

Code No. : 10320 E Sub. Code : AMCH 41

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fourth Semester

Chemistry — Core

ORGANIC CHEMISTRY — II

(For those who joined in July 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

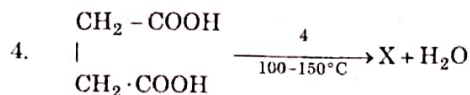
Answer ALL questions.

Choose the correct answer :

1. The formation of cyanohydrin from a ketone is an example of _____ reaction.
- (a) electrophilic addition
(b) nucleophilic addition
(c) nucleophilic substitution
(d) electrophilic substitution

2. Under Wolff - Kishner reduction conditions, the conversions which may be brought about are
- (a) Cyclohexanone into cyclohexane
(b) Benzaldehyde into benzyl alcohol
(c) Cyclohexanone into cyclohexanol
(d) None

3. Which one of the following is the most strong acid?
- (a) Acetic acid (b) n-butyric acid
(c) Propionic acid (d) Formic acid



Succinic acid X is _____

- (a) $\begin{array}{c} \text{CH}_2 - \text{CH}_3 \\ | \\ \text{CH}_2 - \text{CH}_3 \end{array}$ (b) $\begin{array}{c} \text{CH}_2 - \text{COOH} \\ | \\ \text{CH}_2 - \text{CH}_3 \end{array}$
(c) $\begin{array}{c} \text{CH}_2 - \text{CO} \\ | \quad \diagup \quad \diagdown \quad \text{O} \\ \text{CH}_2 - \text{CO} \end{array}$ (d) $\begin{array}{c} \text{COOH} \\ | \\ \text{COOH} \end{array}$

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5. Ethyl bromide reacts with sodium hydrosulphide gives _____
- (a) ethanethiol (b) diethyl sulphide
(c) mustard gas (d) sulphonal
6. The metal used in Reformatsky reaction is _____
- (a) Mg (b) Li
(c) Pb (d) Zn
7. Nitro - acinitro tautomerism is not exhibited by _____
- (a) primary nitro compound
(b) tertiary nitro compound
(c) secondary nitro compound
(d) none of the above
8. The hydrogen atom in the methylene group is strongly acidic because of _____ groups.
- (a) electron withdrawing
(b) electron releasing
(c) both (a) and (b)
(d) none of the above

9. Which of the following correctly lists the conformations of cyclohexane in order of increasing energy?
- (a) Chair < twist < boat < half - chair
(b) Chair < boat < twist < half - chair
(c) Half - chair < boat < twist < chair
(d) Chair < twist < half - chair < boat
10. Which statement about cyclohexane is incorrect?
- (a) Each carbon atom is sp³ hybridized
(b) The cyclohexane ring can flip between chair and boat conformations
(c) Cyclohexane suffers ring strain
(d) Hydrogen atoms occupy equatorial or axial sites

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Discuss the mechanism of nucleophilic addition of Grignard reagent with acetaldehyde.

Or

- (b) What is Meerwein - Ponnort - Verley reduction? Explain with example.

12. (a) How is urea prepared? How does it react with
(i) HNO_2 (ii) NH_2NH_2 .

Or

- (b) Discuss the effect of substituents on the acidity of carboxylic acid with suitable example.

13. (a) How is diethylsulphide prepared? How is it react with (i) H_2O_2 (ii) Ni.

Or

- (b) How is methyllithium react with the following (i) HCHO (ii) CH_3CHO (iii) CH_3COCH_3 .

14. (a) How are the following prepared from ethyl acetoacetate?

(i) Butanoic acid

(ii) Crotonic acid.

Or

- (b) Discuss the mechanism of nitroso - oxime tautomerism what are the evidences for the two forms?

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15. (a) Explain Sachse - Mohr theory of strainless ring.

Or

- (b) How is the civatone prepared? Write its structure.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) (i) Explain the relative reactivities of carboxyl compounds.

(ii) Discuss the mechanism of Knoevenagal reaction.

Or

- (b) Give the preparation, properties and uses of chloral.

17. (a) Explain the reaction of action of heat on

(i) hydroxy acids

(ii) dicarboxylic acid.

Or

- (b) (i) Discuss the mechanism of esterification.

(ii) Write note on the optical property of lactic acid.

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18. (a) How are the following prepared from diethylzinc?

(i) Primary alcohol

(ii) Secondary alcohol

(iii) Tertiary alcohol

(iv) Keton.

Or

- (b) Discuss the preparation and properties of

(i) Sulphone

(ii) Sulphonal

(iii) Mustard gas.

19. (a) Explain the following tautomerisms and the evidences for them

(i) Keto - enol

(ii) Nitro - acinitro.

Or

- (b) How are the following prepared from diethyl mulonate?

(i) Succinic acid

(ii) Aceto acetic acid

(iii) Poutanoic acid.

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20. (a) Discuss the conformational analysis of mononutrituted cyclohexane.

Or

- (b) Write note on :

(i) Baeyers strain theory

(ii) Coulson - Moffit's concept.

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Reg. No. :

Code No. : 10321 E Sub. Code : AMCH 51

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fifth Semester

Chemistry — Core

INORGANIC CHEMISTRY — II

(For those who joined in July 2020 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Kr and Xe encapsulated in zeolite structures is an example for
- (a) Clathrate compounds
(b) Hydrates
(c) fluorides
(d) Molybdates

2. Which one of the following is a isotope of helium
(a) ^3He (b) ^4He
(c) (a) and (b) (d) ^5He
3. The formula for Ziegler natta catalyst is
(a) $\text{TiCl}_4 + \text{Et}_3\text{Al}$ (b) $\text{TiCl}_4 + \text{Et}_3\text{Al}$
(c) $\text{Cl}_4 + \text{Et}_3\text{Al}$ (d) $\text{TiCl}_6 + \text{Et}_3\text{Al}$
4. Wilkinson's catalyst is
(a) $\text{C}_5\text{H}_4\text{IP3}$ (b) $\text{C}_5\text{H}_4\text{IP5Rh}$
(c) $\text{C}_5\text{H}_4\text{IP3Rh}$ (d) $\text{C}_5\text{H}_4\text{IP3R}$
5. The majority of the Lanthanides are
(a) Paramagnetic (b) Diamagnetic
(c) Ferro magnetic (d) Anti ferromagnetic
6. The most common oxidation state exhibited by actinides is
(a) +2 (b) 0
(c) +1 (d) +3
7. Which process converts an ore to its purest form
(a) Smelting (b) Melting
(c) Calcinations (d) Roasting

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8. Which method used to purify the metals such as Germanium, Gallium, and Silicon?
- (a) Van Arkel
(b) Zone refining
(c) Electrolysis
(d) Van arkel deboer method
9. The number of gram equivalents of solute present in one litre of a solution is called as
- (a) Molarity (b) Molality
(c) Normality (d) Formality
10. Occlusion is a kind of
- (a) Co precipitation (b) Post precipitation
(c) Precipitation (d) Solubility product

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Describe the significance of inert gases.
Or
(b) List out the applications of hydrates of noble gases.

12. (a) Write a note on sodium nitroprusside.
Or
(b) Write a note on zinc group metals.
13. (a) Discuss on lanthanide contraction.
Or
(b) Write the preparation and properties of uranium hexafluoride.
14. (a) Define the following (i) calcination (ii) electrolysis.
Or
(b) Discuss on van Arkel deboer method.
15. (a) How the acid base reaction is playing a significant role in titration?
Or
(b) Define the following (i) Co precipitation (ii) Post precipitation.

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[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) (i) Explain the preparation and properties of oxides of xenon. (6)
(ii) Write any three properties of helium. (2)

Or

- (b) Discuss on the properties of fluorides of krypton and radon.
17. (a) (i) Write the preparation of Ziegler - Natta catalyst. (5)
(ii) Write a short note on iron group metals. (3)

Or

- (b) (i) How can we prepare the Nickel DMG complex? (4)
(ii) Discuss on Wilkinson's catalyst.
18. (a) (i) Account on the properties and uses of ceric ammonium sulphate. (6)
(ii) Write the uses of thrium nitrate.

Or

- (b) (i) Compare lanthanides with actinides on their basic characteristics. (6)
(ii) Write the preparation of thorium dioxide. (2)

19. (a) How froth floatation and magnetic separation methods are useful in metallurgical processes?

Or

- (b) (i) Explain zone refining. (4)
(ii) Write a short note on the basic principles of metallurgy. (4)
20. (a) (i) How the common ion effect is useful in precipitation of cations? (4)
(ii) Account on the interfering radicals and their elimination. (4)

Or

- (b) (i) What are the conditions for precipitation? (4)
(ii) How will you minimize the errors during the precipitation process? (4)

(6 pages)

Reg. No. :

Code No. : 10322 E Sub. Code : AMCH 52

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fifth Semester

Chemistry — Core

PHYSICAL CHEMISTRY — II

(For those who joined in July 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The gas expands adiabatically, the heat absorbed is
 - Positive
 - Negative
 - Zero
 - Can't be calculated

- During isothermal expansion of an ideal gas its enthalpy
 - increases
 - decreases
 - no change in enthalpy
 - none of the above
- When solid ice melts to liquid water at 0°C the entropy?
 - Increases
 - Decreases
 - Remains constant
 - Zero
- Free energy is
 - an intensive property
 - an extensive property
 - an electrical property
 - a colligative property
- In an equilibrium reaction for which $\Delta G^\circ = 0$, the equilibrium constant should equal to
 - 0
 - 1
 - 2
 - 10

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- How many phases are present at the eutectic point of Pb – Ag system?
 - 1
 - 2
 - 3
 - 4
- During the titration of a weak acid against NaOH, the conductance of the solution, after the neutralisation point
 - increases
 - decreases
 - varies irregularly
 - is constant
- Aqueous solution of NH_4Cl is
 - Neutral
 - Acidic
 - Basic
 - Amphoteric
- In salt bridge, KCl is largely used because
 - forms a good jelly
 - K^+ and Cl^- have same transport number
 - K^+ and Cl^- are isoelectronic
 - KCl is an electrolyte
- For a cell reaction to occur spontaneously, the emf of the cell should be
 - positive
 - negative
 - zero
 - none of the above

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PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

- (a) Explain with examples what is meant by cyclic process.

Or

(b) Compare exact and inexact differentials with examples.
- (a) Write a note on Nernst heat theorem.

Or

(b) What are the merits and limitations of second law of thermo dynamics?
- (a) Derive Van't Hoff reaction isotherm.

Or

(b) Explain phase diagram of sulphur system.
- (a) Derive Ostwald dilution law. Mention its applications and limitations.

Or

(b) Discuss the conductometric titration of HCl vs NaOH.

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[P.T.O.]

15. (a) What are reversible cells? How do you measure its emf?

Or

- (b) Explain electrochemical series and its significance.

PART C -- (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Derive an expression for work done during reversible isothermal expansion of a real gas?

Or

- (b) Derive expression for Joule Thomson co-efficient.

17. (a) Explain the following :

- (i) activity
- (ii) activity co-efficient
- (iii) std states.

Or

- (b) Define partial molal free energy and derive Gibb's Duhem equation.

18. (a) Draw and discuss the phase diagram of Mg - Zn system.

Or

- (b) Derive Van't Hoff reaction isochore of a reaction.

19. (a) (i) Explain Metallic and electrolytic conductance.

- (ii) Measurement of conductance and cell constant.

Or

- (b) Explain Debye Hackel Onsagar theory.

20. (a) Derive an expression for liquid junction potential.

Or

- (b) Determine pH of a solution using quinhydrone electrode.

(6 pages)

Reg. No. :

Code No. : 10323 E Sub. Code : AMCH 53

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fifth Semester

Chemistry — Core

ORGANIC CHEMISTRY — III

(For those who joined in July 2021 only)

Time : Three hours

Maximum : 75 marks

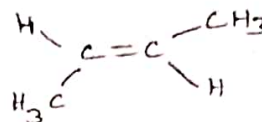
PART A — (10 × 1 = 10 marks)

Answer ALL questions.

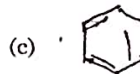
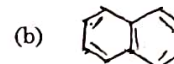
Choose the correct answer :

- Which of the following is optically active
(a) Alanine (b) 2-butanol
(c) Lactic acid (d) All of these
- The number of stereoisomers for 3-pentane 2-ol
(a) 2 (b) 4
(c) 3 (d) 5

- Assign E or Z configuration to the given compound



- Z-configuration (b) S-configuration
 - E-configuration (d) R-configuration
- The energy required to rotate n-butane molecule about the carbon-carbon bond is called _____
(a) Rotational energy
(b) Torsional energy
(c) Enantiomeric energy
(d) Potential energy
 - Which of the following compounds is not aromatic?



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- The reaction in which benzene reacts with alkyl halide in the presence of a Lewis acid as a catalyst to produce alkyl benzene is as
(a) Nitration
(b) Halogenation
(c) Friedel craft acylation
(d) Friedel craft - alkylation
- The hetero atom in thiophene is
(a) N (b) O
(c) S (d) Se
- What is the reactivity order in the following five membered hetero cyclic compounds?
(a) Pyrrole (b) Furan
(c) Thiophene (d) Pyridine
- Allzarin is a _____ dye.
(a) azo (b) mordant
(c) vat (d) nitro
- Which of the following is not a chromophore
(a) -N = N- (b) -NO
(c) -NO₂ (d) -NH₂

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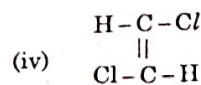
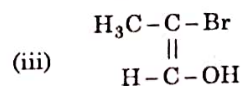
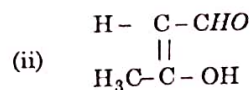
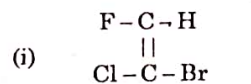
PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Explain elements of symmetry with suitable examples.

Or

- Write a note on asymmetric synthesis.
- (a) Assign E - Z notation to the following structures



Or

- Explain the conformational analysis of cyclopentane.

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[P.T.O.]

13. (a) Write a note on benzenoid and non-benzenoid compounds with suitable example.

Or

- (b) Explain the S_N2 mechanism.

14. (a) Explain the molecular orbital picture of pyrrole.

Or

- (b) Describe the synthesis and electrophilic substitution reactions of isoquinoline.

15. (a) Write a note on resonance theory.

Or

- (b) Discuss the Haworth's synthesis of Naphthalene.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Describe the mechanism of racemisation.

