



K23P 1378

Reg. No. :

Name :

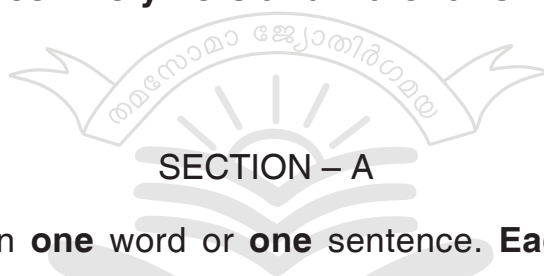
III Semester M.Sc. Degree (CBSS – Reg./Supple./Imp.)
Examination, October 2023
(2020 Admission Onwards)

CHEMISTRY

CHE 3E 03 : Polymers and Material Chemistry

Time : 3 Hours

Max. Marks : 60



SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **one** mark.

1. What are living polymers ?
2. Write the structure of Ziegler Natta catalyst.
3. What is intrinsic viscosity of polymer solutions ?
4. What do you mean by end group analysis of polymer ?
5. What are graft and block polymers ?
6. Give any one method for the functionalization in polystyrene.
7. What are casting alloys ?
8. Give two examples of zinc base alloys. (8×1=8)

SECTION – B

Answer **any eight** questions. Answer may be **two** or **three** sentences. **Each** question carries **two** marks.

9. What is ring opening polymerization ? Illustrate using suitable examples.
10. What is gel point ? How it is determined experimentally ?

P.T.O.



11. What are syndiotactic polymers ? Give examples.
12. Define Flory Huggins theory of polymer solutions.
13. How will you calculate the molecular weight of polymer solutions using lowering of vapour pressure method ?
14. Define number average molecular weight of polymers. How it is determined ?
15. Explain the hydrolytic degradation of polymers.
16. How cross linking reactions in polymers are carried out ? Explain using suitable examples.
17. What are polymer blends ? Give two examples.
18. What are bearing materials ? Explain any one type of bearing material.
19. What is latent functionality ?
20. Write a short note on the classification of ceramics. (8×2=16)

SECTION – C

Answer **any four** questions. Short paragraph questions. **Each** question carries **three** marks.

21. Discuss the mechanism of coordination polymerization.
22. Write notes on the types of molecular forces and chemical bonding in polymers.
23. How will you determine the molecular weight of polymers by osmotic pressure method ?
24. Explain the various types of post reactions of polymers.
25. What is suspension polymerization ? What are its advantages ?
26. What are refractory materials ? Write notes on tantalum based refractory materials. (4×3=12)



SECTION – D

Answer **any four** questions. Essay type questions. **Each** question carries **six** marks.

27. A) Discuss the kinetics and mechanism of radical chain polymerization.

OR

B) Define glass transition temperature. What are the factors influencing glass transition temperature ? How glass transition temperature influences the properties of polymers ?

28. A) Explain the light scattering method for the determination of molecular weight of polymers.

OR

B) What is the principle of gel permeation chromatography ? How GPC is used for the fractionation and molecular weight determination of polymers ?

29. A) Explain briefly on thermal, mechanical, photo and oxidative degradation of polymers.

OR

B) Write notes on gas phase polymerization, bulk polymerization and emulsion polymerization.

30. A) Explain the various mechanical, thermal, optical, electrical and magnetic properties of engineering materials.

OR

B) What are composite materials ? How are they classified ? Briefly explain the applications of composite materials.

(4×6=24)



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III Semester M.Sc. Degree (CBSS – Reg./Sup./Imp.)
Examination, October 2022
(2019 Admission Onwards)

CHEMISTRY

CHE3E.03 : Polymers and Material Chemistry

Time : 3 Hours

Max. Marks : 60



SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **one** mark.

1. Give the structure of the monomer of Nylon 6.
2. Draw the schematic structures of block and graft copolymers of the monomers A and B.
3. Which type of molecular weight measurement can be done with light scattering method ?
4. Give Mark-Houwink equation.
5. Give any two examples of cross linking agents used in polymer reactions.
6. Write one example for a solid phase polymerization reaction.
7. Give the composition of aluminium base alloy.
8. Which material is used for die ?

(8×1=8)

P.T.O.



SECTION – B

Answer **any eight** questions. Answer may be in **two** or **three** sentences. **Each** question carries **two** marks.

