

VIVEKANANDA COLLEGE, TIRUVEDAKAM WEST

 (Autonomous & Residential)
 [Affiliated to Madurai Kamaraj University]
 M.Sc. Chemistry Degree (Semester) Examinations, April 2018 Part – III : Core Subject : Second Semester : Paper – I

> ORGANIC CHEMISTRY - II Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: **75**

$\underline{SECTION}-\underline{A}$

Answer ALL Questions:

 $(10 \times 2 = 20)$

1. Define ambident nucleophile.

- 2. Write any two characteristics of $S_N 1$ reaction mechanism.
- 3. What is Vilsmeir reaction? Give an example.
- 4. State Bredt's rule.
- 5. What is Sharpless asymmetric epoxidation? Give an example.
- 6. Define Grignard reagent. Give an example.
- 7. What is Ene reaction? Give an example.
- 8. Write a note on Birch reduction.
- 9. Give any two applications of DCC.
- 10. Define phase transfer catalyst. Give an example.

<u>SECTION – B</u>

Answer ALL Questions:

 $(5 \times 5 = 25)$

- 11. a) Write the difference between S_N1 and S_N2 reaction mechanisms. (OR)
 - b) Discuss the neighbouring group participation involving nonbonded electrons and π electrons.
- 12. a) Illustrate Hofmann rule with suitable example. **(OR)**
 - b) Write a short note on ortho/para ratio.
- 13.a) Give an example of Diels-Alder reaction and discuss its mechanism. (OR)
 - b) Explain the Hydroboration reaction with a suitable example.
- 14. a) Describe the Chichibabin reaction with suitable mechanism. (**OR**)
 - b) Discuss in detail Skraup synthesis.
- 15.a) Write the synthetic applications of DDQ.

(**OR**)

b) Write a short note on crown ethers.

SECTION – C

Answer any THREE Questions:

 $(3 \times 10 = 30)$

(5+5)

- 16. Describe an account of nucleophilic substitution reaction at an aliphatic trigonal carbon and vinylic carbon.
- 17. Explain: i) Diazonium coupling
 - ii) Gattermann-Koch reaction. (5+5)
- 18. Describe the following reactions:i) Michal additionii)Reformatsky reaction.
- 19. Explain the mechanism of Stobbe and Dieckmann condensations with suitable examples.
- 20. Write the synthetic reactions and applications of the following reagents.

i) LiAlH₄ ii) $Zn(BH_4)_2$ 00000



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 M.Sc. Chemistry Degree (Semester) Examinations, April 2018
 Part – III : Core Subject : Second Semester : Paper – II

INORGANIC CHEMISTRY - II

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u> Answer ALL Questions:

 $(10 \times 1 = 10)$

- 1. What is meant by the term symbol?
- 2. $[FeF_6]^{3-}$ is colourless whereas $[CoF_6]^{3-}$ is coloured. How can this difference be accounted for?
- 3. While [Fe (H₂O) ₆]³⁻ is strongly paramagnetic, [Fe (CN) ₆]³⁻ is less diamagnetic.Explain.
- 4. What is Trans effect?
- 5. Predict the stability of Mo(CO) 7.
- 6. What are oxidative addition and reductive elimination reactions?
- 7. What are metal carbonyls? Give an example.
- 8. What happens when Fe (CO) $_6$ is irradiated with UV light?
- 9. Why do lighter elements generally undergo fusion while heavier elements show nuclear fission?
- 10. What is meant by Q-value of nuclear reactions? Give an example.

<u>SECTION – B</u>

Answer ALL Questions:

 $(5 \times 7 = 35)$

11.a) Discuss the Octahedral complexes of metal ion with d² and d⁹ configuration.

(OR)

- b) Explain the following terms i) Band contours ii) Band intensities iii) Nephelauxetic ratio
 - iv) Nephelauxetic series

12. a) Describe the paramagnetism, ferromagnetism and antiferromagnetism.

(OR)

- b) Write short note on Inner sphere electron transfer reaction.
- 13.a) Explain the structure and bonding of Ferrocene. **(OR)**
 - b) Discuss the mechanism of hydroformylation of olefins using the original catalyst, HCo(Co)₄
- 14. a) Describe the structure and bonding of the following metal carbonyls i) Fe₂ (CO) ₉ ii) Mn₂ (CO) ₁₀

(**OR**)

- b) Give preparation and properties of dioxygen complex.
- 15.a) Describe the detection and measurement of radioactivity by using Geiger-Muller counter.