Or

- (b) Discuss the optical activity of biphenyl and spiranes compounds.

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17. (a) Describe the conformational analysis of cyclohexane.

Or

- (b) Explain the following terms :

- (i) angle strain
- (ii) torsional strain
- (iii) vander walls strain
- (iv) dihedral angle.

18. (a) Explain the mechanism of Friedal - Crafts alkylation and acylation.

Or

- (b) Describe the methods of determination of orientation by

- (i) Korner's absolute method
- (ii) Dipolemoment method.

19. (a) Compare the aromatic character of pyrrole, furan and thiophene.

Or

- (b) Explain the preparation, mechanism of electrophilic substitution reactions of indole.

20. (a) Discuss the structure of naphthalene.

Or

- (b) Describe the classification of dyes, according to the method of their applications.

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Reg. No. :

Code No. : 10324 E Sub. Code : AMCH 62

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Sixth Semester

Chemistry – Core

PHYSICAL CHEMISTRY – III

(For those who joined in July 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The two main factors that affect absorbance are
(a) Concentration
(b) Path length
(c) Intensity
(d) Concentration of the substance and path length
- How many modes of vibration are found in H₂O?
(a) 1 (b) 6
(c) 3 (d) 0

- H₂ is
(a) IR active (b) Raman active
(c) Raman inactive (d) IR inactive
- CO is
(a) IR active (b) Raman active
(c) Raman inactive (d) IR inactive
- A example for symmetry operator is
(a) Inversion operation
(b) Mirror plane
(c) Improper rotation
(d) All the above
- C_{2v} is a point group of
(a) NH₃ (b) H₂O
(c) H₂S (d) NO
- The unit of first order reaction rate constant is
(a) Sec⁻¹ (b) Sec
(c) Joule (d) Joule⁻¹
- The reaction of hydrogen with chlorine belongs to
(a) First order (b) Zero order
(c) Second order (d) Third order

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- Absorption of nitrogen on the surface of charcoal at lower temperature is
(a) Chemisorption (b) Absorption
(c) Physisorption (d) All the above
- Benzene and toluene is an example for
(a) Ideal solution
(b) Non ideal solution
(c) Positive deviation
(d) Negative deviation

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

- (a) Write on various types of molecular spectra.
Or
(b) List out the factors affecting absorption maximum and intensity.
- (a) Write a note on energy level splitting in ESR spectroscopy.
Or
(b) Discuss on Kramer's degeneracy.

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- (a) Explain H₂O and NH₃ point groups.
Or
(b) Explain Abelian and cyclic groups.
- (a) List out the characteristics of third order reaction.
Or
(b) Describe on second order reactions with examples.
- (a) List out the applications of absorption.
Or
(b) Write a note on Azeotropic distillation.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

- (a) Explain. Born oppenheimer approximation.
Or
(b) (i) Discuss on the types of transitions in molecules. (5)
(ii) Write a short note on moment of inertia. (3)

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[P.T.O.]

17. (a) Discuss on the following :
(i) Coupling constants (4)
(ii) Zero field splitting. (4)
Or
(b) Write a note on the following :
(i) Chemical shift (4)
(ii) Applications of NMR. (4)
18. (a) Explain
(i) Planes of symmetry (4)
(ii) Types of planes. (4)
Or
(b) Discuss on the following
(i) Improper rotational axis of symmetry. (5)
(ii) Identity elements. (3)
19. (a) (i) How will you determine the order of a reaction? (5)
(ii) Differentiate order from molecularity of a reaction. (3)
Or
(b) Explain the following :
(i) Energy of activation (4)
(ii) Determination of Arrhenius frequency factor. (4)

20. (a) (i) Differentiate physisorption from chemisorptions. (5)
(ii) Write a note on critical solution temperature. (3)
Or
(b) (i) Discuss on ideal and non ideal solutions with examples. (4)
(ii) Write a note on adsorption indicators. (4)
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B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Sixth Semester

Chemistry – Core

ORGANIC CHEMISTRY – IV

(For those who joined in July 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Invert sugar is _____.
(a) glucose (b) fructose
(c) glucose + fructose (d) maltose
- Carbohydrates are characterized by the presence of _____.
(a) hydroxyl group (b) carbonyl group
(c) asymmetric carbon (d) all the above

- Pick out a sesquiterpene from the following
(a) limonene (b) rubber
(c) zingiberene (d) squalene
- Which of the following is an auxochrome?
(a) C=C (b) =CH₂
(c) -NH₂ (d) -N=N-
- Acetone has _____ type of protons.
(a) one (b) two
(c) three (d) six

PART B — (5 × 5 = 25 marks)

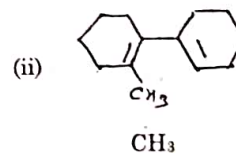
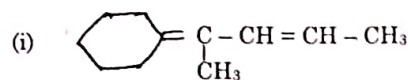
Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

- (a) What are polysaccharides? Draw the structure of starch.
Or
(b) Explain the osazone formation by glucose and fructose.
- (a) Comment on the mechanism of Kolbe's reaction.
Or
(b) Write the preparation and uses of cinnamaldehyde.

- p-dihydroxybenzene is called as _____.
(a) quinine (b) quinone
(c) quinol (d) hydroquinone
- Identify the unsaturated aldehyde from the following
(a) benzaldehyde (b) formaldehyde
(c) cinnamaldehyde (d) acetaldehyde
- _____ rearrangement involves migration of a group or atom to electron deficient nitrogen atom.
(a) Hofmann
(b) Benzil-benzilic acid
(c) Fries
(d) Wolff
- The conversion of ketoximes to N-substituted amide is _____ rearrangement.
(a) Beckmann (b) Benzil-benzilic acid
(c) Fries (d) Wolff
- Which of the following is a piperidine class alkaloid?
(a) nicotine (b) conine
(c) quinine (d) morphine

- (a) Summarize the salient features of rearrangement involving migration of a group from oxygen to ring carbon atom.
Or
(b) Discuss the mechanism of Wolff rearrangement.
- (a) State and explain isoprene rule.
Or
(b) Write the synthesis of nicotine.
- (a) Discuss the NMR spectra of isobutene.
Or
(b) Calculate the λ_{\max} for the following compounds



PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the following conversions
(i) Glucose to fructose
(ii) Fructose to glucose.
Or
(b) Summarise the chain lengthening and shortening of aldoses.
17. (a) Predict the mechanism for the following reactions.
(i) Perkin reaction
(ii) Claisen reaction.
Or
(b) (i) Discuss the acidic character of phenol.
(ii) What is ortho effect? Explain with example.
18. (a) Give the mechanism for the following rearrangement
(i) Bayer-Villiger oxidation
(ii) Benzil-benzilic acid rearrangement.
Or
(b) Compare the mechanism of Beckmann, Hofmann and Curtius rearrangement.

19. (a) How will you elucidate the structure of citral.

Or

- (b) Write the general methods for the determination of structure of alkaloids.
20. (a) Explain the applications of UV spectroscopy in the structural analysis of organic compounds.

Or

- (b) (i) How will you differentiate inter and intra molecular hydrogen bonding with the help IR spectroscopy.
(ii) Draw and explain the NMR spectra of anisole.
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(6 Pages)

Reg. No. :

Code No. : 20716 E Sub. Code : CACB 11

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

First/Third Semester

Biochemistry — Allied - II

CHEMICAL BIOLOGY AND BIOPHYSICAL
CHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Which of the following biomolecules simply refers to as "Staff of life"?
(a) Lipids (b) Proteins
(c) Vitamins (d) Carbohydrates
- Which of the following is a reducing sugar?
(a) Dihydroxyacetone (b) Erythulose
(c) Glucose (d) All of the above

- Fats are abundantly found in _____
(a) Reproductive tissue
(b) Vegetative tissue
(c) Both (a) and (b)
(d) None of these
- Hydrolysis of fats by alkalies into fatty acids and glycerol is called
(a) coagulation (b) saponification
(c) suspension (d) colloidal
- Aminoacids with aliphatic 'R' group are
(a) Glycine, alanine, leucine
(b) Serine, threonine, cysteine
(c) Lysine, arginine, histidine
(d) Phenylalanine, tyrosine and tryptophan
- The naturally occurring proteins consist of
(a) D-aminoacids (b) L-aminoacids
(c) Both (a) and (b) (d) None of these



7. Each nucleotide consists of
- (a) Base-sugar-OH
 - (b) Sugar-phosphate
 - (c) Base-sugar-phosphate
 - (d) (Base-sugar-phosphate)
8. Uridine present in RNA is _____
- (a) Nucleotides
 - (b) Pyrimidine
 - (c) Purine
 - (d) None of these
9. Separation of different fatty acids can be done by
- (a) counter current chromatography
 - (b) affinity chromatography
 - (c) gas chromatography
 - (d) thin layer chromatography
10. Deficiency of vitamin B₁₂ causes _____
- (a) Megaloblastic anemia
 - (b) Pernicious anemia
 - (c) Sickle cell anemia
 - (d) None

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) List the importance of carbohydrates.
- Or
- (b) Write the classification of carbohydrates.
12. (a) Mention the classification of lipids.
- Or
- (b) Write notes on PUFA.
13. (a) Summarize the physical properties of aminoacids.
- Or
- (b) Explain fibrous proteins and their functions.
14. (a) Describe the structure of pyrimidines.
- Or
- (b) Summarize the biological importance of water soluble vitamins.



15. (a) Write the principle and applications of HPLC.

Or

(b) Explain the principle and applications of UV/visible spectroscopy.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Write an account on heteropolysaccharides.

Or

(b) Explain in detail about homopolysaccharides.

17. (a) Mention the structure and physiological importance of cholesterol.

Or

(b) Comment on phospholipids.

18. (a) Describe the structure and functions of myoglobin.

Or

(b) Draw the structure of haemoglobin and its functions.

19. (a) Explain the structure and importance of vitamin E and vitamin D.

Or

(b) Describe the structure of mRNA.

20. (a) Write the principle and applications of spectrophotometer.

Or

(b) Explain Beer - Lambert's law.



(6 Pages)

Reg. No. :

Code No. : 20717 E Sub. Code : CACB 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second/Fourth Semester

Biochemistry — Allied - II

PRINCIPLES OF BIOCHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The coenzyme is _____
- (a) often a metal
 - (b) always a protein
 - (c) often a vitamin
 - (d) an inorganic compound

2. Which of the following is produced with the combination of apoenzyme and coenzyme?
- (a) Holoenzyme
 - (b) ES complex
 - (c) Prosthetic group
 - (d) Enzyme product complex
3. The enzymes involved in feedback inhibition are called
- (a) Allosteric enzymes
 - (b) Holoenzymes
 - (c) Apoenzymes
 - (d) Coenzymes
4. What is the effect on initial velocity if the substrate concentration is low?
- (a) Increases rapidly
 - (b) Increases slowly
 - (c) Decrease
 - (d) Remains constant
5. Name the type of pathway involved in the synthesis of compounds
- (a) Anabolic pathway
 - (b) Catabolic pathways
 - (c) Amphibolic pathways
 - (d) Anapleuotic pathway

6. Which of the following cycle shows amphibolic pathway?
- (a) Glyoxylate (b) Citric acid cycle
(c) Glycolysis (d) Lipid metabolism
7. Which of the following is the correct sequence of electron acceptors in ETS for production of ATP?
- (a) cyt b, c, a, a₃ (b) cyt a, a, b, c
(c) cyt c, b, a, a₃ (d) cyt b, c, a₃, a
8. Electron transport system is present in which of the following parts of mitochondria?
- (a) Inner membrane (b) Outer membrane
(c) Matrix (d) Stroma
9. Which of the following is a transaminase?
- (a) α - amylase (b) chymotrypsin
(c) proteinases (d) SGPT
10. Which of the following do not have high concentration of aspartate transaminase?
- (a) Heart (b) Liver
(c) Saliva juice (d) Kidney

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write note on coenzymes.
Or
(b) Explain enzyme specificity.
12. (a) What is Km? Add notes on its significance.
Or
(b) Comment on line weaver - burk plot.
13. (a) Illustrate the oxidation of pyruvate to acetyl CoA.
Or
(b) Explain β - oxidation of fatty acid.
14. (a) Analyze the inhibitors of ETC.
Or
(b) Explain uncouples of oxidative phosphorylation.

15. (a) Write the clinical significance of LOH and CPK.

Or

(b) Discuss the clinical significance of SGOT and ALP.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the general characteristics of enzymes.

Or

(b) Explain induced - fit theory of enzyme action.

17. (a) Derive MM equation.

Or

(b) Comment on competition inhibition and its types.

18. (a) Explain glycolysis.

Or

(b) Describe HMP shunt.

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19. (a) Explain ETC in detail.

Or

(b) Illustrate chemiosmotic theory.

20. (a) Explain GTT.

Or

(b) Summarize renal function tests.

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(6 pages)

Reg. No. :

Code No. : 10450 E

Sub. Code : CACH 11

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

First/Third Semester

Chemistry — Allied

ALLIED - CHEMISTRY — I

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Hybridization involves?

- (a) mixing of atomic orbitals centred on the same atom
- (b) mixing of atomic orbitals centred on the different atom
- (c) addition of an electron to an atom
- (d) addition of an electron pair to an atom

2. The bond order of N_2 molecule is _____

- (a) 1.5
- (b) 2
- (c) 2.5
- (d) 3

3. The order of stability of carbonium ions is

- (a) tertiary > secondary > primary
- (b) secondary > tertiary > primary
- (c) primary > secondary > tertiary
- (d) primary > tertiary > secondary

4. Which species represents the electrophile in aromatic nitration?

- (a) NO_2^-
- (b) NO_2^+
- (c) NO_2
- (d) NO_3^-

5. The total pressure of a mixture of two gases is equal to _____

- (a) sum of their partial pressure
- (b) the difference in partial pressure
- (c) the product of partial pressure
- (d) the ratio of the partial pressures



6. NaCl is an example of _____
- (a) Ionic compounds
 - (b) Covalent compounds
 - (c) Metallic compounds
 - (d) Molecular compounds
7. Which of the following substances is used for making a blue glass _____
- (a) CuO
 - (b) CuCO_3
 - (c) CuSO_4
 - (d) CoO
8. T.N.T. is _____
- (a) 2,4-dinitrotoluene
 - (b) 1,2,3-trinitrotoluene
 - (c) 2,4,6-trinitrotoluene
 - (d) 3,4,6-trinitrotoluene
9. Sulpha drugs are used for _____
- (a) Precipitating bacteria
 - (b) Removing bacteria
 - (c) Decreasing the size of bacteria
 - (d) Stopping the growth of bacteria

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10. Antipyretics are medicinal compounds which _____
- (a) lower body temperature
 - (b) relieve pain
 - (c) control malaria
 - (d) can kill other organisms

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Draw the Molecular orbital diagram of O_2 molecule.