9. What is glassy state and glass transition temperature ?
10. Discuss various configurations of polymers chains with examples.
11. What is living polymerization ? Give one example.
12. How viscosity average molecular weight is determined ?
13. Write in short about the end group analysis in the measurement of molecular weight of polymers.
14. What is the principle behind osmometric method of molecular weight measurement ?
15. Discuss polymers blends and their properties with examples.
16. Write in brief about the gas phase polymerization reaction.
17. Explain the vulcanization process.
18. What are ferrites and give their importance ?
19. Give the technical importance of porous metallic bearing.
20. Explain the properties of hybrid composites and their applications. **(8×2=16)**

SECTION – C

Short paragraph questions. Answer **any four** questions. **Each** question carries **three** marks.

21. What is gelation and gel point ? Discuss how gelation occurs in polymers and explain how gel point is estimated.
22. Discuss the effect of temperature and pressure on chain polymerization.
23. Write a note on Flory-Huggins interaction parameter.



24. What are the driving forces for polymer solubility ?
25. Explain the various casting alloys used in die industry.
26. Discuss the synthesis and properties of ceramic materials. **(4×3=12)**

SECTION – D

Essay questions. Answer **four** questions. **Each** question carries **six** marks.

27. A) What is Zeigler-Natta catalyst ? Write a note on the synthesis of polypropylene by Zeigler-Natta catalyst.

OR

- B) i) Discuss about glass transition temperature and the factors affecting glass transition temperature.
ii) How T_g affects the properties of polymers ?

28. A) i) What do you understand by molecular weight distribution ?

ii) What are the advantages and disadvantages of narrow and broad molecular weight distribution ?

iii) Describe the determination of MWD by Gel Permeation Chromatography.

OR

- B) i) Distinguish between excluded volume and hydrodynamic volume.
ii) How GPC is important in the fractionation of polymers ?

29. A) Explain various processes for the degradation of polymers.

OR

B) Discuss the polymerization reactions in homogeneous and heterogeneous systems.

30. A) Discuss the various magnetic behaviors of materials used in engineering industry.

OR

B) i) Write a short note on the refractory materials.

ii) Briefly discuss about the composite materials and its classification. **(4×6=24)**



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Examination, October 2023
(2020 Admission Onwards)
CHEMISTRY
CHE 3C 10 : Physical Chemistry – III

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **one** mark.

1. What is steric factor in collision theory ?
2. What is saddle point in PES ?
3. What is chain length of a reaction ?
4. Explain cage effect.
5. What is critical micelle concentration ?
6. What do you mean by differential heat of adsorption ?
7. Write notes on protective colloids.
8. What is Dorn effect ? How it arises ?

(8×1=8)

SECTION – B

Answer **any eight** questions. Answer may be **two** or **three** sentences. **Each** question carries **two** marks.

9. What are the informations obtained from PES ?
10. Explain briefly temperature jump method in relaxation.
11. What are the drawbacks of Lindemann's theory ?

P.T.O.



12. Explain briefly the various steps involved in chain reactions.
13. How solvent influences the rate of a chemical reaction in solution phase ?
14. What is steady state approximation ?
15. What is LEED ? What are its applications ?
16. Write BET equation and explain the terms.
17. Write the steps involved in surface catalysed reactions.
18. What are the factors providing stability to colloidal solutions ?
19. What is electro osmosis ? What are its applications ?
20. What are micelles ? Explain with examples. (8×2=16)

SECTION – C

Answer **any four** questions. Short paragraph questions. **Each** question carries **three** marks.

21. How flash photolysis is used to study fast reactions ?
22. Discuss the steps involved in unimolecular reactions according to Lindemann's theory.
23. How ionic strength influences the rate of chemical reactions in solutions ?
24. Derive Bronsted Bjerrum equation.
25. Discuss briefly the principle of Auger spectroscopy. How it is used in surface analysis ?
26. Differentiate between sedimentation potential and streaming potential. (4×3=12)

SECTION – D

Answer **any four** questions. Essay type questions. **Each** question carries **six** marks.

27. A) What are the postulates of collision theory of reaction rates ? Derive the rate constant of chemical reactions using collision theory.

OR

- B) Discuss in detail transition state theory. Derive Eyring equation.



28. A) Derive the rate equation for the photochemical reaction between H_2 and Cl_2 reaction.

OR

B) How solvent dielectric constant influences the rate constant of a chemical reaction in solution ? Explain using mathematical formulations.