(OR)

b) Write short note on stellar energy.

$\underline{SECTION - C}$

Answer any THREE Questions:

 $(3 \times 10 = 30)$

- 16. Draw and explain the Tanabe-Sugano diagram for d⁶ system for low spin and high spin complex.
- 17. a) Describe the substitution reactions in octahedral complex.b) Write a note on Marcus theory.
- 18. What is Wacker's process? Describe its mechanistic aspects.
- 19. Discuss the preparation, properties and structure of metal nitrosyl.
- 20. Explain the following i) Isotope dilution techniqueii) Radiometric titration.

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 M.Sc. Chemistry Degree (Semester) Examinations, April 2018
 Part – III : Core Subject : Second Semester : Paper – III

PHYSICAL CHEMISTRY - II

Under CBCS - Credit 4

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u> Answer ALL Questions:

 $(10 \times 2 = 20)$

- 1. The term symbol for the ground state of N atom is ${}^{4}S_{3/2}$ Determine the electronic configuration for this element.
- 2. What is hybridization? Mention the type of hybridization involved in H₂O.
- 3. Calculate allowed rotational energy levels for molecules using a suitable formula.
- 4. Which of the following molecules show rotational spectra? Give reason.
 - i) HCl ii) CO iii) H₂ iv) N₂
- 5. Explain the selection rule for Raman spectra.
- 6. Outline the principle of photoelectron spectroscopy.
- 7. Distinguish between homogeneous and heterogeneous catalysis with an example.
- 8. Write any four characteristics of catalytic reactions.
- 9. What is quantum yield?
- 10. Define phosphorescence.

<u>SECTION – B</u>

Answer ALL Questions:

 $(5 \times 5 = 25)$

11.a) Derive term symbol for P^2 configuration. (OR)

OK)

b) State and explain Huckel-pi electron theory with suitable example.

- 12.a) Discuss the rotational spectrum of a rigid diatomic molecule. (OR)
 - b) Find out the normal modes of vibration of the following molecules and specify IR active modes.
- 13.a) Discuss the quantum theory of Raman spectroscopy and show how the Stokes and anti-Stokes lines appear in the Raman spectrum of a molecule?

(**OR**)

- b) State and illustrate the Frank-Condon principle with suitable potential energy curves.
- 14. a) Discuss the kinetics and mechanism of enzyme-catalyzed reactions. (OR)
 - b) Derive an expression for Gibbs adsorption isotherm.
- 15.a) Draw and explain the features of Jablonski diagram.

(**OR**)

b) Explain the flash photolysis technique.

<u>SECTION – C</u>

Answer any THREE Questions:

 $(3 \times 10 = 30)$

- 16. Discuss the application of variation method to helium atom.
- 17. Discuss the rotation-vibration spectrum of a diatomic molecule and show the appearance of the spectrum consisting of the P and R branches.
- 18. a) State and explain Koopman's theorem. (5)
 - b) Explain the photo electron spectra of oxygen molecule.(5)
- 19. Derive B.E.T. adsorption isotherm and its applications.
- 20. a) Derive Stern-Volmer equation. (6)
 - b) Write a short note on state acidity constant. (4)



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(Autonomous & Residential) [Affiliated to Madurai Kamaraj University] M.Sc. Chemistry Degree (Semester) Examinations, April 2018 Part - III : Core Subject : Fourth Semester : Paper - I

> **ORGANIC CHEMISTRY - IV** Under CBCS - Credit 4

Time: 3 Hours	CBCS - Credit 4	Max. Marks: 75
<u>SEAnswer ALL Questions</u> :	<u>CTION – A</u>	$(10 \times 1 = 10)$
 Define free radicals.Give What is Bayer-Villiger re 	an example. arrangement?	
3. Write any two medicinal	applications of benzof	urans.
4. Define proteins. Give an e	xample.	
5. Write the structure of test	osterone.	
6. What happens when chole	esterol is distilled with	selenium?
7. Write a note on biologica	l catalysis.	
8. Give any two chemical ch	naracteristics of supran	nolecules.
9. Discuss the nature of subs	strate and solvent in ele	ectro organic
synthesis.		
10. Define isotopic peaks. G	ive an example.	