Or

- (b) Explain the sp hybridisation with suitable example.

12. (a) Explain Homolytic and Heterolytic cleavage with example.

Or

- (b) Explain substitution reaction with specific example.

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[P.T.O.]



13. (a) Compare gases and liquid state.

Or

(b) Explain intrinsic semiconductors.

14. (a) Write a note on setting of cement.

Or

(b) Explain the preparation and chemistry of T.N.T.

15. (a) How is sulphadiazine prepared? Give its mode of action and uses.

Or

(b) Discuss the cause and treatment of diabetes.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain molecular orbital theory.

Or

(b) Explain sp^2 and sp^3 hybridisation with suitable example.

17. (a) Explain the formation and properties of free radical.

Or

(b) Explain different types of elimination reaction.

18. (a) Derive Vander-Waals gas equation.

Or

(b) Explain different types of crystallographic system.

19. (a) Briefly explain the manufacture of glass.

Or

(b) Describe the wet process and dry process for the manufacture of cement.

20. (a) Explain the following terms with an example

(i) Analgesics

(ii) Antipyretics

(iii) Local anaesthetics.

Or

(b) Discuss the cause and treatment of cancer.



(6 pages)

Reg. No. :

Code No. : 10451 E Sub. Code : CACH 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Second/Fourth Semester

Chemistry — Allied

ALLIED CHEMISTRY — II

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The species having tetrahedral complex is
(a) $[\text{Pd}(\text{Cl}_4)]^{2-}$ (b) $[\text{Ni}(\text{CN})_4]^{2-}$
(c) $[\text{Pd}(\text{CN})_4]^{2-}$ (d) $[\text{NiCl}_4]^{2-}$
- Which one of the following contains cobalt?
(a) Chlorophyll (b) Haemoglobin
(c) Vitamin B₁₂ (d) Vitamin C

- Which of the following groups has the highest inductive effect?
(a) CH_3^- (b) CH_3CH_2
(c) $(\text{CH}_3)_2\text{CH}^-$ (d) $(\text{CH}_3)_3\text{C}^-$
- A racemic mixture is a mixture of
(a) Meso and d-isomers
(b) d-and l-isomers in equal proportions
(c) d-and l-isomers in different proportions
(d) meso and l-isomers
- The unit of equivalent conductivity is
(a) $\text{ohm}^{-1} \text{cm}^2$ (b) $\text{ohm}^{-1}\text{cm}^{-1}$
(c) mho cm (d) mho cm^{-2}
- Reaction occurring at cathode is _____
(a) Hydrolysis (b) Neutralisation
(c) Oxidation (d) Reduction
- Fructose contains _____
(a) 5 OH groups
(b) 3 secondary alcoholic groups
(c) 1 Ketonic group
(d) All are correct



8. An amino acid contains
(a) $-\text{NH}_2$ and COOH group
(b) $-\text{NH}_2$ group
(c) $-\text{COOH}$ group
(d) any other group

9. Penicillin is
(a) Vitamin (b) Hormone
(c) Antibiotic (d) Analgesic

10. Phenacetin is used as
(a) Analgesic (b) Antipyretics
(c) Antimalarial (d) Antiseptic

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write the IUPAC nomenclature of following complexes.
- $[\text{Pt}(\text{NH}_3)_3\text{Cl}_3]\text{Cl}$
 - $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
 - $[\text{Cu}(\text{NH}_3)_4\text{SO}_4]$
 - $[\text{Cr}(\text{H}_2\text{O})_4\text{Cl}_2]\text{Cl}$
 - $[\text{Ni}(\text{NH}_3)_4]\text{Cl}_2$.

Or

- (b) Write a detailed note on chelate effects with examples.

12. (a) State and explain Inductive effect with suitable examples.

Or

- (b) Discuss the optical activity of tartaric acid.

13. (a) Write a note on applications of Kohlrausch's law.

Or

- (b) Describe a method for the determination of pH using glass electrode.

14. (a) How does glucose react with

(i) Excess of $\text{C}_6\text{H}_5\text{NHNH}_2$

(ii) Na/Hg .

Or

- (b) Write a note on classification of amino acids.

15. (a) Write briefly about airborne diseases.

Or

- (b) Write short notes on :

(i) Tulsi

(ii) Keezhanelli.



PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Explain briefly Werner's theory of coordination compounds.

Or

- (b) How do Sidgwick theory explain the formation of coordination compounds?

17. (a) Discuss the types of hybridisation in ethylene and acetylene molecules.

Or

- (b) (i) Explain hyper conjugative effect.
(ii) Discuss the optical activity of tartaric acid.

18. (a) Account on the following

- (i) Galvanic cell
(ii) Prevention of corrosion.

Or

- (b) What are conductometric titrations? Explain the following type of titrations.

- (i) Strong acid vs strong base
(ii) Weak acid vs strong base.

19. (a) (i) Describe the classification of carbohydrates with an example.
(ii) Explain the preparation and properties of glycine.

Or

- (b) Write a note on primary and secondary structure of proteins.

20. (a) (i) Write briefly about hereditary diseases.
(ii) Write a note on antibiotics.

Or

- (b) Define and give examples of the following terms.

- (i) Analgesics
(ii) Antipyretics
(iii) Sulpha drugs.



(6 pages)

Reg. No. :

Code No. : 10446 E Sub. Code : CMCH 11

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

First Semester

Chemistry — Core

INORGANIC CHEMISTRY — I

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Select the de-Broglie equation from the following

- (a) $E = mc^2$ (b) $(\Delta x) \times (\Delta p) = h/4\pi$
(c) $\lambda = h/p$ (d) $n\lambda = 2d \sin \theta$

2. Quote the shape of 's' orbital

- (a) dumb-bell (b) spherical
(c) circle (d) elliptical

3. Identify the atom which has the highest electronegativity

- (a) Cl (b) F
(c) Br (d) I

4. Predict the atom which has the biggest size

- (a) Na (b) Cs
(c) Be (d) I

5. Express which of the following has the highest bond order among the following

- (a) N_2 (b) O_2
(c) H_2 (d) F_2

6. Find out the molecule which has two lone pair of electrons and V shaped structure

- (a) H_2O (b) NH_3
(c) PCl_5 (d) BeH_2

7. Identify the element which has diagonal relationship with Li

- (a) Be (b) Al
(c) Mg (d) Na



8. Predict the element which has the electronic configuration $4s^2$ as the outermost orbital
- (a) K (b) Ca
(c) Mg (d) Ba
9. Select the cation which gives green colour in flame test
- (a) Ca^{2+} (b) Ba^{2+}
(c) Sr^{2+} (d) Na^+
10. Illustrate the indicator from the following which is used as an acid-base indicator
- (a) EDTA
(b) Phenolphthalein
(c) $KMnO_4$
(d) Potassium ferrocyanide

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Describe briefly the Rutherford's atom model.

Or

- (b) State Pauli's exclusion principle and Hund's rule of maximum multiplicity. Explain briefly.

12. (a) Discuss the factors affecting the ionising energy.

Or

- (b) Explain the factors influencing the electronegativity.

13. (a) Examine the various factors favouring the formation of ionic bond.

Or

- (b) Sketch the MO diagram of HF molecule and explain its bond order and magnetic nature based on this diagram.

14. (a) Discuss the inert pair effect.

Or

- (b) Describe the chemistry of zeolites.

15. (a) Analyse the principle of complexometric titrations with suitable example.

Or

- (b) Distinguish between post-precipitation and co-precipitation.



PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) State the four types of quantum numbers and explain their significance with shape of the orbitals.

Or

- (b) Describe briefly the photoelectric effect and Heisenberg's uncertainty principle.

17. (a) Explain briefly the following :

- (i) Modern periodic law
- (ii) Electron affinity
- (iii) Covalent radius.

Or

- (b) How is electronegativity determined using Mullikan's and Pauling's approach?

18. (a) State and explain Born-Haber cycle and its applications.

Or

- (b) (i) Describe the structure of H_2O and NH_3 molecule based on VSEPR theory.
(ii) Describe the magnetic behaviour of O_2^+ , O_2^{2+} , O_2^- and O_2^{2-} .

19. (a) Discuss the allotropes of carbon and sulphur.

Or

- (b) Explain the periodicity of s block elements with respect of electronic configuration, atomic and ionic size, ionisation energy and electronegativity.

20. (a) Illustrate the solubility product, common ion effect, complexation, oxidation, reduction reactions involved in the identifications of anions and cations.

Or

- (b) Analyse the various conditions for the precipitation and minimisation of errors.



(8 pages)

Reg. No. :

Code No. : 10447 E Sub. Code : CMCH 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Second Semester

Chemistry — Core

ORGANIC CHEMISTRY — I

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which among the following is not associated with aliphatic compounds?
 - (a) contain straight chain
 - (b) contain $(4n + 2)\pi$ electrons
 - (c) contain branched chain
 - (d) all the above

2. Which of the following is a permanent electron displacement effect?
 - (a) Inductomeric
 - (b) Electromeric
 - (c) Inductive
 - (d) All of the mentioned
3. Choose the correct one which will react faster in SN_2 reaction?
 - (a) $CH_3 - CH = CH - Br$
 - (b) $CH_2 = CH - CH_2 - Br$
 - (c) $CH_2 = C = CH - Br$
 - (d) All the above
4. When an unsymmetrical reagent adds on unsymmetrical alkene, the negative part of the reagent gets attached to the carbon of carbon - carbon double bond which carries less number of hydrogen atoms. This rule is called _____
 - (a) Markovnikov rule
 - (b) Anti - Markovnikov rule
 - (c) Saytzeff rule
 - (d) None



5. Which of the following will not give aldol condensation?

- (a) phenyl acetaldehyde
- (b) 2-methyl pentanal
- (c) 1-phenyl propanone
- (d) benzaldehyde

6. The correct order of increasing acidic strength is _____

- (a) Phenol < Ethanol < Chloroacetic acid < Acetic acid
- (b) Ethanol < phenol < chloroacetic acid < acetic acid
- (c) Ethanol < phenol < acetic acid < chloroacetic acid
- (d) Chloroacetic acid < acetic acid < phenol < ethanol

7. Organozinc reagent is also known as _____

- (a) Reformatsky enolate
- (b) Grignard reagent
- (c) Tollen's reagent
- (d) None of these

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8. Chloramine T is prepared from _____

- (a) Benzene sulphonic acid
- (b) Benzene sulphonyl chloride
- (c) Toluene sulphonic acid
- (d) Sulphonal

9. Which of the following statement regarding cycloalkanes is wrong?

- (a) Any disubstituted cycloalkane can have cis-trans isomers
- (b) The planar form of any cycloalkane with a ring larger than cyclopropane will not be the most stable conformation
- (c) Cyclopentane is nonpolar to avoid the torsional strain between adjacent C - H bonds
- (d) The least strained form of any unsubstituted cycloalkane is the chair conformation of cyclohexane

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[P.T.O.]



10. In the given conformation, C_2 is rotated about $C_2 - C_3$ bond anticlockwise by an angle of 120° , then the conformation obtained is _____



- (a) Fully eclipsed (b) Partially eclipsed
(c) Staggered (d) Gauche

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) What is nitrene? How is it prepared? Write its structure.
Or
(b) Define (i) Mesomeric effect (ii) Hyper conjugative effect. Give example to illustrate them.
12. (a) Write a mechanism for the peroxide initiated addition of HBr to propene.

Or

- (b) Explain Bredt's rule with example.

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13. (a) Explain the mechanism of addition reaction of Grignard reagent with carbonyl compounds.

Or

- (b) Write note on :
(i) Wolff - Kishner reduction
(ii) Meerwein Ponderf Verley reduction.

14. (a) How is the following prepared from methyl lithium.

- (i) n - propyl alcohol
(ii) Acetic acid.

Or

- (b) How is the following prepared

- (i) Sulphonal
(ii) Mustard gas.

15. (a) Explain why cyclopentane is more stable than cyclobutane.

Or

- (b) Explain Sachse - Mohr concept of strainless ring.

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PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Discuss IUPAC rules for naming branched alkanes. Illustrate with example.

Or

- (b) Write notes on the shape and stability of (i) Carbanion (ii) Carbonium ion (iii) Free radical.

17. (a) Explain with suitable example, the effect of substrate and solvent in S_N1 reaction.

Or

- (b) Discuss the classification of alkadienes with example. Explain the stability of 1,3-butadiene.

18. (a) How α , β , γ and σ hydroxy acids are differentiated?

Or

- (b) Discuss the mechanism of addition reaction of
(i) HCN to aldehyde
(ii) NaHSO_3 to ketone.

19. (a) How does methyl-magnesium chloride reacts with

- (i) CO_2
(ii) CH_3CHO
(iii) $\text{CH}_3\text{CO}\cdot\text{CH}_3$.

Or

- (b) (i) What is a tosyl group? How is it important in organic chemistry?
(ii) Write note on reformatsky reaction.

20. (a) How is ethyl aceto acetate react with the following

- (i) urea
(ii) hydroxylamine
(iii) phenyl hydrazine.

Or

- (b) Explain conformational analysis of n-butane with energy diagram.