29. A) How will you determine the surface area of a solid using Langmuir, BET and Harkin's Jura method ?

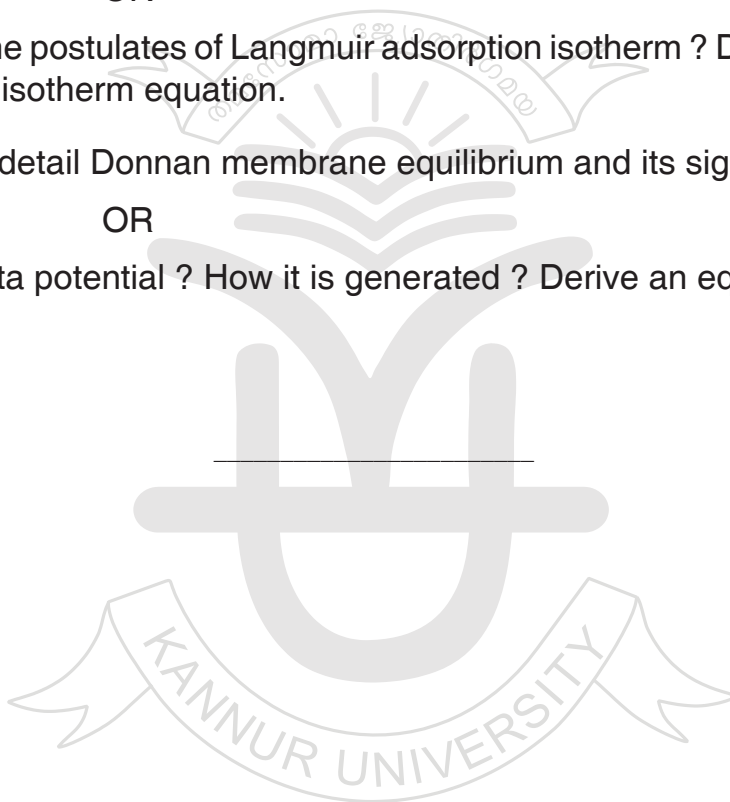
OR

B) What are the postulates of Langmuir adsorption isotherm ? Derive Langmuir adsorption isotherm equation.

30. A) Discuss in detail Donnan membrane equilibrium and its significance.

OR

B) What is Zeta potential ? How it is generated ? Derive an equation for Zeta potential. **(4×6=24)**





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Examination, October 2022
(2019 Admission Onwards)
CHEMISTRY
CHE 3C.10 : Physical Chemistry – III

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **1** mark.

1. Give the Eyring equation of bimolecular reaction and explain the terms.
2. What is potential energy surface ?
3. What is steady state approximation ?
4. What is primary salt effect ?
5. What are micelles ?
6. Give the Gibbs adsorption equation.
7. What is electrical double layer ?
8. What is weight average molecular mass ?

(8×1=8)

SECTION – B

Answer **eight** questions. Answer may be in **one** or **two** sentences. **Each** question carries **2** marks.

9. Explain the principle of microscopic reversibility.
10. Distinguish between prototropic and protolytic mechanism with examples.

P.T.O.



11. Write Taft equation and explain the terms.
12. How does dielectric constant of a medium affect the rate of reactions in solutions ? Give its relationship with rate constant.
13. Give the mechanism of $H_2 - Br_2$ reaction.
14. What is cage effect ?
15. What are surfactants ? How they are classified ?
16. What is the basic principle of photo electron spectroscopy ?
17. What is the surface area of the solid if 118 ml of H_2 formed a monolayer on silica gel at STP ? The cross sectional area of H_2 is 0.192 nm^2 .
18. What is Zeta potential ?
19. Give the relation for weight average molecular weight determined by sedimentation equilibrium method.
20. What is Donnan membrane equilibrium ?

(8×2=16)

SECTION – C

Answer **four** questions. **Each** question carries **3** marks.

21. Give the thermodynamic treatment of transition state theory.
22. Explain the kinetics of $H_2 - Cl_2$ reaction.
23. Give the Semenov Hinshelwood mechanism of explosive reactions.
24. How Langmuir and BET isotherms are used for the surface area determination ?
25. Briefly explain the working of Auger spectroscopy.
26. Briefly explain the osmotic method for the determination of molecular mass of macromolecules.

(4×3=12)



SECTION – D

Answer either **A** or **B** of **each** question. **Each** question carries **6** marks.

27. A) Briefly explain the Lindemann-Hinshelwood mechanism of unimolecular reactions.

B) Discuss any two methods for studying the kinetics of fast reactions.