SECTION – B

Answer ALL Questions: $(5 \times 7 = 35)$ 11.a) Discuss Sand Meyer reaction. (\mathbf{OR}) b) Explain the Fries rearrangement with suitable example. 12. a) Give the synthesis of vitamin C. (**OR**) b) Write the functions of nucleic acids. 13.a) Define steroids. Discuss the classifications of it. (\mathbf{OR}) b) Write briefly about biosynthesis of steroids. 14.a) Write short notes on reversible and irreversible inhibition. (**OR**) b) Discuss the fullerenes with suitable example. 15. a) Discuss in detail the reactions of intermediates formed in electrode process. (**OR**) b) Explain the McLafferty rearrangement. **SECTION - C** $(3 \times 10 = 30)$ **Answer any THREE Questions:** 16. Discuss the reactions and mechanism of the following rearrangements. i) Beckmann rearrangement ii) Hoffmann rearrangement 17. Explain the synthesis of the followings: i) Vitamin A ii) Vitamin E 18. Describe the structural elucidation of cholesterol. 19. Explain : i) Crown ethers ii) Zeolites 20. Write the comparisons of ORD and CD.



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(Autonomous & Residential) [Affiliated to Madurai Kamaraj University] **M.Sc. Chemistry** Degree (Semester) Examinations, April 2018 Part – III : Core Subject : Fourth Semester : Paper – II

INORGANIC CHEMISTRY - IV

Under CBCS – Credit 4

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u> Answer ALL Questions:

 $(10 \times 1 = 10)$

- 1. What are photochemical reactions?
- 2. Define photoisomerisation reactions.
- 3. Sketch and explain the TGA curve of crystalline CuSO₄.5H₂O
- 4. Compare DSC and DTA.
- 5. Which is stronger H₃ PO₃ or H₄ PO₄? Explain.
- 6. Why are interhalogens more reactive than halogens?
- 7. Round off the following numbers to three significant figures.

i) 65.8437 ii) 69.873 iii) 67.250 iv) 63.35

- 8. What is meant by term precision?
- 9. What is fluorescence quenching?
- 10. What do you mean by ligant interaction?

<u>SECTION – B</u>

Answer ALL Questions:

 $(5 \times 7 = 35)$

11.a) Explain the photophysical process of coordination compounds by using Jablonski diagram.

(**OR**)

- b) Discuss the photosubstitution reaction with suitable examples.
- 12.a) Write the principle of solvent extraction.

(**OR**)

b) How is phosphate determined by nephelometric method?

- 13.a) Describe the preparation, properties and structure of H_2SO_5 . (OR)
 - b) Give the synthesis and structure of xenon fluorides.
- 14. a) Explain the following i) Gaussian distribution ii) Linear regression (**OR**)
 - b) In the analysis of an ore, the percentages of an element found to be 65.55, 65.90, 67.85, 66.85, 69.90 and 65.00. The value 69.90 appears to be suspect. Ascertain whether this should be retained or rejected. The Q_{critical} for 6 observations at 90% confidence level is 0.56.
- 15. a) Explain the recognition and sensing of Zn^{II}.

(**OR**)

b) Discuss the metal containing fluorosensors for amino acids.

<u>SECTION – C</u>

Answer any THREE Questions:

 $(3 \times 10 = 30)$

- 16. a) Write a note on Reineck's salt actinometers
 - b) Explain the oxidative and reductive quenching reactions of excited state tris (2,2-bipyridine) Ruthenium (II) complexes.
- 17. Describe the applications of DTA and DSC .
- 18. a) Give the preparation, properties and structure of Marshall's acid.
 - b) Write a note on pseudohalogens.
- 19. a) Explain the standard deviation and relative standard deviation.
 - b) For titrating 10 ml of a solution with the help of microburette the volumes of the titrant used are 9.98, 9.99, 9.98, 9.95, 10.00 and 10.20 ml. Calculate the standard deviation.
- 20. a) Discuss the electron and energy transfer mechanism of fluorescent chemical sensors.
 - b) Explain the transition metal recognition and sensing of Ni^{II} and Cu^{II} .