Code No. : 10448 E Sub. Code : CMCH 31

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Third Semester

Chemistry — Core

PHYSICAL CHEMISTRY — I

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- PV = constant at constant temperature is called
 - Charle's law
 - Avogadro's law
 - Boyle's law
 - None of these

- Radio carbon dating was developed by
 - M. Curie
 - M. Calvin
 - H. Bequerel
 - W.F. Libby
- Geiger nattal rule states that
 - $\log \lambda = c \log R + b$
 - $\log c = \lambda \log R + b$
 - $\log b = c \log R + \lambda$
 - None of the above
- During photosynthesis chlorophyll act as a
 - Catalyst
 - Sensitizer
 - Promotor
 - None of the above
- Delayed fluorescence is called
 - Fluorescence
 - Phosphorescence
 - Chemiluminescence
 - Bioluminescence

- $\frac{\sqrt{8RT}}{\pi m}$ is called
 - average velocity
 - most probable velocity
 - root mean square velocity
 - none of these
- CST of Phenol-H₂O system — on adding NaCl.
 - Increase
 - Decrease
 - No change
 - Can't be predicted
- Ideal solution obey —.
 - Henry's law
 - Raoult's law
 - Boyle's law
 - Graham's law
- Which one of the following material does possess same electrical conductivity in all directions?
 - NaCl solution
 - Glass
 - Molten NaCl
 - Solid NaCl
- The co-ordination number for an atom in fcc structure is —.
 - 4
 - 6
 - 8
 - 2

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

- Discuss the merits and demerits of kinetic equation.

Or

 - Explain compressibility of gases.
- Write a note on Raoult's law of binary liquid mixture.

Or

 - Write a note on azeotropic distillation.
- Write a note on elements of symmetry.

Or

 - Explain Miller indices with an example.
- Write notes on magic numbers.

Or

 - Write note on mass defect.
- Explain the primary and secondary process of an photochemical reaction with an example.

Or

 - Write a note on fluorescence.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Discuss in detail Maxwell's distribution of molecular velocities.

Or

- (b) Explain the term co-efficient of viscosity. How is this parameter used for calculating the mean free path and collision diameter of a gas?

17. (a) State and explain trouton's rule.

Or

- (b) Explain the theory of fractional distillation of miscible liquids.

18. (a) Derive lattice energy using Born Lande equation.

Or

- (b) Draw and explain the structure of NaCl.

19. (a) Explain a method for separation of Isotopes.

Or

- (b) How is age of wood is determined by radioactivity?

Page 5 Code No. : 10448 E

20. (a) Explain photosensitization with an example.

Or

- (b) Explain the fate of excited states.
-

Page 6 Code No. : 10448 E

(6 pages)

Reg. No. :

Code No. : 10449 E Sub. Code : CMCH 41

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Fourth Semester

Chemistry – Core

INORGANIC CHEMISTRY – II

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. NH_3 is
 - (a) Lewis acid
 - (b) Lewis base
 - (c) Arrhenius acid
 - (d) All the above
2. Ag^+ is a
 - (a) Hard base
 - (b) Hard acid
 - (c) Soft acids
 - (d) Soft base

3. Which one of the following is a highest oxidation state in d block elements?
 - (a) +2
 - (b) +4
 - (c) +7
 - (d) (a) and (c)
4. Most of the transition metals ions and their compounds are
 - (a) Ferro magnetic
 - (b) Anti ferro magnetic
 - (c) Paramagnetic
 - (d) Diamagnetic
5. Which metal is used for refining metals that have a low melting point by zone refining?
 - (a) tin
 - (b) lead
 - (c) bismuth
 - (d) all the above
6. Which one of the industrial process for the commercial production of pure ductile titanium, zirconium etc?
 - (a) Zone refining
 - (b) Van arkel de boer refining
 - (c) Electrolytic refining
 - (d) All the above

Page 2 Code No. : 10449 E

7. Which one of the following is correct?
 - (a) All halogens are diatomic molecules
 - (b) All halogens exist as monoatomic molecules
 - (c) All the halogens are colourless
 - (d) Chlorine does not reacts with water
8. Which indicates how readily they can accept electrons?
 - (a) Oxidising state
 - (b) Oxidising power
 - (c) Oxidising ability
 - (d) Oxidation
9. When a measurement results comes to the true value, its known as
 - (a) Precision
 - (b) Error
 - (c) Accuracy
 - (d) Systematic accuracy
10. The median of 4, 1, and 7
 - (a) 1
 - (b) 2
 - (c) 7
 - (d) 4

Page 3 Code No. : 10449 E

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write on lewis concept.

Or

(b) Write shortly on SHAB principle.
12. (a) Write a note on the following in d block elements (i) Density (ii) Colour.

Or

(b) Explain Lanthanide contraction.
13. (a) Write the preparation and properties of $\text{U}(\text{CH}_3\text{COO})_2$.

Or

(b) Write the preparation and properties of $\text{K}_2\text{Cr}_2\text{O}_7$.
14. (a) Write the preparation and properties of CIF.

Or

(b) Write the preparation and properties of clathrates.

Page 4 Code No. : 10449 E
[P.T.O.]

15. (a) How the significant figures are important in error analysis?

Or

- (b) Define the following (i) Median (ii) Mean (iii) Relative mean deviation.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) (i) Discuss on Brownsted Lowry concept. (5)
(ii) Write a note on levelling effect. (3)

Or

- (b) (i) Write in detail on Usanovic concept. (4)
(ii) Write on classification of solvent. (4)

17. (a) Discuss on the following in d block elements
(i) Catalytic properties (ii) Complex formation.

Or

- (b) Discuss the following in f block elements
(i) Oxidation states (ii) Magnetic properties.

Page 5 Code No. : 10449 E

18. (a) Explain :

(i) Magnetic separation (4)

(ii) Calcination and roasting. (4)

Or

- (b) Explain

(i) Van Arkel refining (4)

(ii) List out the uses of thorium. (4)

19. (a) (i) Write a note on pseudohalogens. (5)

(ii) List out the properties of clathrates. (3)

Or

- (b) (i) Write a note on cyanogens and azidocarbon disulphide. (5)

(ii) List out the uses of inert gases. (3)

20. (a) (i) How will you detect and eliminate the systematic errors? (6)

(ii) Define Errors. (2)

Or

- (b) (i) How the standard deviation is useful in the statistical treatment of error analysis. (5)

(ii) Write a note on T test. (3)

Page 6 Code No. : 10449 E

(6 pages)

Reg. No. :

Code No. : 10457 E Sub. Code : CNCH 32

U.G. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Third Semester

Chemistry

Non Major Elective – WATER MANAGEMENT

(For those who joined in July 2021 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The part of wastewater that is contaminated with feces is known as
- (a) sewage water (b) industrial water
(c) dye pollutants (d) all the above

7. A process that requires the presence of oxygen is known as
- (a) anaerobic (b) aerobic
(c) primary (d) secondary
8. The change in form of materials dissolved in water into solid particles is termed as
- (a) chemical precipitation
(b) coagulation
(c) filtration
(d) osmosis
9. Ganga action plan was started in
- (a) 1986 (b) 1996
(c) 2006 (d) 1970
10. To conserve rainwater by collecting, storing is called as
- (a) Pollution prevention
(b) Water prevention
(c) Rain water harvesting
(d) All the above

Page 3 Code No. : 10457 E

2. Increasing the amount of plant and algae growth to coastal waters leads to
- (a) pollution
(b) hazardous
(c) eutrophication
(d) detergent pollution
3. Which one of the following is a quality parameter for water?
- (a) temperature (b) pH
(c) dissolved solids (d) all the above
4. Biological parameter of water quality include
- (a) algae (b) phytoplankton
(c) (a) and (b) (d) sewage indication
5. The process of cleaning the water with a chemical, in order to destroy bacteria is called as
- (a) Filtration (b) Disinfection
(c) Coagulation (d) Sedimentation
6. The process of removing salts from seawater is called as
- (a) filtration (b) disinfection
(c) desalination (d) coagulation

Page 2 Code No. : 10457 E

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the types of water pollutants.
Or
(b) Describe the eutrophication and its effects.
12. (a) Account on the WHO standards for drinking water.
Or
(b) How will you determine the pH of drinking water?
13. (a) Discuss on sedimentation.
Or
(b) Write a note on reverse osmosis.
14. (a) Explain Chemical precipitation.
Or
(b) How the chemical processes are useful in waste water treatment?
15. (a) List out the objectives implementation and drawbacks of ganga action plan.
Or
(b) Write a note on water recycling.

Page 4 Code No. : 10457 E

[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) (i) Discuss on the sewage and domestic wastes. (5)
(ii) Write a note on detergents. (3)

Or

- (b) (i) How the industrial effluents are hazardous to the environment? (6)
(ii) Define. Pathogens. (2)
17. (a) (i) Illustrate the water quality standards for drinking water. (6)
(ii) Define. Total hardness. (2)

Or

- (b) Discuss on the following:
(i) BOD
(ii) COD.
18. (a) (i) Explain Flocculation. (5)
(ii) Write a note on filtration. (3)

Or

- (b) (i) How the disinfection process is useful in the process of drinking water? (4)
(ii) Write a note on water softening. (4)

Page 5 Code No. : 10457 E

19. (a) (i) Explain: Aerobic and anaerobic processes. (5)
(ii) Discuss shortly on waste water treatment. (3)

Or

- (b) (i) Discuss on evaporation adsorption. (4)
(ii) Explain. Chemical precipitation. (4)

20. (a) (i) Elaborate the concept of rain water harvesting. (5)
(ii) Write the significance of rivers. (3)

Or

- (b) (i) Write the water prevention and control of pollution act 1974. (5)
(ii) Write a short note on drip irrigation. (3)

Page 6 Code No. : 10457 E

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The role of TiO_2 in cosmetics
(a) anticeptic (b) uv-filter
(c) colourant (d) preservatives
2. Pick out the name of a natural perfume from the following
(a) musk (b) linalool
(c) coumarin (d) flavones

8. Plants prepare their own food by _____.
(a) hydrolysis
(b) oxidation
(c) reduction
(d) photosynthesis
9. The chemical compound used in leather tanning is _____.
(a) ammonium sulphate
(b) ammonium borate
(c) basic chromium sulphate
(d) ammonium chloride
10. _____ is a synthetic fiber.
(a) wool
(b) silk
(c) cotton
(d) nylon

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the classification of cosmetics.
Or
(b) Summarize the role of additives in cosmetics.

3. The byproduct obtained with soap is _____.
(a) KOH (b) NaOH
(c) glycol (d) glycerol
4. Pick out the name of the surfactant from the following
(a) sodium sulphate
(b) sodium lauryl sulphate
(c) uranyl sulphate
(d) paraffin
5. In microwave oven electromagnetic energy is converted into _____ energy.
(a) light (b) sound
(c) heat (d) none of the above
6. Which of the following is a saturated fatty acid?
(a) myristic acid
(b) palmitic acid
(c) steric acid
(d) all the above
7. Plant converts carbon dioxide into _____.
(a) starch
(b) aldehyde
(c) ketone
(d) water

12. (a) What are soaps? Give their composition.
Or
(b) Summarize the bio-degradability of soap.
13. (a) Compile the chemistry of microwave cooking.
Or
(b) Predict the nature and composition of fatty acids in butter.
14. (a) Illustrate the effect of nutrient deficiency in plants.
Or
(b) Illustrate the role of fertilizers with example.
15. (a) Identify the different dyes used in textile industries. Give their nature.
Or
(b) Write the composition of carpet material.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Tabulate the composition of moisturizing soap and medicated soap.

Or

- (b) Discuss the following cosmetics in detail.

- (i) shampoo
- (ii) deodorants

17. (a) What are detergents? Explain their action.

Or

- (b) Give the composition of the following with example.

- (i) washing soap
- (ii) toilet soap.

18. (a) Compile the chemistry of cooking.

Or

- (b) Predict the stability of nutrients during cooking.

19. (a) Discuss the biological control of weeds and pests.

Or

- (b) Illustrate the following with example

- (i) insecticides
- (ii) fungicides

20. (a) Construct the methodology for leather tanning.

Or

- (b) Illustrate the following with example.

- (i) Yarn
- (ii) Fabrics.

(6 pages)

Reg. No. : _____

Code No. : 10452 E Sub. Code : CSCH 31

B.Sc (CBCS) DEGREE EXAMINATION,
APRIL 2023

Third Semester

Chemistry — Skill Based Subject

GREEN CHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The atom economy obtained for green synthesis is in the range of
- (a) 62 - 70 %
 - (b) 72 - 82 %
 - (c) 40 - 50 %
 - (d) 90 - 100 %

2. Which of the following is not a principle of green chemistry?

- (a) Green solvents and auxiliaries
- (b) Use of renewable feedback
- (c) Hazardous Chemical Synthesis
- (d) Design for energy efficiency.

3. What is the starting material for nylon - 6,6 is

- (a) Acetic anhydride
- (b) 2-methyl propyl benzene
- (c) Nitric acid
- (d) Adipic acid

4. Which of the following is a green solvent used for bleaching clothes?

- (a) Hydrogen peroxide
- (b) Tetrachloro ethane
- (c) Benzene
- (d) Toluene

5. What is the effect of enzymes on the rate of biochemical reactions?
- (a) The rate decreases
 - (b) The rate increases
 - (c) It does not change
 - (d) Either (b) or (a)
6. The dibasic acid is used in its _____
- (a) liquid form (b) solid state
 - (c) impure form (d) pure form
7. Use of _____ has led to high yielding synthesis of a thermally unstable Hofmann elimination product.
- (a) Ultra sound
 - (b) Hyper sound
 - (c) Low frequency
 - (d) Microwave irradiation
8. The chemical effect of ultrasound was first reported by
- (a) Richards & Loomis
 - (b) Pierre curie
 - (c) Thorny craft
 - (d) Barnaby

9. Which of the following is a commonly used material in solar cell?
- (a) Aluminium (b) Germanium
 - (c) Silicon (d) Copper
10. How is hydrogen stored physically?
- (a) As atoms
 - (b) By compressing hydrogen gas
 - (c) In the form of hydrides
 - (d) In the form of water.

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Define green chemistry. Give the needs of green chemistry.
- Or
- (b) Discuss the Rearrangement reactions with 100% atom economy.
12. (a) Give the advantages and applications of super critical fluid.
- Or
- (b) Discuss about dry cleaning super. critical polymerisation.

13. (a) Explain bio catalyst.

Or

(b) Define acid-base catalyst. Explain the TAMM catalyst.

14. (a) Explain the mechanism of Claisen rearrangement.

Or

(b) Discuss alkylation of ultrasound assisted reactions.

15. (a) Explain the sources of Biomass.

Or

(b) Explain the importance of wind energy.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

(a) Describe the environmental load factor and Reaction selectivity.

Or

(b) Explain the following :

(i) Any five principles of Green Chemistry.