28. A) Derive the Michaelis-Menten equation of enzyme catalysis.

B) Briefly explain the Rice Herzfeld mechanism of branching chain reaction.

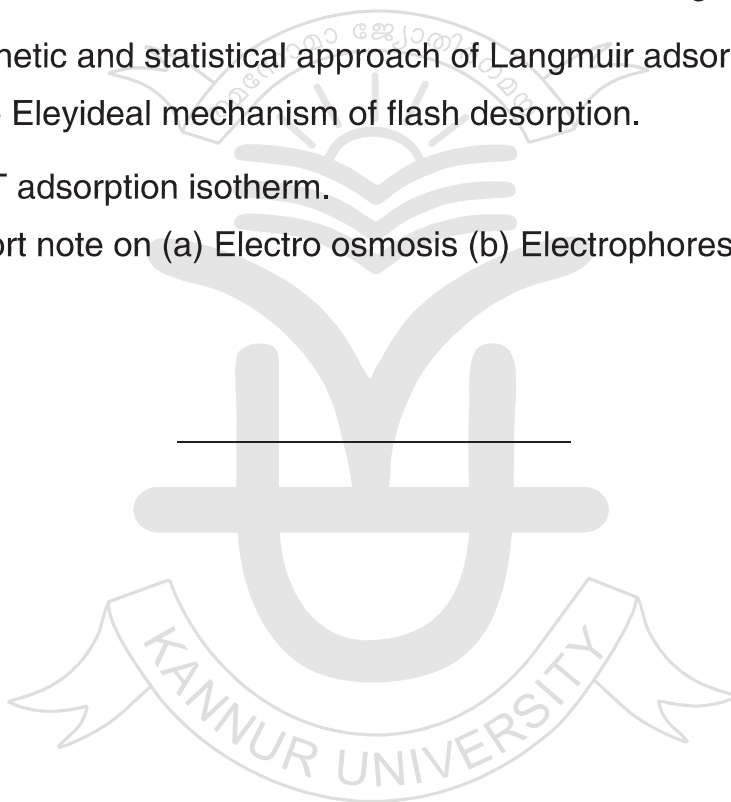
29. A) Give the kinetic and statistical approach of Langmuir adsorption isotherm.

B) Explain the Eleyideal mechanism of flash desorption.

30. A) Derive BET adsorption isotherm.

B) Write a short note on (a) Electro osmosis (b) Electrophoresis.

(4×6=24)





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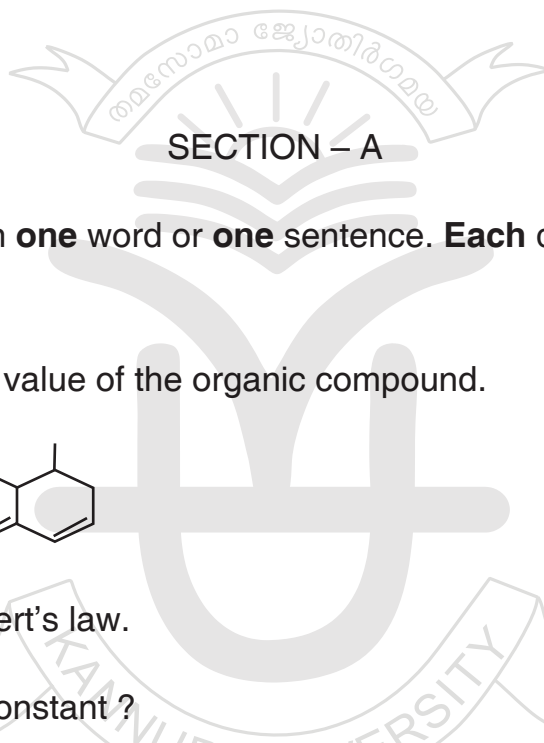
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III Semester M.Sc. Degree (CBSS – Reg./Supple./Imp.)
Examination, October 2023
(2020 Admission Onwards)
CHEMISTRY
CHE 3C 09 : Organic Chemistry III

Time : 3 Hours

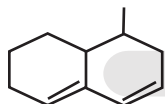
Max. Marks : 60



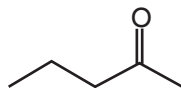
Answer **all** questions in **one** word or **one** sentence. **Each** question carries **one** mark.