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 M.Sc. Chemistry Degree (Semester) Examinations, April 2018 Part – III : Core Subject : Fourth Semester : Paper – III

PHYSICAL CHEMISTRY - IV

Under CBCS - Credit 4

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u> Answer ALL Questions:

 $(10 \times 2 = 20)$

- 1. Compare electrolytic and electrochemical cells.
- 2. What is outer Helmholtz plane?
- 3. Write Tafel equation.
- 4. Give the importance of half wave potential.
- 5. Mention the two main points of difference between classical statistical mechanics and quantum statistical mechanics.
- 6. What is meant by partition function?
- 7. What is residual entropy? How is it calculated?
- 8. Define photon gas.
- 9. Differentiate between natural and synthetic polymers.
- 10. What are additives? Give examples.

<u>SECTION – B</u>

Answer ALL Questions:

 $(5 \times 5 = 25)$

- 11.a) Discuss Gouy Chapman model of electrical double layer. (OR)
 - b) Derive Butler Volmer relation for current density at the electrode.

- 12.a) What is electro-catalysis? Explain any two applications of it. (OR)
 - b) Draw the polorogram and explain the various terms involved in it.
- 13.a) Derive Fermi-Dirac expression for the most probable distribution of N particles.

(**OR**)

- b) Explain the law of equipartion of energy.
- 14. a) Discuss Debye's theory of heat capacities of solids.

(**OR**)

- b) Write expression for Bose-Einstein and Fermi-Dirac distribution laws. How does Maxwel Boltzman law follow from this.
- 15.a) What are addition and condensation polymers? Give examples of each.

(**OR**)

b) Write a note on Zeiglar – Natta catalyst.

<u>SECTION – C</u>

Answer any THREE Questions:

 $(3 \times 10 = 30)$

- 16. a) What is electrocatalysis? Explain any three applications of it.
 - b) Write the advantages and disadvantages of dropping mercury electrode.
- 17. Define over voltage. What are the factors affecting over voltage? Give two applications.
- 18. Explain microcanonical, canonical and grand canonical ensembles with suitable examples.
- 19. Derive the statistical expression for equilibrium constant from partition function.
- 20. Describe osmotic pressure and viscosity methods for the determination of weight of a polymer.



33EP2A



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 M.Sc. Chemistry Degree (Semester) Examinations, April 2018
 Part – III : Elective Subject : Second Semester : Paper – I

MEDICINAL AND PHARMACEUTICAL CHEMISTRY

Under CBCS – Credit 5

Time: 3 Hours

Max. Marks: 75

<u>SECTION – A</u> <u>Answer ALL Question</u>s:

 $(10 \times 2 = 20)$

 $(5 \times 5 = 25)$

- 1. What do you mean by LD-50 and ED-50?
- 2. What are antimetabolites? Give an example.
- 3. Give the sources of drugs.
- 4. What are the factors affecting metabolism of drug?
- 5. What are antineoplastic agents? Give an example.
- 6. Define antibiotics and mention some important antibiotics.
- 7. Differentiate sedatives and hypnotics.
- 8. What is diabetes? How it is caused?
- 9. List out the deficiency symptoms of vitamin D and vitamin K.
- 10. Write the biological role of Ca and Na.

<u>SECTION – B</u>

Answer ALL Questions:

- 11.a) Discuss the causes, treatment and prevention for the following diseases: i) Filariasis ii) Plague (OR)
 - b) Give a brief account of various assaying methods.

12. a) Explain the medicinal properties of Ocimum Sanctum. (OR)
b) Mention the uses of neem and keezhanelli in medicine.
13. a) What are anaesthetics? How it is classified. (OR)
b) Discuss the symptoms and treatment of cancer.
14. a) What are antihypertensive drugs and antianginal agents? Give one example for each.

(OR)

- b) Discuss with examples any two kinds of cardiovascular drugs.
- 15.a) Explain about the organic pharmaceutical bases.

(OR)

b) Explain how phosphorus and aluminium-based drugs are medicinally important?