(ii) 100% Atom economy in elimination reactions.

17. (a) Give the reactions in water and near critical water region in super critical water.

Or

(b) Describe the extraction of super critical fluids and its applications.

18. (a) Explain the hydrolytic process prefluorinated catalyst.

Or

(b) Describe the photo sensitized super acid catalyst.

19. (a) Explain ultrasound reaction in coupling reaction and Cannizzaro reactions.

Or

(b) Give the microwave assisted reactions in the hydrolysis of benzoyl chloride and methyl benzoate.

20. (a) Describe the storage of solar energy.

Or

(b) Give the detail information of wind energy its importance and uses.

(6 Pages)

Reg. No. :

Code No. : 10455 E Sub. Code : CSCH 42

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Fourth Semester

Chemistry

Skill Based Subject — INDUSTRIAL CHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Hardness of water is measured in terms of
- (a) gm/litre (b) mgm/litre
- (c) ppm (d) none of the above

2. Brackish water contain dissolved salts
- (a) Ca - salts (b) Mg salts
- (c) NaCl (d) Zn - salts
3. LPG mainly contains
- (a) methane and ethane
- (b) propane and butane
- (c) ethane and propane
- (d) methane and butane
4. The odurant mixed with LPG is
- (a) H₂S (b) Ozone
- (c) Chlorine (d) Mercaptane
5. The OCV of H₂ – O₂ fuel cell is
- (a) 1.0 V (b) 1.1 V
- (c) 1.2 V (d) 1.5 V
6. Which of the following material is used in solar cell
- (a) Barium (b) Silicon
- (c) Silver (d) Selenium

7. The constituents of a paint is
- (a) filler (b) pigment
(c) thinner (d) all the above
8. The ships in sea are protected from corrosion by
- (a) anodic protection (b) cathodic protection
(c) deaeration (d) anodic inhibitor
9. The colouring agent used for the preparation of red ink is
- (a) malachite green (b) ink blue crystals
(c) eosin Y (d) nigrosine crystals
10. _____ is made from potato starch.
- (a) Gum paste (b) Tooth paste
(c) Agarbattis (d) Mouth balls

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Write the disadvantages of hardness of water.
Or
(b) Explain estimation of temporary hardness of water by 'O' Hehner's method.

Page 3 Code No. : 10455 B

12. (a) Define biogas, mention its uses.

Or

- (b) What are synthetic fuels? Give examples write their preparation by polymerisation.

13. (a) What are dielectric materials? Mention their main properties.

Or

- (b) Explain the working of lithium battery.

14. (a) Write the mechanism of wet corrosion.

Or

- (b) Describe galvanization.

15. (a) Write the preparation and properties of wax candle.

Or

- (b) Describe the preparation and uses of shoe polish.

Page 4 Code No. : 10455 B

[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Explain zeolite process of removing water hardness.

Or

- (b) How are ions of the salt from the salt water separated by electro dialysis?

17. (a) Write the different types of petroleum products and their applications.

Or

- (b) What is power alcohol? How is it manufactured?

18. (a) Explain hydrogen - oxygen fuel cell.

Or

- (b) Briefly explain the working of a solar cell.

19. (a) Write the differences between galvanizing and tinning.

Or

- (b) Explain electroplating.

20. (a) Discuss the preparation and uses of plaster of paris, writing ink.

Or

- (b) Write the preparation and uses of silicon carbide crucible, safety matches.
-

(6 pages)

Reg. No. :

Code No. : 10012 E

Sub. Code : SACH 11/
AACH 11

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

First/Third Semester

Chemistry — Allied

ALLIED CHEMISTRY — I

(For those who joined in July 2017–2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The shape of BF_3 molecule is
(a) hexagonal (b) trigonal
(c) tetrahedral (d) 'V' shaped
- Maximum electrons present in 'd' orbital is
(a) 2 (b) 4
(c) 6 (d) 10

- Which one among the following is not an electrophile?
(a) BF_3 (b) AlCl_3
(c) SO_3 (d) NH_3
- Free radicals are
(a) Positively charged
(b) Negatively charged
(c) Neutral
(d) All of these
- Which one among the following is light emission due to chemical reactions?
(a) Thermoluminescence
(b) Chemiluminescence
(c) Bioluminescence
(d) Fluorescence
- $3\text{O}_2 \rightarrow 2\text{O}_3$
The quantum yield of the above reaction is
(a) 2.0 (b) 10^2
(c) 10^3 (d) 0.01
- Which one among the following is thermoplastic?
(a) Nylon (b) Terelyene
(c) Orlon (d) Polystyrene

Page 2 Code No. : 10012 E



8. The monomer of neoprene rubber is
(a) acrylic acid (b) methyl acrylate
(c) chloroprene (d) acrylonitrile
9. The raw material used in the preparation of moth ball is
(a) turpentine (b) benzene
(c) naphthalene (d) toluene
10. Synthetic lubricating oil does not possess
(a) easily inflammable
(b) high flash point
(c) high viscosity index
(d) high thermal stability

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Distinguish between electrovalent bond and covalent bond.
Or
(b) Write the electronic configuration of the following elements.
(i) Nitrogen (At.no.7)
(ii) Phosphorous (At.no.15)
(iii) Calcium (At.no.20)
(iv) Chromium (At.no.24)
(v) Copper (At.no.29)

12. (a) Write notes on electrophiles and nucleophiles with suitable examples

Or

- (b) Explain carbonium ion and free radicals with examples

13. (a) Explain the following :

- (i) Stark-Einstein law
(ii) Quantum yield.

Or

- (b) What is quantum yield? Give any two examples for the reactions having high and low quantum yield.

14. (a) How is polyporpylene prepared? Give its two uses.

Or

- (b) Name the monomers used in the making of phenol resins. Write any four uses of phenol resins.

15. (a) What are lubricants? Explain their types with examples.

Or

- (b) Write down the preparation of the following :

- (i) Tooth paste
(ii) Moth balls

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) What is hydrogen bonding? Explain the types of hydrogen bonding. Write down its consequences.

Or

- (b) Write notes on :

- (i) Aufbau principle
- (ii) Hund's rule
- (iii) sp^3d hybridisation.

17. (a) Explain the following reactions with suitable equations.

- (i) Addition reactions
- (ii) Elimination reactions
- (iii) Substitution reactions.

Or

- (b) Explain the following with suitable examples

- (i) Free radicals
- (ii) Homolytic and heterolytic cleavage

18. (a) Compare the thermal and photochemical reactions.

Or

- (b) Distinguish between fluorescence and phosphorescence by giving two examples each.

19. (a) What are polymers? How are they classified? Explain briefly any two of these polymers?

Or

- (b) How are Buna-N and Buna-S rubbers prepared? Write down their uses.

20. (a) Explain the preparation of the following

- (i) Nail polish
- (ii) Tooth powder.

Or

- (b) (i) Explain the criteria of a good lubricating oil.
(ii) Write the advantages of solid lubricants.



19/06/23
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(7 pages)

Reg. No. :

Code No. : 10013 E

Sub. Code : SACH 21/
AACH 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Second/Fourth Semester

Chemistry — Allied

ALLIED CHEMISTRY — II

(For those who joined in July 2017–2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following is a characteristic of an aromatic compound?
- (a) cyclic
 - (b) planar
 - (c) $(4n+2)\pi$ electrons
 - (d) all the above

2. Which of the following is formed when benzene is oxidised by V_2O_5 in presence of air?
- (a) Benzoic anhydride
 - (b) Benzaldehyde
 - (c) Maleic anhydride
 - (d) Benzoic acid
3. Which isotope below has the highest binding energy?
- (a) ^4He
 - (b) ^{16}O
 - (c) ^{32}S
 - (d) ^{55}Mn
4. Which of the following element used for dating the ancient remains is?
- (a) C - 14
 - (b) Ni
 - (c) C - 12
 - (d) Rd
5. Nucleoside contains
- (a) Base - phosphate
 - (b) Base - sugar
 - (c) Base sugar - phosphate
 - (d) Sugar - phosphate



6. Which of the following is a reducing sugar?
- (a) Dihydroxy acetone
 - (b) Erythrulose
 - (c) Glucose
 - (d) All the above
7. Urea is a _____ fertilizer.
- (a) Nitrogen (b) Potash
 - (c) Phosphatic (d) None of these
8. Producer gas is a mixture of
- (a) Water and air (b) CO and CO₂
 - (c) CO and H₂ (d) CO and N₂
9. Deficiency of insulin causes
- (a) scurvy (b) diabetes
 - (c) beri - beri (d) hepatitis - B
10. Dysentery is _____ disease.
- (a) infectirus (b) herebtitary
 - (c) deficiency (d) none of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the oxidation reaction in benzene.

Or

- (b) Discuss the preparation of anthracene.

12. (a) Write short notes on mass defect.

Or

- (b) Write the difference between nuclear fission and nuclear fusion.

13. (a) Write a note on artificial sweetners.

Or

- (b) Write any three colour reactions of proteins.

14. (a) Explain the role of mineral elements in plant growth.

Or

- (b) Write a note on photochromic glass.



15. (a) Explain the Water - borne diseases.

Or

(b) Write note on :

(i) Analgesics

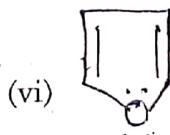
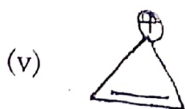
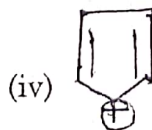
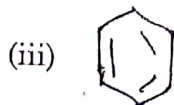
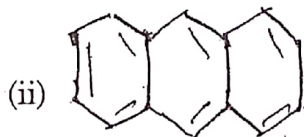
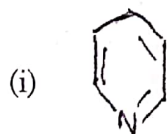
(ii) Sulpha drugs.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Which of the following compounds will show aromaticity? Give reasons.



Or

Page 5 Code No. : 10013 E

(b) Discuss the chemical reactions of Naphthalene.

17. (a) Write a notes on :

(i) Isobars

(ii) Isotones

(iii) Separation of isotopes.

Or

(b) Explain nuclear fission and its applications.

18. (a) Explain the classification of aminoacids.

Or

(b) What are nucleic acid? Give the components of DNA.

19. (a) How are the following prepared?

(i) Ammonium sulphate

(ii) Superphosphate of lime

(iii) Mixed fertilizers.

Or

(b) Explain the classification of detergents and uses.

Page 6 Code No. : 10013 E

20. (a) What is diabetes? Explain briefly the types of diabetes and their treatment.

Or

(b) Write a note on :

(i) Antimalarials

(ii) Antibiotics.

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(7 pages)

Reg. No. :

Code No. : 10013 E

Sub. Code : SACH 21/
AACH 21

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Second/Fourth Semester

Chemistry — Allied

ALLIED CHEMISTRY — II

(For those who joined in July 2017–2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following is a characteristic of an aromatic compound?
- (a) cyclic
 - (b) planar
 - (c) $(4n+2)\pi$ electrons
 - (d) all the above

2. Which of the following is formed when benzene is oxidised by V_2O_5 in presence of air?
- (a) Benzoic anhydride
 - (b) Benzaldehyde
 - (c) Maleic anhydride
 - (d) Benzoic acid
3. Which isotope below has the highest binding energy?
- (a) ^4He
 - (b) ^{16}O
 - (c) ^{32}S
 - (d) ^{55}Mn
4. Which of the following element used for dating the ancient remains is?
- (a) C - 14
 - (b) Ni
 - (c) C - 12
 - (d) Rd
5. Nucleoside contains
- (a) Base - phosphate
 - (b) Base - sugar
 - (c) Base sugar - phosphate
 - (d) Sugar - phosphate



6. Which of the following is a reducing sugar?
- (a) Dihydroxy acetone
 - (b) Erythrulose
 - (c) Glucose
 - (d) All the above
7. Urea is a _____ fertilizer.
- (a) Nitrogen
 - (b) Potash
 - (c) Phosphatic
 - (d) None of these
8. Producer gas is a mixture of
- (a) Water and air
 - (b) CO and CO₂
 - (c) CO and H₂
 - (d) CO and N₂
9. Deficiency of insulin causes
- (a) scurvy
 - (b) diabetes
 - (c) beri - beri
 - (d) hepatitis - B
10. Dysentery is _____ disease.
- (a) infectirus
 - (b) herebtitary
 - (c) deficiency
 - (d) none of these

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the oxidation reaction in benzene.

Or

- (b) Discuss the preparation of anthracene.

12. (a) Write short notes on mass defect.

Or

- (b) Write the difference between nuclear fission and nuclear fusion.

13. (a) Write a note on artificial sweetners.

Or

- (b) Write any three colour reactions of proteins.

14. (a) Explain the role of mineral elements in plant growth.

Or

- (b) Write a note on photochromic glass.



15. (a) Explain the Water - borne diseases.

Or

(b) Write note on :

(i) Analgesics

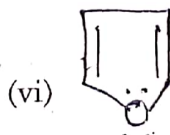
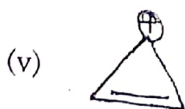
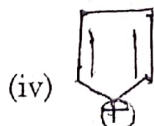
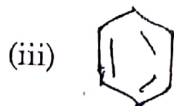
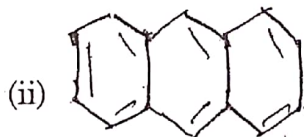
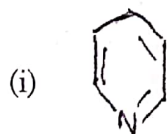
(ii) Sulpha drugs.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Which of the following compounds will show aromaticity? Give reasons.



Or

Page 5 Code No. : 10013 E

(b) Discuss the chemical reactions of Naphthalene.

17. (a) Write a notes on :

(i) Isobars

(ii) Isotones

(iii) Separation of isotopes.

Or

(b) Explain nuclear fission and its applications.

18. (a) Explain the classification of aminoacids.

Or

(b) What are nucleic acid? Give the components of DNA.

19. (a) How are the following prepared?

(i) Ammonium sulphate

(ii) Superphosphate of lime

(iii) Mixed fertilizers.

Or

(b) Explain the classification of detergents and uses.

Page 6 Code No. : 10013 E

20. (a) What is diabetes? Explain briefly the types of diabetes and their treatment.

Or

(b) Write a note on :

(i) Antimalarials

(ii) Antibiotics.

