thermodynamics.

(*e*) Explain the term partial molar property.

(*f*) Define magnetic susceptibility ? Give its unit.

(*g*) What are paramagnetic substances ? Give its examples.

(*h*) What are the applications of Vant-Hoff's equation.

P.T.O.

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

(*a*) Discuss the conventional representation of electrochemical cells.

(*b*) Derive Gibb's and Helmholtz equation.

(*c*) Describe Gouy's method for the determination of magnetic susceptibility of a substance.

3. Answer any *one* of the following : 1×7=7

(*a*) What is concentration cell ? Derive an equation for emf of concentration cell without transport ? 7

(*b*) (*i*) Derive Clausius-Clapeyron equation for liquid $\rightleftharpoons$ vapour equilibria. Give its applications. 4

(*ii*) The equilibrium constant for a reation is 50 at 1273 K and 25 at 1373 K. Calculate the heat of reaction ? 3

($R = 8.314\ JK^{-1}\ mole^{-1}$).

Section B

(Inorganic Chemistry)

4. Solve any *three* of the following : 3×3=9

(*a*) What are boranes ? How are they classified ?

(*b*) Draw the structure of 1, 2, 1, 7 and 1, 12 dicarbo-closo dodecarboranes.

(*c*) Give the properties of carboranes.

(*d*) Discuss the role of Na^+ and K^+ in the body of living organism.

(*e*) Explain how Nitrogenase converts atmospheric Nitrogen to ammonia.

5. Solve any *two* of the following : 2×2=4

(*a*) Give an account of myoglobin.

(*b*) Give any *two* methods of preparations of diboranes.

(*c*) Describe closocarboranes with suitable example.

(*d*) Write properties of metalloboranes.