$\underline{SECTION-C}$

Answer any THREE Questions:

- $(3 \times 10 = 30)$
- 16. Explain the following: i) Pharmacokinetics
 - ii) Pharmacodynamics
 - iii) Pharmacology
 - iv) Pharmacognosy
- 17. Enumerate the classification of drugs.
- 18. Give a brief account of the following:a) Streptomycin b) Chloramphenicol c) Antipyreticsd) Anti-inflammatory agents
- 19. Write short notes on the following:
 - i) Lipid profile HDL and LDL
 - ii) Lipid lowering drugs
 - iii) Psychedelic drugs
- 20. Discuss the role and applications of medicinal important inorganic compounds of Fe and Hg.

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33EP4B



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M.Sc. Chemistry Degree (Semester) Examinations, April 2018 Part – IV : Elective subject : Fourth Semester : Paper – I

CHEMISTRY FOR NATIONAL ELIGIBILITY TEST Under CBCS – Credit: 5

Time: 2 Hours

Max. Marks: 75

A	nswer ALL Ques	<u>stions</u> :	()	$10 \times 1 = 10)$
1	. The orbital with t	wo radial and tw	o angular nodes	is
	a)3p	b) 5d	c) 5f	d) 8d
2	. The number of lo	ne pairs are iden	tical in the pairs	
	a)XeF ₄ , ClF ₃		b) XeO ₄ , ICl ₄ ⁻	
	c) XeO ₂ F ₂ , ICl ₄ ^{$-$}		d) XeO ₄ , ClF ₃	
3	The molecule in velectron is	which the bond o	rder increases u	pon addition of an
	a)O ₂	b) B ₂	c) P ₂	d) N ₂
4	. The number of B	ravais lattices are	2	
	a)14	b) 32	c) 7	d) 10
5	Which of the folloionization energy	owing pairs has t ?	he highest diffe	rence in their first
	a)Xe, Cs	b) Kr, Rb	c) Ar, K	d) Ne, Na
6	. The molecule C_3	O ₂ has a linear str	ructure. This con	npound has
	a)4 σ and 4 π bor	nds	b) 3 σ and 2 π	bonds
	c) 2 σ and 3 π bo	nds	d) 3 σ and 4 π	bonds
7	The correct order atoms is	of decreasing ele	ectronegativity of	of the following
	a)As > Al > Ca >	S	b) $S > As > Al$	l > Ca
	c) Al > Ca > S >	As	d) $S > Ca > As$	s > Al
8	. The correct order	of the size of S,	S^{2-} , S^{2+} and S^{4+}	species is
	a) $S > S^{2+} > S^{4+} >$	S ²⁻	b) $S^{2+} > S^{4+} > S^{4+}$	$\overline{\mathbf{S}^{2-}} > \mathbf{S}$
	c) $S^{2-} > S > S^{2+} >$	• S ⁴⁺	d) $S^{4+} > S^{2-} >$	$S > S^{2+}$

9. The oxidation st	tate of iron in me	t-haemoglobin is	5
a) three	b) two	c) four	d) zero
10. The metal ion p	resent in carboxy	peptidase	
a) Mg (II)	(b) Fe (II)	c) Zn (II)	d) Mn (II)
11. The electric dip	ole allowed trans	ition among the	following is q
a) ${}^{3}S \rightarrow {}^{3}D$	b) ${}^{3}S \rightarrow {}^{3}P$	c) ${}^{3}S \rightarrow {}^{1}D$	d) ${}^{3}S \rightarrow {}^{1}F$
12. The kinetic theo	ory of gases prove	es	
a) Boyle's law		b) Avogadro'	s law
c) Charle's law		d) All of the a	above
13. The ground stat	e term symbol fo	$r p^1 configuratio$	n is
a) 2 S	b) ² D	c) ^{2}P	d) ³ P
14. The NMR spect	rum is observed	inregion	
a) UV	b) X-ray	c) IR d	l) radiofrequency
15. The neutral com	plex which obey	s 18-electron rul	e is
a) $(\eta^{5}-C_{5}H_{5})Fe($	$CO)_2$	b) $(\eta^{5}-C_{5}H_{5})F$	$\operatorname{Re}(\eta^{6}-\mathrm{C}_{6}\mathrm{H}_{6})$
c) (η ³ -C ₅ H ₅)Mo	o(CO) ₃	d) $(\eta^{3}-C_{5}H_{5})_{2}$	Co
16. The number of 1	microstate for d^2	configuration is	
a)60	b) 120	c) 240	d) 45
17. The molecule th	hat has an S_6 sym	metry element	
B_2H_6	b) CH ₄	c) PH ₅	d) SF ₆
18. How many aton	ns are there in an	element packed	in a FCC structure
a)1	b) 2	c) 4	d) 8
19. Which of the fo	llowing exhibits	rotational spectra	a?
a)CO	b) N ₂	c) CO_2	d) H ₂
20. Among the follo	owing, aromatic c	compound is	
a) Cyclopentadi	enyl cation	b) Cycloprop	enyl cation
c) Cyclooctatetr	raene	d) Cyclobuta	diene
21. Addition of BH	3 to a carbon-carb	oon double bond	is
a) anti-Markovni	kov syn addition	b) anti-Markov	nikov anti addition
c) Markovníkov	v syn addition	d) Markovnik	tov anti addition