(6 pages)

Reg. No. :

Code No. : 10022 E Sub. Code : SECH 5 A/
AECH 51

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fifth Semester

Chemistry

Major Elective — POLYMER CHEMISTRY

(For those who joined in July 2017–2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Monomers are converted to polymer by
- Condensation reaction between monomers
 - Hydrolysis of monomers
 - Protonation of monomers
 - None of these

2. In co-ordination polymerisation the catalyst used is

- Zn/HCl
- Na/Hg
- Ziegler Natta catalyst
- None of these

3. Tg is evaluating the

- Flexibility of a polymer
- Response on mechanical stress
- Plastic at particular temperature
- All the above

4. Which one of the following is not true

- $M_w > M_n$
- $M_w < M_n$
- Viscosity of the polymers is more than solvent
- Both (a) and (c)

5. Method used to produce articles from thermo setting plastics is

- (a) Compression moulding
- (b) Calendaring
- (c) Rotational casting
- (d) Blow moulding

6. The technique used to make hollow article

- (a) Calendaring (b) Injection moulding
- (c) Blow moulding (d) Film casting

7. Which of the following is a polyamide?

- (a) Teflon (b) Nylon 6, 6
- (c) Terrylene (d) Bakelite

8. Which one of the following is thermosetting plastic?

- (a) Bakelite (b) PVC
- (c) Teflon (d) PET

9. Which one of the following is a conducting polymer?

- (a) Polyaniline (b) PVC
- (c) PET (d) PMMA

10. Which one of the following is a inorganic polymer?

- (a) Starch (b) Cellulose
- (c) Silicones (d) Reyan

Page 3 Code No. : 10022 E

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) How are polymers classified based on origin?

Or

(b) Write a note on Bulk polymerisation.

12. (a) Write notes on molecular weight of polymers.

Or

(b) Write a note on glass transition temperature.

13. (a) Write a note on calendaring.

Or

(b) Explain blow moulding.

14. (a) Differentiate thermoplastic and thermosetting resins.

Or

(b) Give the preparation and properties of polystyrene.

15. (a) Write a note on biopolymers.

Or

(b) Write a note on silicones.

Page 4 Code No. : 10022 E

[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Discuss in detail about co-ordination polymerisation.

Or

- (b) Write a note on (i) addition polymerisation
(ii) condensation polymerisation.

17. (a) Write a note on polymer degradation.

Or

- (b) Write a note on (i) degree of polymerisation
(ii) vulcanisation.

18. (a) Write a note on emulsion polymerisation.

Or

- (b) Explain the following (i) compression moulding
(ii) die casting.

19. (a) Explain the preparation and properties of thermo setting plastics.

Or

- (b) Give the preparation, properties and uses of the following (i) Nylon 66 (ii) PVC.

Page 5 Code No. : 10022 E

20. (a) Write a detail about high temperature and fire resistant polymers.

Or

- (b) Write a note on conducting polymers.

Page 6 Code No. : 10022 E

(6 pages)

Reg. No. :

Code No. : 10026 E Sub. Code : SECH 6 A/
AECH 61

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2023.

Sixth Semester

Chemistry

Major Elective – GREEN CHEMISTRY

(For those who joined in July 2017 – 2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The percentage ratio of molecular weight of product and molecular weight of reactants is called
(a) Yield
(b) Carbon efficiency
(c) Atom economy
(d) Mass intensity
- Concept of Atom Economy was introduced by
(a) Bohr (b) William
(c) Rontgen (d) B.M. Trost
- Dimerisation of Butadiene gives
(a) Octa-1,4,6-triene
(b) Octa-1,3,6-triene
(c) Octa-1,2,3-triene
(d) Octa-1,5,6-triene
- _____ is a preferred green solvent.
(a) Methanol (b) Ethyl acetate
(c) Toluene (d) Water
- The example for oxido reductase biocatalyst is
(a) Carboxylases (b) Aldolases
(c) Ketolase (d) Dehydrogenase
- The catalyst which is used to remove heavy metals in water is
(a) MCM-41
(b) PFC
(c) Oxido-reductase
(d) Modified PEG supported enzyme

7. Green synthesis of catechol starts from
- (a) Fructose (b) Sucrose
(c) D-Glucose (d) Acetaldehyde
8. The rearrangement involved in the green synthesis of Paracetamol
- (a) Claisen rearrangement
(b) Hofmann rearrangement
(c) Wagnere rearrangement
(d) Beckmann rearrangement
9. Father of Green Chemistry is
- (a) John C. Warner (b) Paul T. Anastas
(c) Lewis (d) Henry
10. Drug used for reducing nausea and vomiting during pregnancy is
- (a) Titanium dioxide
(b) Thalidomide
(c) Prufen
(d) Paracetamol

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the terms "Mass Intensity and Mass Productivity".
Or
(b) Discuss briefly "the concept of selectivity".
12. (a) Discuss the applications of Ionic liquids in organic synthesis.
Or
(b) Explain the principle and procedure of super critical fluid extraction.
13. (a) Explain photosensitised super acid catalyst with examples.
Or
(b) Write notes on Bio-Catalysts with types and examples.
14. (a) Give the green synthesis method of Ibu Profen.
Or
(b) Discuss about the microwave assisted reactions.

15. (a) Discuss about versatile bleaching agents.

Or

(b) Discuss about the choice of starting materials with examples.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss briefly the need and scope of green chemistry.

Or

(b) (i) Explain the term atom economy and carbon efficiency with an example.

(ii) Define the terms yield and effective mass yield.

17. (a) Draw the phase diagram of carbon dioxide. Explain its super critical state.

Or

(b) What are green reagents? Explain the action of dimethyl carbonate and polymer supported reagents in synthesis.

Page 5 Code No. : 10026 E

18. (a) Write notes on (i) Activated Hydrotalcites
(ii) Polymer supported catalyst.

Or

(b) Discuss about (i) TAML catalyst
(ii) Perfluorinated catalyst.

19. (a) Discuss the green synthesis of (i) Citral
(ii) Paracetamol.

Or

(b) Explain in detail about the Ultra sound assisted reactions.

20. (a) Discuss the twelve principles of Green Chemistry with suitable examples.

Or

(b) Explain the important role of green chemistry in day to day life.

Page 6 Code No. : 10026 E

(6 pages)

Reg. No. :

Code No. : 10001 E Sub. Code : SMCH 11

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

First Semester

Chemistry — Core

INORGANIC CHEMISTRY — I

(For those who joined in July 2017–2019)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The one which is used to describe the position and energy of the electron in an atom
 - (a) quantum number
 - (b) wave function
 - (c) probability distribution
 - (d) debroglie equation

2. The principle which states that the electrons fill lower - energy atomic orbitals before filling higher - energy ones is
 - (a) Hund's rule
 - (b) Aufau principle
 - (c) Pauli's principle
 - (d) Wave function
3. The unit of electron affinity is
 - (a) mol⁻¹
 - (b) kJ/mol
 - (c) kJ/mol⁻¹
 - (d) kJ⁻¹mol
4. The general outer electronic configuration of S block element is
 - (a) ns⁽¹⁻¹⁾
 - (b) ns⁽¹⁻⁰⁾
 - (c) ns⁽²⁻¹⁾
 - (d) ns⁽¹⁻²⁾
5. Which theory fails to explain the tetravalency of carbon
 - (a) Molecular Orbital theory
 - (b) Valance Bond theory
 - (c) Lattice energy
 - (d) Fajan's rule



6. Which one of the following is a factor which affects lattice energy
- (a) The magnitude of charge associated with the constituent ions
- (b) The distance between the ions
- (c) (a) and (b)
- (d) None of the above
7. Which is more appropriate to BeH_2
- (a) electron deficient covalent compound
- (b) electron rich covalent compound
- (c) covalent compound
- (d) electron deficient ionic compound
8. The melting point and boiling point of lithium are _____ that than other alkali metals.
- (a) higher (b) lower
- (c) no change (d) none of the above
9. Borazine is _____ reactive as compared to benzene.
- (a) more (b) less
- (c) equal (d) not applicable

Page 3 Code No. : 10001 E

10. $-\text{R}_2\text{Si}-\text{O}-\text{SiR}_2-$ is related to
- (a) silicones (b) silicates
- (c) borohydrides (d) oxyacids

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Discuss on schrodinger wave equation.

Or

- (b) Define
- (i) Hund's rule (2.5)
- (ii) Aufbau principle. (2.5)

12. (a) Describe on the classification of s,p,d and f block element.

Or

- (b) Explain. Allred Rochow's scale of electronegativity.

13. (a) List out the factors affecting lattice energy.

Or

- (b) Discuss on the applications of MOT to O_2 and F_2 .

Page 4 Code No. : 10001 E

[P.T.O.]



14. (a) Discuss on the diagonal relationship between Li and Be.

Or

- (b) Compare the solvation tendencies of alkali and alkaline earth metals with examples.

15. (a) List out the general characteristics of p-block elements.

Or

- (b) Write the preparation and properties of borazine.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Write a note on the quantum numbers and their significance.

Or

- (b) (i) Discuss on the radial probability distribution.
(ii) Write a short note on Pauli's exclusion principle.

17. (a) Define the following :

- (i) ionic radii
(ii) atomic radii
(iii) electron affinity
(iv) ionisation energy.

Or

- (b) (i) List out the factors affecting the electronegativity. (4)
(ii) Write the applications of electronegativity. (4)

18. (a) Explain

- (i) Born Haber cycle. (5)
(ii) Discuss on enthalpy of formation. (3)

Or

- (b) Explain

- (i) Fajan's rule. (4)
(ii) Write a note on sp and sp^2 hybridisation with examples. (4)

19. (a) (i) List out the general characteristics of s-block elements. (4)

- (ii) Discuss on the complexation tendencies of alkali metals with examples. (4)

Or

Page 6 Code No. : 10001 E

Page 5 Code No. : 10001 E



- (b) (i) Write a note on the classification. (3)
(ii) and Salient features of hydrides. (5)
20. (a) Describe on the preparation and properties of oxyacids.

Or

- (b) Discuss on the preparation, properties and structure of diborane.
-



(7 pages)

Reg. No. :

Code No. : 10002 E Sub. Code : SMCH 12

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

First Semester

Chemistry — Core

PHYSICAL CHEMISTRY — I

(For those who joined in July 2017–2019)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The relation for root mean square velocity is
(a) $\sqrt{\frac{3RT}{M}}$ (b) $\sqrt{\frac{2RT}{M}}$
(c) $\sqrt{\frac{8RT}{\pi M}}$ (d) $\sqrt{\frac{RT}{M}}$
- The number of vibrational modes of CO₂ and H₂O molecules are
(a) 4, 3 (b) 2, 2
(c) 3, 2 (d) 2, 4

3. The quantum yield (Φ) of a photochemical reaction is expressed as

- $$\frac{\text{Number of molecules decomposed or formed}}{\text{Number of photons of radiation energy absorbed}}$$
- $$\frac{\text{Number of molecules activated}}{\text{Number of photons of activation energy absorbed}}$$
- $$\frac{\text{Number of molecules of reactants}}{\text{Number of photons of radiation energy absorbed}}$$
- None of the above

4. Sulphates of calcium, barium and strontium exhibit

- Chemiluminescence
- Fluorescence
- Phosphorescence
- Bioluminescence

5. ${}_{19}\text{K}^{40}$ and ${}_{20}\text{Ca}^{40}$ are

- Isomers (b) Isotopes
- Isobars (d) Isotones

6. Complete the following nuclear reaction with suitable particle in the place of x.
 ${}_{27}\text{Co}^{59} + x \rightarrow {}_{27}\text{Co}^{60} + {}_1\text{H}^1$
- (a) ${}_1\text{H}^1$ (b) ${}_1\text{D}^2$
(c) ${}_1\text{H}^3$ (d) ${}_0\text{n}^1$
7. The crystal defect observed in AgBr is
- (a) Schottky defect
(b) Frenkel defect
(c) Metal excess defect
(d) Metal deficiency defect
8. Which of the following is not a covalent crystal?
- (a) Graphite (b) Diamond
(c) Rock salt (d) Fullerene
9. Two solutions of equal osmotic pressures are called _____
- (a) Hypotonic solutions
(b) Hypertonic solutions
(c) Isotonic solutions
(d) None of these

10. Freezing point of 0.1 M aqueous solutions will be maximum for
- (a) Glucose (b) KCl
(c) NaCl (d) K_2SO_4

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Explain the principle of equipartition of energy.
- Or
- (b) Calculate the root mean square velocity of oxygen at 27°C. (R = 8.314×10^7 ergs; Molecular weight of oxygen = 32).
12. (a) Write a note on quantum yield.
- Or
- (b) Briefly explain the phenomenon of photosensitization with an example.
13. (a) Write a note on half life period and average life period.
- Or
- (b) Write short notes on the composition of nucleus and nuclear forces.

14. (a) Draw the crystal structure of NaCl.

Or

(b) Discuss Schottky and Frenkel defects in crystals.

15. (a) Describe a method of determining the molecular weight of solute using depression in freezing point.

Or

(b) Cottrell's method used to determine the elevation of boiling point.

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) (i) Write the relation for Maxwell's distribution of molecular velocities and explain the terms in it.

(ii) Write notes on viscosity of gases.

Or

(b) (i) Define collision number, collision diameter and mean free path

(ii) Explain how the mean free path and collision diameter of a gas can be calculated from coefficient of viscosity of the gas.

Page 5 Code No. : 10002 E

17. (a) Explain with examples

(i) Phosphorescence

(ii) Fluorescence.

Or

(b) What are lasers? Give the principle, types and applications of lasers.

18. (a) Explain nuclear fission and fusion with suitable examples.

Or

(b) Explain liquid drop model and shell model of the nuclear structure.

19. (a) Write notes on

(i) Miller indices

(ii) Bravais lattices

(iii) Structure of ZnS crystal.

Or

(b) Discuss Schottky and Frenkel defects in crystals.

Page 6 Code No. : 10002 E

20. (b) Derive an expression for the relationship between molal depression in freezing point and molality of a solution.

Or

(b) Write notes on

- (i) Laws of osmotic pressure
- (ii) Vant Hoff Factor
- (iii) Abnormal molecular mass.