(8×1=8)

1. Calculate the λ_{\max} value of the organic compound.



2. Define Beer-Lambert's law.
3. What is coupling constant ?
4. How many ^1H NMR signals would you expect in the following organic compound ?

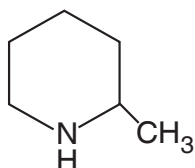


5. How will you identify chlorine atom present in an organic compound by using mass spectra ?
6. What is nitrogen rule ?

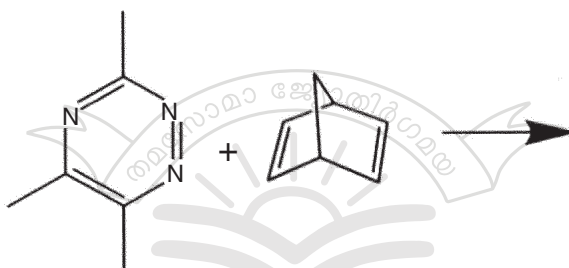
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7. Write the IUPAC name of the following organic compound.



8. Complete the reaction.



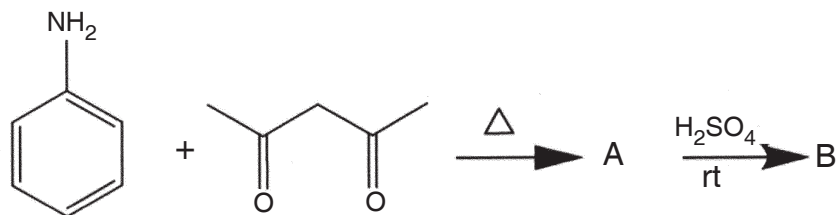
SECTION – B

Answer **any eight** questions. Answer may be **two** or **three** sentences. **Each** question carries **two** marks. **(8×2=16)**

9. How will you distinguish cis-but-2-ene and trans-but-2-ene using IR spectroscopy ?
10. How the polarity of the solvent shifts the wavelength of $n \rightarrow \pi^*$ electronic transition ?
11. The intensity of $n \rightarrow \pi^*$ electronic transitions are usually very low. Give reason.
12. Water is not commonly used as a solvent in IR spectroscopy. Give reason.
13. Intensities of ^{13}C NMR peaks are lower than that of ^1H NMR. Give reason.
14. Hydroxylic peak of acidified ethanol usually give a single peak. Why ?
15. What is McLafferty rearrangement ? Explain.
16. Write the fragmentation pattern and identify the base peak of cyclohexene.
17. Explain the metastable ion present in mass spectrum.



18. Identify the products A and B.



19. Write a short note on oxetane.

20. Explain the cycloaddition reactions of azepines.

SECTION – C

Answer **any four** questions. Short paragraph questions. **Each** question carries **three** marks. (4×3=12)

21. An organic compound has molecular formula $\text{C}_3\text{H}_6\text{O}$ is IR (KBr) : 2995, 2918, 1715, 1422, 1360 and 1213 cm^{-1} . Assign the structure.

22. Account the electronic transitions in enes and enones.

23. Explain anisotropic effect with suitable examples.

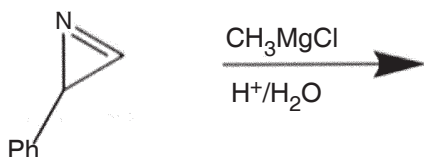
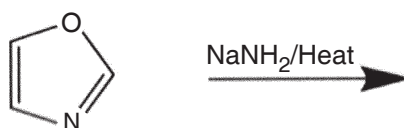
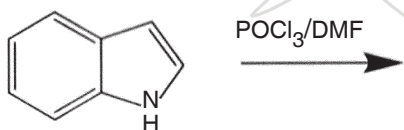
24. Write a short note on :

i) GC-MS

ii) HPLC -MS

25. What are coumarins ? Write any one synthetic method to prepare coumarin.

26. Complete the following reactions.





SECTION – D

Answer **any four** questions. Essay type questions. **Each** question carries **six** marks.

(4×6=24)

27. A) Explain the factors affecting vibrational frequencies. What are the applications of IR spectroscopy ?

OR

B) Explain FTIR and its instrumentation.

28. A) Briefly discuss the following :

- i) Double resonance
- ii) NOE
- iii) DEPT.

OR

B) Explain the spin-spin interaction in NMR spectroscopy.