31. Which of the following is true regarding the stability of compounds?				
a) aromatic < non-aromatic = anti-aromatic				
b) aromatic > an	ti-aromatic > nor	n-aromatic		
c) aromatic > no	n-aromatic > ant	i-aromatic		
d) anti-aromatic	> non-aromatic 2	> aromatic		
32. Lewis acid is an				
a) Electron pair o	lonor	b) Oxide dono	r	
c) Oxide accepto	r	d) Electron pa	ir acceptor	
33. The calculated va	alue of magnetic	moment of V^{3+}	is	
a) 1.73 BM	b) 2.83 BM	c) 3.87 BM	d) 4.90 BM	
34. Which of follows	ng is an example	e for closo type b	ooranes?	
a) $B_5 H_8^-$	b) B ₂ H ₇ ⁻	c) $C_2 B_{10} H_{12}$	d) $B_5 H_{12}^{-}$	
35. The number of 1	H NMR signals e	xpected for metl	nyl cyclopropane	
is				
a) 2	b) 3	c) 4	d) 6	
36. The EAN for Fe	36. The EAN for Fe(CO) ₅ is			
a) 35	b) 37	c) 36	d) 34	
37.TGA can be used	l to evaluate the _	of a m	aterial.	
a) thermal stabili	ty	b) change of e	ntropy	
c) change of enth	alpy	d) none		
38. The following co	nversion is an ex	ample of		
	CH ₂ O			
N.	Me ₂ NH, A		∠NMe ₂	
CH ₃				
a) Arndt-Eistert	nomologation	b) Mannich rea	ction	
c) Michael additi	on	d) Chichibabin	amination reaction	
39. Vitamin B_{12} is th	e coordination co	ompound of		
a) Fe	b) Mn	c) Mg	d) Mo	
40. The bond order of	of N_2^+ is			
a) 3	b) 3.5	c) 2	d) 2.5	

41. The splitting of sp	pectral lines due	to presence of el	ectrical field is
known as	4	h) Starly offerst	
a) Compton effect	al and	d) Zaaman aff	hat
		u) Zeemen ente	
42. Which of the follo	owing is aromatic		
a) [10]-annulene	nnulono	b) $[18]$ -annule	ne
43. Which of the follo spectroscopy?	owing is used in a	internal standard	l in NMR
a) NBS	b) DMSO	c) TMS	d) THF
44. Which of the follo radical?	owing is the corre	ect order of stab	ility of carbon free
a) $3^{\circ} > 2^{\circ} > 1^{\circ}$	b) $1^{\circ} > 3^{\circ} > 2^{\circ}$	c) $2^{\circ} > 1^{\circ} > 3^{\circ}$	d) $1^{\circ} > 2^{\circ} > 3^{\circ}$
45. An organometalli	c fragment that is	s isolobal to CH	3 ⁺ is
a) Fe(CO) ₅	b) Mn(CO) ₅	c) $Cr(CO)_5$	d) $[Ni(CO)_3]^+$
46. The following mo	plecule has		
F		соон	
НООС		Н	
a) plane of symm	etry	b) S configurat	tion
c) R configuration	n	d) centre of syn	mmetry
47. Boron in BCl_3 ha	S		
a) sp hybridizatio	n	b) sp ² hybridiz	ation
c) sp ³ hybridizatio	on	d) no hybridiz	ation
48. The molecule that	t will show Rama	an spectrum, but	not IR spectrum,
among the follow	ing is	$a) \mathbf{D} \mathbf{r} \mathbf{C} \mathbf{I}$	4) CC
	0) HCI	C) BICI	$d) CS_2$
49. The Adam's catal	lyst 1s		
a) $PtCl_4^2$	b) $HgCl_2$	c) $PdCl_2$	d) PtO_2
50. The pair that cont the following, is	ains a spherical t	op and a symme	etric top, among
a) CH_4 , CH_2Cl_2		b) CH ₂ Cl ₂ , CH	[3Cl
c) CH ₃ Cl, CH ₄	_	d) CH ₄ , C(CH	3)4
	5		



