



K23U 3413

Reg. No. :

Name :

III Semester B.Sc. Degree (CBCSS – OBE – Regular/Supplementary/
Improvement) Examination, November 2023
(2019 to 2022 Admissions)

COMPLEMENTARY ELECTIVE COURSE IN CHEMISTRY/POLYMER
CHEMISTRY

3C03CHE/PCH(BS) : Chemistry (For Biological Science)

Time : 3 Hours

Max. Marks : 32

Instruction : Answer the questions in **English** only.

SECTION – A

Very short answer type. **Each** carries **1** mark. Answer **all 5** questions.

1. Give an example for thermoplastics.
2. Write one example for a nucleophile.
3. _____ is constant in an isochoric process.
4. Equation for the half-life of first order reaction is _____.
5. Give an example for chelate ligand.

(5×1=5)

SECTION – B

Short answer type. **Each** carries **2** marks. Answer **any 4** questions out of 6.

6. State Markownikoff rule.
7. Explain S_N1 mechanism with example.
8. Define heat capacity.
9. State and explain Werners theory of co-ordination.
10. Define chirality with example.
11. Name the co-ordination compounds :



(4×2=8)

P.T.O.



SECTION – C

Short essay type. **Each** carries **3** marks. Answer **any 3** questions out of 5.

12. State and explain Walden inversion.
13. What is optical isomerism ? Explain with example.
14. Give an account of synthetic fibres.
15. The half-life of first order reaction is 100 seconds, if the initial concentration of the reaction is 2mol L^{-1} . How much of it will be consumed in 250 seconds ?
16. If the change in internal energy for the process $\text{MCO}_3 \rightarrow \text{MO} + \text{CO}_2$ is 105 KJ at 400 K and 1 atm. pressure, calculate enthalpy change. **(3×3=9)**

SECTION – D

Long essay type. **Each** carries **5** marks. Answer **any 2** questions out of 4.

17. a) What are the factors affecting the stability of co-ordination compounds ?
b) Give applications of co-ordination compounds. **(3+2)**
 18. a) Explain the difference between enantiomer and diastereomers.
b) Discuss the optical isomerism of lactic acid. **(3+2)**
 19. a) Explain mechanism of $\text{S}_{\text{N}}2$ reaction.
b) Discuss the concept of spontaneous and non-spontaneous process. **(3+2)**
 20. a) What are the factors affecting the rate of reaction ?
b) Explain the collision theory of reaction. **(2+3)**
- (2×5=10)**
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K22P 1376

Reg. No. :

Name :

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

CHEMISTRY

CHE 3C.09 : Organic 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. Aniline absorption shifts from 230 nm in neutral medium to 203 nm in acidic medium. Why ?
2. What is the significance of the fingerprint region in the IR spectra ?
3. How many different types of protons are there in allyl chloride ?
4. Predict the number of peaks on the ^{13}C NMR spectrum of p-dimethoxy benzene and m-dimethoxy benzene.
5. What are the major fragments and their m/z values in the mass spectrum of nitrobenzene ?
6. What is a metastable ion ? What is its significance ?
7. Draw the structure of coumarin. What is its use in medicine ?
8. Sketch the structures of the pyrimidine bases present in DNA. **(8×1=8)**

SECTION – B

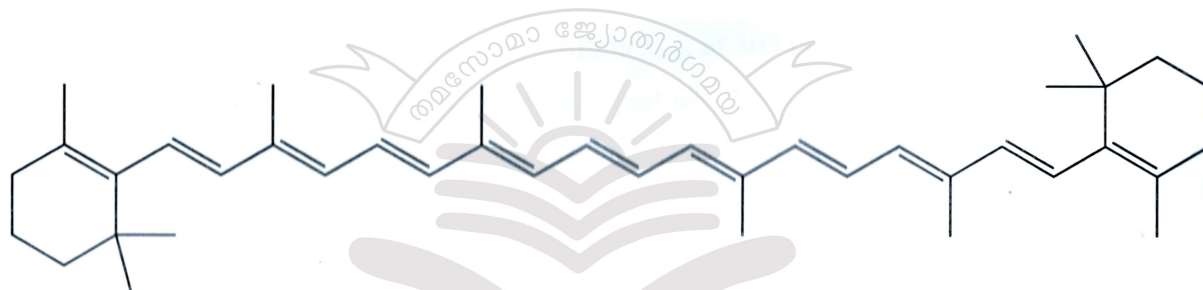
Answer **any 8** questions. Answer may be **two** or **three** sentences. **Each** question carries **2** marks.