29. A) Assign the structure of the organic compound C_8H_8O shows the following spectral data

Two base peaks at $m/z = 119$ and 91

IR (KBr) : $2825, 2717, 1700\text{ cm}^{-1}$

$^1\text{H NMR}$: $\delta 2.4$ (3H, s), $\delta 7.1 - 7.9$ (4H, a pair of doublets $J=8\text{ Hz}$) and $\delta 10.0$ (1H, S)

OR

B) Describe the EI, CA, FAB and electro spray ion sources in the mass spectroscopy.

30. A) Explain the preparation and properties of indole and quinoline.

OR

B) Explain the preparation and properties of pyrans and pyrimidines.



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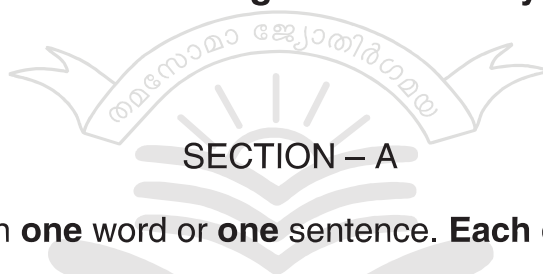
(2020 Admission Onwards)

CHEMISTRY

CHE3C08 : Inorganic Chemistry – II

Time : 3 Hours

Max. Marks : 60



SECTION – A

Answer **all** questions in **one** word or **one** sentence. **Each** question carries **one** mark. (8×1=8)

1. Give an example of a compound which will exhibit Jahn-Teller distortion.
2. Tetrahedral complexes are high spin. Why ?
3. What is the ground state term for p^2 configuration ?
4. What is Neel's temperature ?
5. Define chelate effect.
6. Why square planar complexes are considered as generally labile ?
7. What is Zeise's salt ? Draw its structure.
8. Give two examples of organometallic compounds of beryllium.

SECTION – B

Answer **any eight** questions. Answer may be **two** or **three** sentences. **Each** question carries **two** marks. (8×2=16)

9. Pt^{4+} ion forms octahedral whereas Pt^{2+} ion forms square planar complexes. Explain.
10. Draw the crystal field splitting diagram for $[CoCl_4]^{2-}$ and calculate CFSE.

P.T.O.



11. Write the electronic configuration of $[\text{Fe}(\text{CN})_6]^{4-}$ on the basis of CFT and predict whether the complex is paramagnetic or diamagnetic.
12. Draw the Orgel diagram of transition metal complex with d^2 configuration.
13. CdCO_3 is colourless while CdS is yellow. Why ?
14. What do you mean by spin orbit coupling in transition metal complexes ?
15. What is trans effect ? Explain using examples.
16. Write notes on anation reactions with suitable examples.
17. Explain briefly substitution reactions in square planar complexes. What are the factors influencing the substitution reactions in square planar complexes ?
18. What are metallocenes ? Draw the structure of two metallocenes.
19. What do you mean by migratory insertion reactions ? Explain with suitable examples.
20. Write notes on metal alkyne complexes. Give two examples.

SECTION – C

Answer **any four** questions. Short paragraph questions. **Each** question carries **three** marks. **(4×3=12)**

21. Explain tetragonal distortion or Jahn-Teller distortion using suitable examples.
22. What is nephelauxetic effect ? What is the significance of Racah parameter ?
23. How magnetic measurements are used for the structural determination of transition metal complexes ? Explain using suitable examples.
24. Explain thermodynamic and kinetic stability of transition metal complexes using suitable examples.
25. What is oxidative addition reaction ? What are the characteristics of oxidative addition reactions ? Discuss using examples.
26. Explain Monsantoacetic acid process.



SECTION – D

Answer **any four** questions. Essay type questions. **Each** question carries **six** marks. **(4×6=24)**

27. A) Explain the MO energy level diagram for octahedral, tetrahedral and square planar complexes.

OR

B) Explain CFT. Write notes on the crystal field splitting in octahedral complexes. What are the factors affecting the magnitude of Δ ?

28. A) Discuss briefly Gouy method for the determination of magnetic susceptibility of complexes.

OR

B) What are Tanabe Sugano diagrams ? Draw the Tanabe Sugano diagram of d^2 octahedral complexes ? Discuss the applications of Tanabe Sugano diagrams.

29. A) Explain briefly the determination of formation constants by pH metric and spectrometric methods.

OR

B) Write notes on the redox reactions and photochemical reactions of coordination compounds.

30. A) Discuss the structure and bonding in ferrocene.

OR

B) Explain the mechanism of hydroformylation reaction.