54. a) Identify the following species as aromatic or anti-aromatic or non-aromatic or homo-aromatic



(**OR**)

b) The character table of C_{3v} point group is provided below, along with an additional reducible representation (Γ).

SECTION - B

Answer ALL questions:

 $(10 \times 5 = 50)$

51.a) Identify the hybridisation and shape of the following species iii) I₃⁻ i) $NO_2^$ ii) XeO_2F_2

(**OR**)

- b) Draw the most stable conformations of
 - i) 2-Fluoroethanol ii) trans-1,3-dimethylcyclohexane
 - iii) 1,2-Ethanediol
- 52.a) Among the following, identify the species isolobal to CH₂.
 - i) CpCr(CO)₂ ii) CpCu iii) Ni(CO)₂ iv) Cr(CO)₄ v) $Fe(CO)_4$

(\mathbf{OR})

- b) Calculate the spectroscopic ground state term symbols for $[Mn(H_2O)_6]^{2+}$, $[Cr(H_2O)_6]^{3+}$ and $[Cu(H_2O)_6]^{2+}$.
- 53.a) Draw MO diagram of O₂ molecule and calculate the bond order for O_2^+ , O_2^{2+} , O_2^- and O_2^{2-} species.

(\mathbf{OR})

b) Identify the intermediate A and the major product B in the following reaction are



 A_1 1 -1 -1 -1 0A₂ E 1 2

Identify the reducible representation (Γ).

- 55.a) Identify the following species as closo, nido, arachno or hypo. i) $C_2B_5H_7$ ii) Os₃(CO)₁₂ iii) B₆H₁₀ iv) $GeC_2B_9H_{11}$ (\mathbf{OR})
 - b) Discuss the synthetic uses of OsO₄ and NaBH₄.
- 56.a) Calculate the number of metal-metal bonds in the following complexes

i) $Ir_4(CO)_{12}$ ii) $Ru_3(CO)_{12}$ iii) $Co_4(CO)_{12}$ (\mathbf{OR})

- b) State Le Chatlier principle and explain its applications.
- 57.a) Write the rate law and units for zero, first and second order reactions.

(\mathbf{OR})

b) Match the metalloprotein in column A with its biological function and metal centre in column B.

Column A	Column B
(a) Hemoglobin	i. Group transfer reactions and
	cobalt
(b) Cytochrome b	ii. O ₂ transport and copper
(c) Vitamin B ₁₂	iii.Electron carrier and iron
(d) Hemocyanin	iv. Conversion of CO ₂ to H ₂ CO ₃
(e) Carbonic	v. O ₂ transport and iron
anhydrase	

- 58.a) List out the role of Fe, Mn, Mo and Zn in biological processes. (\mathbf{OR})
 - b) Identify the metal ion present in the following enzyme and write their role.
 - i) superoxide dismutase ii) carbonic anhydrase iii) nitrogenase

59. a) Calculate the number of signals in ¹H NMR spectra for the



b) Match the compounds in Column P with their corresponding IR stretching frequencies(cm⁻¹) in Column Q and justify your answer.

	Column P		Column Q
I		Α	1865
п	°,	в	1770
III	0~0~0	С	1745

60. a) A polymer has the following molar mass distribution

Number of molecules	Molar mass (g.mol ⁻¹)
50	5000
75	6000

Calculate the number average molar mass (Mn) of the polymer.

(OR)

b) Five membered aromatic heterocyclics are good at electrophilic substitution reactions - Explain.