9. Propene and propyne show C-C multiple bond stretching in IR spectrum, while ethylene and ethyne do not show such bands. Why ?

P.T.O.

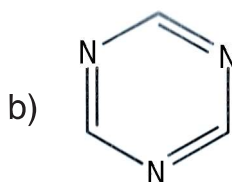
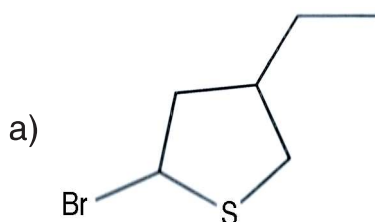


10. Explain how *cis*-stilbene is distinguished from *trans*-stilbene using UV spectra.
11. Comment on the aromatic nature of cyclooctatetraene on the basis of its NMR spectrum.
12. An organic compound having the molecular formula C_3H_7Cl exhibits the following signals in the 1H NMR spectrum : (i) δ 0.9 (3H, t); δ 1.6 (2H, m); δ 3.3 (2H, t). Suggest the probable structure.
13. Calculate the λ_{max} and ϵ_{max} for the following molecules using Woodward-Fieser rules.

 β -Carotene

All-trans-lycopene

14. Explain the term off-resonance decoupling.
15. What is nitrogen rule ? Explain the rule taking the example of nitrobenzene.
16. Explain the principle of TOF analyser.
17. Phenetole in its mass spectrum exhibits an ion peak at $\frac{m}{z}$ 94. Explain its formation.
18. Name the following compounds based on Hantzsch-Widman system of nomenclature.





19. Pyrrole is more reactive at 2-position than 3-position in electrophilic substitution reactions. Explain.

20. Give any method of synthesis of oxirane.

(8×2=16)

SECTION – C

Short paragraph questions. Answer **any 4** questions. **Each** question carries **3** marks.

21. An organic molecule having molecular formula C_2H_5NO shows in its IR spectrum an absorption band at 1680 cm^{-1} . When reduced with $LiAlH_4$ it forms C_2H_7N whose IR spectrum lacks the peak at 1680 cm^{-1} , instead it exhibits a band at 3300 cm^{-1} . Suggest the probable structure.

22. a) An organic compound in hexane exhibits λ_{max} at 305 nm and in ethanol at 307 nm. What should be the nature of the transition and why ?

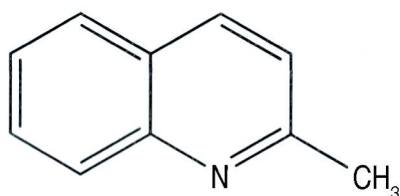
b) Sketch the first order NMR spectrum of ethanol.

23. Explain Nuclear Overhauser Effect.

24. What is FAB ? What are its advantages and disadvantages ?

25. a) Explain McLafferty rearrangement with an example.

b) Give a synthesis of the following :



26. How is pyrimidine ring constructed ? Give one method of synthesis of thymine.

(4×3=12)



SECTION – D

Essay type questions. Answer 4 questions. **Each** question carries 6 marks.

27. a) The principal flavour constituent of cinnamon is a compound whose mass spectrum shows the molecular ion at m/z 132 (C_9H_8O), with the base peak at m/z 131, and a significant peak at m/z 103. IR spectrum : 1690 cm^{-1} (s); UV spectrum : 284 (intense), 308 (weak) nm. 1H NMR spectrum: δ 9.75 (1H, d, $J = 8$ Hz), 7.45 (1H, d, $J = 16$ Hz), 7.4 (5H, m) and 6.7 (1H, dd, $J = 16, 8$ Hz). Deduce the structure of the molecule and comment on its stereochemistry with respect to the NMR spectrum.