(7 pages)

Reg. No. :

Code No. : 10004 E Sub. Code : SMCH 22

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Chemistry – Core

ORGANIC CHEMISTRY – I

(For those who joined in July 2017-2019)

Time : Three hours

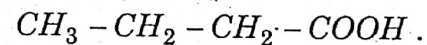
Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

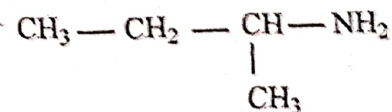
Choose the correct answer :

1. IUPAC name of the compound



- (a) n-butyric acid (b) Butyric acid
(c) Butanoic acid (d) All the above

2. IUPAC name of the compound

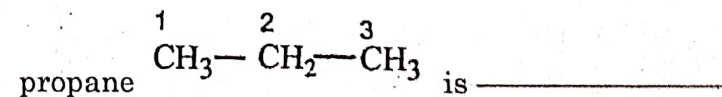


- (a) 2-Amino butane
(b) 1-methyl-1-aminopropane
(c) 2-methyl-3-aminopropane
(d) None of these

3. The +I (Inductive effect) is shown by?

- (a) CH_3 (b) $-\text{OH}$
(c) F (d) $-\text{C}_6\text{H}_5$

4. Heterolysis of $\text{C}_1 - \text{C}_2$ bond in



- (a) methyl and ethyl free radical
(b) Ethyl carbocation and methyl carbanion
(c) Methyl carbocation and Ethyl carbanion
(d) Methyl and Ethyl carbonium ion

5. Which of the following alkenes reacts with HBr in the presence of a peroxide to give anti-Markovniko's product?

- (a) 1-Butene
(b) 2,3-Dimethyl-2-butene
(c) 2-Butene
(d) 3-Hexene

6. What compound results from the 1,4-addition of HBr to 1,3-butadiene?
(a) 1-bromo-1-butene (b) 2-bromo-2-butene
(c) 4-bromo-1-butene (d) 1-bromo-2-butene
7. Which compound reacts most rapidly by an SN^1 mechanism?
(a) Methyl chloride (b) Isopropyl chloride
(c) Ethyl chloride (d) tert-Butyl chloride
8. Freon-12, CCl_2F_2 , is used as a
(a) Local anaesthetic (b) Dry-cleaning agent
(c) Refrigerant (d) Disinfectant
9. Oxidation of a primary alcohol with produces
(a) a carboxylic acid (b) an ether
(c) a ketone (d) an ester
10. In the manufacture of dynamite, one of the chemicals used is
(a) Glycerol (b) Glycerol triacetate
(c) Glycerol trinitrate (d) Glycerol triiodide

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Discuss about IUPAC rules for naming of alcohols with example.
Or
(b) Write a note on structural isomerism with examples.
12. (a) Write a note on steric effect with suitable example.
Or
(b) Explain the hybridization and geometry of methane molecule.
13. (a) Give the mechanism of Anti-Markownikoff's addition in alkene.
Or
(b) Explain the classification of dienes with example.
14. (a) Explain SN^2 mechanism with suitable example.
Or
(b) Describe the preparation, properties and uses of vinyl chloride.



15. (a) Write short notes on estimation of hydroxyl group.

Or

- (b) Explain the mechanism of dehydration of alcohols.

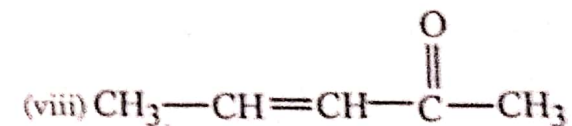
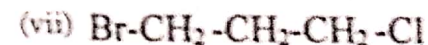
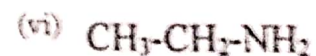
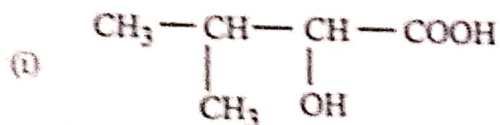
PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Give an account on IUPAC nomenclature of the alkanes and Cycloalkanes with examples.

Or

- (b) Give IUPAC names of the following molecules.



17. (a) Explain Inductive Effect and electromeric effect with suitable example.

Or

- (b) Write a note on the following
(i) Homolytic and Heterolytic fission
(ii) Electrophile and Nucleophile

18. (a) Explain the ozonolysis and hydroboration reactions of alkenes.

Or

- (b) Explain the following
(i) Diels-Alder reaction
(ii) Allylic bromination by NBS

19. (a) Discuss the mechanism of E_1 and E_2 elimination reactions.

Or

- (b) Explain the preparation and uses of chloroform and Carbon tetrachloride.
20. (a) How will you distinguish primary, secondary and tertiary alcohols by (i) Oxidation (ii) Dehydration (iii) Victor-Meyer and (iv) Lucas test.

Or

- (b) (i) Write a note on Zeisel's method for the estimation of alkoxy group.
- (ii) Describe the preparation and uses of Oxirane.
-

(6 pages)

Reg. No. :

Code No. : 10007 E Sub. Code : SMCH 51

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Fifth Semester

Chemistry – Core

ORGANIC CHEMISTRY – III

(For those who joined in July 2017 – 2019)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Optically active isomers but not mirror images are called _____.
- (a) Enantiomers
(b) Mesomers
(c) Tautomers
(d) Diastereomers

6. Cine-substitution is explained by
- (a) SN_1 mechanism
(b) SN_2 mechanism
(c) Benzyne mechanism
(d) None
7. What is the product formed when thiophene reacts with bromine is benzene
- (a) 2-bromothiophene
(b) 3-bromothiophene
(c) 3, 4-dibromothiophene
(d) 2,5-dibromothiophene
8. Benzopyrrole is
- (a) Indole (b) Furan
(c) Quinoline (d) Naphthalene
9. Which of the following is a direct dye
- (a) Phenolphthalein (b) Congored
(c) Alizarin (d) Indigo
10. Naphthalene on oxidation with alkaline KmO_4 gives _____.
- (a) Phthalic acid (b) Phthalic anhydride
(c) Phthalonic acid (d) None

Page 3 Code No. : 10007 E

2. In which type of projection we can get staggered and eclipsed conformations
- (a) Newmann projection
(b) Sawhorse projection
(c) Fischer projection
(d) Wedge projection
3. Total number of conformations in ethane are _____.
- (a) Infinity (b) 2
(c) 3 (d) 4
4. Which of the following conformation of n-butane is the least stable?
- (a) Anti (b) Eclipsed
(c) Fully eclipsed (d) None
5. Sulphonation of benzene is a _____.
- (a) Irreversible reaction
(b) Reversible reaction
(c) Addition reaction
(d) None

Page 2 Code No. : 10007 E

PART B — (5 × 5 = 25 marks)

Answer ALL questions by choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Differentiate enantiomers and diastereomers.
- Or
- (b) Discuss the mechanism of stereospecific reactions with example.
12. (a) Draw the Newmann and Sawhorse representation for n-butane.
- Or
- (b) Define the term :
- (i) Torsional angle
(ii) Energy barrier.
13. (a) Discuss the mechanism of nitration.
- Or
- (b) Discuss Korner's absolute method of orientation.
14. (a) Although Pyrrole, Furan and Thiophene do not contain any benzene ring still they are classified as aromatic compounds. Explain.
- Or
- (b) Write skraup synthesis of quinoline.

Page 4 Code No. : 10007 E
[P.T.O.]

15. (a) Give the preparation and uses of malachite green.

Or

(b) Explain the synthesis of naphthalene.

PART C — (5 × 8 = 40 marks)

Answer ALL questions by choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the sequence rules with example for D-L notation.

Or

(b) Explain partial and absolute asymmetric synthesis.

17. (a) (i) Discuss the conformational analysis of propane.

(ii) Draw the energy diagram for propane.

(iii) Draw the sawhorse representation for staggered and eclipsed forms of propane.

Or

(b) Discuss the conformational analysis of (i) 1,2-halohydrin (ii) 1, 2-glycol.

Page 5 Code No. : 10007 E

18. (a) Discuss the consequences of aromaticity.

Or

(b) Explain SN_1 and SN_2 mechanism for aromatic nucleophilic substitution.

19. (a) Compare the aromatic characters of thiophene, pyrrole and furan.

Or

(b) Explain the mechanism of electrophilic substitution in Isoquinoline.

20. (a) Discuss briefly various theories of colour and chemical constituents of dyes.

Or

(b) Discuss the structure of anthracene.

Page 6 Code No. : 10007 E

(6 pages)

Reg. No. :

Code No. : 10009 E Sub. Code : SMCH 61/
AMCH 61

B.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2023.

Sixth Semester

Chemistry — Core

INORGANIC CHEMISTRY — III

(For those who joined in July 2017 – 2020)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Common name for potassium trichloro ethylene platinate (II) is
- (a) Edmann's salt
(b) Wilkinson's catalyst
(c) Zeise's salt
(d) Maganese green salt

2. The valency of Iron in the complex $[\text{Fe}(\text{CN})_6]^{-3}$ is
- (a) 1 (b) 2
(c) 3 (d) 4
3. The type of hybridisation present in tetrahedral complex is
- (a) sp (b) sp^3
(c) sp^3d (d) sp^2
4. Which of the following complex is paramagnetic
- (a) $[\text{CO}(\text{NH}_3)_6]^{+3}$ (b) $\text{K}_4[\text{Fe}(\text{CN})_6]$
(c) $[\text{Co}(\text{CN})_6]^{-3}$ (d) $[\text{CoF}_6]^{-3}$
5. The half life period of Labile complexes are
- (a) Short (b) Very short
(c) High (d) Very high
6. Which one of the following is having higher trans effect
- (a) CN^- (b) NH_3
(c) Cl^- (d) NH_4^+

Page 2 Code No. : 10009 E

7. Metal sandwich complex is
- (a) Grignard reagent
(b) Zeises salt
(c) Ferrocene
(d) Wilkinson's catalyst
8. Organometallic compound for the treatment of syphilis was discovered by
- (a) Paul Ehrlich (b) Henry Gilman
(c) Charles (d) Edward
9. Intense pink colour of permanganate ion is due to _____ transition
- (a) d – d (b) Charge transfer
(c) n – N (d) n – π
10. Staggered rules was formulated by the scientist
- (a) Wilfred (b) Werner
(c) Kirk (d) Adamson

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Discuss the geometrical isomerism found in square planar complexes.
- Or
- (b) Discuss the merits and defects of VB theory in detail.

12. (a) Explain the splitting of 'd' orbital in tetrahedral geometry complexes.

Or

- (b) Write short notes on the crystal field stabilisation energy.

13. (a) Explain in detail the term, 'Trans effect' with examples.

Or

- (b) Explain electron-transfer reactions with examples.

14. (a) Discuss the nature and structure of metal-ligand bond in metal carbonyls.

Or

- (b) Write notes on Wilkinson's catalyst.

15. (a) Write notes on photovoltaic cell.

Or

- (b) Explain the process of quenching in detail.

Page 3 Code No. : 10009 E

Page 4 Code No. : 10009 E

[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain the postulates of valence bond theory.

Or

- (b) Discuss the rules to be followed for naming the co-ordination compounds.

17. (a) Discuss the applications of crystal field theory in detail.

Or

- (b) How will you determine the stability constant of a reaction by Bjerrum method?

18. (a) Write notes on :
- (i) Labile complexes
 - (ii) Inert complexes
 - (iii) Aquation.

Or

- (b) Explain oxidation-Reduction reactions in detail with examples.

19. (a) Explain metal nitrosyls in detail with suitable examples.

Or

- (b) Write short notes on
- (i) Ziegler-Natta catalyst
 - (ii) Ferrocene
 - (iii) Organoboron compounds.

20. (a) Discuss in detail about charge-transfer transitions.

Or

- (b) Write notes on
- (i) Adamson's rule
 - (ii) Selection rules.
-

(6 pages)

Reg. No. :

Code No. : 10010 E Sub. Code : SMCH 62

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Sixth Semester

Chemistry - Core

ORGANIC CHEMISTRY - IV

(For those who joined in July 2017-2019)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Which is a reducing sugar?
(a) Glucose (b) Starch
(c) Sucrose (d) None of these
- Starch is a homopolymer of
(a) α -D-Glucose (b) β -D-Glucose
(c) α -D-Fructose (d) β -D-Fructose

- Methods used to find the nature of ring in alkaloids
(a) Hydrolysis
(b) Oxidation
(c) Hofmann's exhaustive methylation
(d) All these
- Terpenes are made up of
(a) Chloroprene (b) Neoprene
(c) Isoprene (d) None of these
- The δ value of TMS is
(a) 10
(b) 5
(c) 0
(d) None of these
- Which electronic excitation requires less energy?
(a) $\sigma - \sigma^*$ (b) $n - \sigma^*$
(c) $\pi - \pi^*$ (d) $n - \pi^*$

Page 3 Code No. : 10010 E

- Which is the strongest acid?
(a) m-hydroxy benzoic acid
(b) p-hydroxy benzoic acid
(c) o-hydroxy benzoic acid
(d) None of these
- O-amino benzoic acid is
(a) Anthranilic acid
(b) Mandelic acid
(c) Cinnamic acid
(d) None of these
- The chemical used to carry out Fries rearrangement is
(a) BCl_3 (b) NH_3
(c) Anhyd. AlCl_3 (d) BF_3
- 1, 2-diols of higher order are called _____.
(a) Pinacols (b) Pyrogallols
(c) Thiols (d) None of these

Page 2 Code No. : 10010 E

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Write notes on the classification of carbohydrates.
Or
(b) What is mutarotation? Explain with example.
- (a) Explain Kolb's reaction with example.
Or
(b) Write notes on benzoin condensation.
- (a) Explain benzidine rearrangement.
Or
(b) Explain Beyer-Villiger oxidation.
- (a) Elucidate the structure of coniine.
Or
(b) Elucidate the structure of menthol.
- (a) Explain Woodward-Fieser rule for calculating λ_{max} for dienes.
Or
(b) What is chemical shift? Explain.

Page 4 Code No. : 10010 E
[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) (i) Convert fructose into glucose.
(ii) Explain the structure of starch.

Or

- (b) (i) Give any four chemical reactions of fructose.
(ii) Give the Haworth structure of cellulose and two uses.

17. (a) (i) Explain Reimer-Tiemann reaction.
(ii) Explain Perkin's reaction.

Or

- (b) Explain the following :
(i) Quinone oxime tautomerism
(ii) Ortho effect.

18. (a) Explain the following rearrangement with example (i) Beckmann (ii) Claisen.