OR

- b) Discuss the various factors affecting the positions frequencies of absorption in the IR spectrum.
28. a) An organic compound having the molecular formula $C_9H_{10}O_2$, gave the following spectral data :
- UV : λ_{max} 274 nm ($\epsilon = 2050$)
IR : ν 3031, 2941, 1724, 1608, 1504, 1060 and 830 cm^{-1}
 1H NMR δ : 2.35 (3H, s); 3.82 (3H, s) and 7.20 – 7.85 (4H, m)
MS (m/z) : 150, 145, 119.
What is the probable structure of the compound ?

OR

- b) Discuss the terms :
- Lanthanide shift reagents and
 - CIDNP.
29. a) Write short notes on :
- MALDI and
 - EI.

OR

- b) What are the common methods for the simplification of complex spectra in NMR spectroscopy ? Explain with suitable examples.
30. a) Explain the synthesis strategies for the synthesis of indole and benzofurans citing examples.

OR

- b) Describe the methods of synthesis of selenophanes, tellurophanes and naphthyridines.

(4×6=24)



K23U 3414

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COMPLEMENTARY ELECTIVE COURSE IN CHEMISTRY/POLYMER
CHEMISTRY

3C03CHE/PCH(PS) : Chemistry (For Physical Science)

Time : 3 Hours

Max. Marks : 32

Instruction : Answer the question in **English** only.

SECTION – A

Very short answer type. **Each** carries **1** mark. Answer **all 5** questions. **(5×1=5)**

1. Arrange the following in the increasing order of energy-Radio waves, Microwaves, IR and Cosmic rays.
2. Define closed system.
3. Define isochoric system.
4. Write the molecular formula of a coordination compound of Cobalt with ligand as NH_3 and Cl^- and coordination number 6.
5. Expansion of GSC, LLC.

SECTION – B

Short answer type. **Each** carries **2** marks. Answer **any 4** questions out of 6. **(4×2=8)**

6. Write and express the entropy criteria for irreversible process.
7. Express the criteria for spontaneous process.
8. What is a zero order reaction ? Give one example.
9. Define isotopes and isobars with one example.
10. Define mass defect and binding energy.
11. Mention two applications of column chromatography.

P.T.O.



SECTION – C

Short essay type. **Each** carries **3** marks. Answer **any 3** questions out of 5. **(3×3=9)**

12. Explain stretching and bending modes of vibrations using a linear molecule.
13. ΔH and ΔS for the reaction : $2 \text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{NO}_2(\text{g})$ at 720 K are -120 kJ and -150 J/K respectively. Calculate the Gibbs energy change and predict whether the reaction is spontaneous or not at 720 K.
14. Explain Werner's coordination theory using the example – $[\text{CoCl}(\text{NH}_3)_5]\text{Cl}_2$.
15. Differentiate between molecularity and order.
16. Compare one merit and demerit of column, planar and gas-liquid chromatography.

SECTION – D

Long essay type. **Each** carries **5** marks. Answer **any 2** questions out of 4. **(2×5=10)**

17. a) Explain spin spin split in NMR using suitable examples.
b) Write a brief note on electronic spectra.
 18. What is meant by the EAN rule ? Calculate and express which of the following compounds obey EAN rule $[\text{Ni}(\text{NH}_3)_6]^{2+}$, $[\text{Ni}(\text{CO})_4]$, $[\text{Fe}(\text{CN})_6]^{3-}$, $[\text{Fe}(\text{CN})_6]^{4-}$.
 19. Derive integrated rate equation for first order reaction. Explain with suitable examples how activation energy and catalyst are related. **(3+2)**
 20. Define and express nuclear fission and fusion. Explain detection of isotopes using Aston's mass spectrograph. **(2+3)**
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