Or

- (b) Explain the following rearrangement with example (i) Pinacol- Pinacolone. (ii) Hofmann.

Page 5 Code No. : 10010 E

19. (a) Elucidate the structure of nicotine.

Or

- (b) Elucidate the structure of camphor.

20. (a) (i) Explain spin-spin splitting.
(ii) Sketch the NMR spectrum of 1-chloropropane and explain.

Or

- (b) (i) Explain the electronic excitations in UV spectroscopy.
(ii) How is I.R. spectroscopy used to distinguish the types of hydrogen bond?

Page 6 Code No. : 10010 E

(6 pages)

Reg. No. :

Code No. : 10011 E Sub. Code : SMCH 63

B.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Sixth Semester

Chemistry – Core

PHYSICAL CHEMISTRY – IV

(For those who joined in July 2017 – 2019 only)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. NMR spectra is studied in
(a) UV region
(b) Visible region
(c) Radio frequency region
(d) Microwave region
2. ESR spectrum is observed in the following region
(a) Microwave (b) X-ray
(c) IR (d) Raman region

3. Rate constant increases as temperature
(a) Constant
(b) Decreases
(c) Increases
(d) Increases or decreases
4. For first order reaction, $t_{1/2} = 69.3$ sec. The value of rate constant is
(a) 10^{-2} sec^{-1} (b) 10^{-4} sec^{-1}
(c) 10 sec^{-1} (d) 10^2 sec^{-1}
5. Ostwald's dilution law is applicable to
(a) Strong electrolytes only
(b) Weak electrolytes only
(c) Strong and weak electrolytes
(d) None of the mentioned
6. Among the given pairs given below which solution pair is a buffer solution?
(a) $\text{KNO}_3/\text{K}_2\text{SO}_4$ (b) $\text{NH}_4\text{OH}/\text{HNO}_3$
(c) $\text{H}_2\text{SO}_4/\text{BaSO}_4$ (d) $\text{NH}_4\text{Cl}/\text{NH}_4\text{OH}$
7. Phase rule is
(a) $F = C - P + 2$ (b) $F = C + P - 2$
(c) $F = C - P + 1$ (d) $F = C + P + 2$

Page 2 Code No. : 10011 E

8. In water phase diagram Triple point is the point where the number of degree of freedom is
(a) 1 (b) 2
(c) 3 (d) 0
9. Which one of the following statements is not true?
(a) Gold at the nanoscale is red
(b) Copper at the nanoscale is transparent
(c) Silicon at the nanoscale is an insulator
(d) Aluminium at the nanoscale is highly combustible
10. One nanometre is _____ metre.
(a) 10^{-9} (b) 10^{-8}
(c) 10^{-7} (d) 10^{-6}

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the ESR spectrum of methyl radical.
Or
(b) What are the two factors affecting chemical shift?
12. (a) What is activation energy? Explain its significance.
Or
(b) Discuss the collision theory of reaction rates. Mention its defects.

Page 3 Code No. : 10011 E

13. (a) What is buffer solution? Explain the buffer action of an acidic buffer.
Or
(b) Explain the common ion effect.
14. (a) Explain the Phase diagram of Pb-Ag system.
Or
(b) Explain the Phase diagram of KI-H₂O system.
15. (a) What are quantum dots? Explain.
Or
(b) Explain the sol-gel method for the synthesis of nano particles.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) (i) Discuss the Principle involved in Raman spectroscopy.
(ii) Discuss the Principles of ESR spectroscopy. How does it differ from NMR spectroscopy?

Or

Page 4 Code No. : 10011 E

[P.T.O.]

- (b) (i) Sketch the low and high resolution NMR spectrum of ethanol.
- (ii) ^{12}C does not give NMR spectra but ^{13}C NMR gives. Why?
17. (a) Deduce the rate expression for second order reaction where both the concentration terms are same. Derive the expression for half life period of this reaction.

Or

- (b) Explain Lindemann hypothesis for unimolecular reactions.
18. (a) Write notes on :
- (i) Ostwald's dilution law
- (ii) Lewis acid-base concept.

Or

- (b) Describe various indicators used in acid base titrations.
19. (a) (i) Derive the Phase rule thermodynamically.
- (ii) Derive the distribution law thermodynamically.

Or

- (b) (i) State the distribution law.
- (ii) What are the applications of distribution law?

20. (a) (i) Explain about carbon nanotubes.
- (ii) Explain the electrical properties of nanosized compounds.

Or

- (b) (i) Applications of nanoscience.
- (ii) Magnetic properties of nanosized compounds.

(6 pages)

Reg. No. :

Code No. : 10021 E Sub. Code : SNCH 4 B/
- ANCH 42

U.G. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Fourth Semester

Chemistry

Non Major Elective – APPLIED CHEMISTRY

(For those who joined in July 2017 – 2020 only)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. _____ salts of higher fatty acid is called hand soaps
- (a) Na
(b) K
(c) Ca
(d) None of the above

6. Poly tetra fluoro ethene is otherwise called as

- (a) Bakelite (b) Teflon
(c) Nylon (d) Fevicol

7. Acetyl salicylic acid is used as

- (a) Anti septic (b) Mouth wash
(c) Analgesics (d) Antibiotics

8. Aluminium hydroxide is used as

- (a) Ant acids (b) Antiseptics
(c) Analgesics (d) Antibiotics

9. Main ingredients of tooth paste includes

- (a) Baking soda
(b) Cloves
(c) Artificial sweetness
(d) All the above

10. Talcum power contains minerals mainly of

- (a) Mg, Si, O₂ (b) Mg, Ca, O₂
(c) Mg, Ti, O₂ (d) All the above

Page 3 Code No. : 10021 E

2. The raw materials used for making soaps are
- (a) hard oils
(b) caustic soda
(c) sodium chloride
(d) all the above
3. The fertilizer that contains 47% Nitrogen is _____
- (a) Ammonium Sulphate
(b) Ammonium Nitrate
(c) Urea
(d) Potassium Nitrate
4. Example for mixed fertilizer is _____
- (a) NPK
(b) Potassium Nitrate
(c) Triple super phosphate
(d) None of the above
5. Bakelite is obtained by condensing phenol with
- (a) HCHO
(b) Acetaldehyde
(c) Benzaldehyde
(d) All the above

Page 2 Code No. : 10021 E

PART B — (5 × 5 = 25 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Give the classification of soaps.
Or
(b) What are Detergents? Give its classification.
12. (a) What are characteristics of good fertilizer?
Or
(b) Write a note on natural fertilizer.
13. (a) Give the difference between thermo plastics and thermo sets with examples.
Or
(b) Write a note on Vulcanization of rubber.
14. (a) Give the definition and uses of Laxatives.
Or
(b) Write a note on Penicillins.
15. (a) Give the preparation and uses of boot polish.
Or
(b) How Phenyl and mothballs are prepared?

Page 4 Code No. : 10021 E
[P.T.O.]

PART C — (5 × 8 = 40 marks)

Answer ALL questions choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Explain the cleaning action of soap.
Or
(b) What are advantages of detergents over soaps?
17. (a) Explain the role of nitrogen, potassium on plant growth.
Or
(b) Give the uses and composition of the following:
(i) Triple super phosphate
(ii) Urea.
18. (a) Write a note on the following:
(i) Terrylene
(ii) Nylon
Or
(b) Explain the uses of the following rubber:
(i) Neoprene
(ii) Butyl rubber

19. (a) Write a note on sedatives and analgesics.
Or
(b) Explain about mouth wash and antiseptics.
20. (a) How are the following prepared:
(i) Tooth powder
(ii) Tooth paste.
Or
(b) How Agarbathis and writing inns are prepared?
-

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023.

Fourth Semester

Chemistry — Core

ORGANIC CHEMISTRY — IV

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

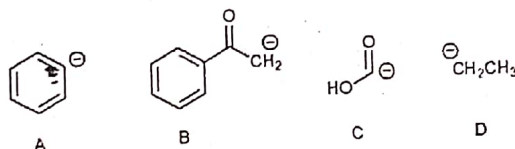
PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following reaction involve ylides?
- (a) Wittig reaction
(b) Wilkinson reaction
(c) Zeigler Natta reaction
(d) Diels-Alder reaction

6. Which of the following synthons is an example of Umpolung?



- (a) Structure A (b) Structure B
(c) Structure C (d) Structure D

7. The _____ is a widely employed transition metal catalyzed cross-coupling reaction.
- (a) Still coupling (b) Suzuki coupling
(c) Negishi coupling (d) Heck coupling
8. The Heck reaction involves _____
- (a) Rhuthenium catalyst
(b) Palladium catalyst
(c) Platinum catalyst
(d) Nickel catalyst

2. _____ is an aryl-aryl coupling reaction with the help of diazonium salt.
- (a) Gomberg-Bachmann reaction
(b) Bamford-Stevens reaction
(c) Reimer-Tiemann reaction
(d) Darzen reaction
3. The _____ conformation of cyclohexane is not very stable form due to the torsional strain applied to the cyclohexane molecule.
- (a) boat (b) chair
(c) axial (d) equatorial
4. The _____ applies to systems in which different products are formed from two substrates in equilibrium with one another.
- (a) Chain-Ingold Prelog rule
(b) Gram rule
(c) Craig rules
(d) Curtin-Hammett principle
5. Which of the following statements best describes a synthon?
- (a) A synthetic reagent used in a reaction
(b) A key intermediate in a reaction sequence
(c) A transition state involved in a reaction mechanism
(d) A hypothetical structure that would result in a given reaction if it existed.

9. Which of the following regulates the female reproductive cycle?
- (a) Progesterone (b) Testosterone
(c) Estrogens (d) Glucocorticoids
10. All steroid hormones are derived from
- (a) Carbohydrate (b) Protein
(c) Cholesterol (d) Vitamins

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Write the Stobbe condensation reaction.
Or
(b) Explain the Gomberg-Bachmann reaction.
12. (a) Explain why the chair conformation of cyclohexane is more stable than boat conformation.
Or
(b) Describe the Conformation and stereochemistry of Decalins.

13. (a) Narrate the protection and deprotection to Alcohol.

Or

(b) Write a comprehensive note on retrosynthetic analysis.

14. (a) State the role of osmium tetroxide in organic synthesis.

Or

(b) Describe the function of DDQ in organic synthesis.

15. (a) Describe the stereochemistry of steroids.

Or

(b) Give the irradiated products of ergosterol.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Write the Darzen condensation and Wittig reactions with the mechanism.

Or

(b) Discuss the regioselectivity and stereospecificity of the Oxymercuration reaction.

Page 5 Code No. : 7057

17. (a) Discuss the conformation of 1, 3-disubstituted cyclohexanes. Also explain their stability.

Or

(b) Give a brief account of the conformational analysis of cyclohexane.

18. (a) Explain the following :

(i) Protecting Groups for Carbonyl compounds.

(ii) Protecting group for Amines.

Or

(b) Write a comprehensive note on functional group interconversions (FGI).

19. (a) Discuss the reaction of Borane with alkenes and alkynes.

Or

(b) Give a comprehensive note on 9-BBN and Adam's Catalyst.

20. (a) What are the chief sources of cholesterol? Establish the structure of DielsHydrocarbon.

Or

(b) How will you convert the following?

(i) Cholesterol to testosterone

(ii) Oestrone to Oestriol

Page 6 Code No. : 7057



(6 pages)

Reg. No. :

Code No. : 5058

Sub. Code : PCIM 42

M.Sc.(CBCS) DEGREE EXAMINATION, APRIL 2023.

Fourth Semester

Chemistry – Core

INORGANIC CHEMISTRY – IV

(For those who joined in July 2017 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The study of observing the change of optical rotation with wavelength is known as _____
(a) UV spectroscopy
(b) Raman effect
(c) Optical rotatory dispersion
(d) Polarization

- Vitamin B₁₂ is _____ complex.
(a) Iron complex
(b) Cobalt complex
(c) Magnesium complex
(d) Iron Sulphur complex
- Carboxy peptidase is a _____ enzyme.
(a) Mg (b) Fe
(c) Zn (d) Graphite
- Azurin is _____ containing protein.
(a) Zn (b) Cu
(c) Fe (d) Mg
- Which of the following complexes has highest excited state redox potential
(a) $*[Cr(bpy)_3]^{2+}$ (b) $*[Ru(bpy)_3]^{2+}$
(c) $*[Ir(bpy)_3]^{3+}$ (d) $[OS(bpy)_3]^{2+}$
- A charge transfer complex otherwise called _____ complex.
(a) Electron donar
(b) Electron-donar-acceptor
(c) Electron acceptor
(d) None of these

Page 3 Code No. : 5058

- The Mossbauer spectra is observed in _____
(a) Solid state
(b) Liquid state
(c) Gaseous state
(d) Liquid crystalline state
- ESCA is concerned with the measurement of _____ energy.
(a) Core electron binding
(b) Rotational
(c) Electronic
(d) Vibrational
- The number of PES peaks given by NH₃ _____
(a) 1 (b) 2
(c) 3 (d) 4
- What is the biological role of Haemoglobin and Myoglobin is _____
(a) Oxygen transport (b) Electron transfer
(c) Enzyme action (d) Iron storage

Page 2 Code No. : 5058

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Write notes on isomer shift.
Or
(b) Give an account on spin state cross over determination.
- (a) Write notes on shake-up and shake off processes.
Or
(b) Explain the theory of photo electron spectroscopy.
- (a) Draw the structure of chlorophyll and explain its role in photosynthesis.
Or
(b) Describe the role of in vivo and in vitro nitrogen fixation.
- (a) Explain the structure, function and mechanism of action of super oxide dismutase.
Or
(b) Explain the mechanism of action of ascorbic oxidase.

Page 4 Code No. : 5058
[P.T.O.]

15. (a) Write a note on High temperature reactions.

Or

- (b) Write notes on chemical vapour Deposition.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Elucidate the absolute configuration of chelate complexes with the help of ORD and CD.

Or

- (b) Discuss in detail about Quadrupole and magnetic splitting of Mossbauer spectroscopy.

17. (a) Explain the theory and applications of Auger electron spectroscopy.

Or

- (b) State and explain Koopman's theorem.

18. (a) List and explain the functions of Non-metals in the biological system.

Or

- (b) Discuss in detail about ferredoxin and rubredoxin.

19. (a) Discuss the mechanism of action of metal complexes as anticancer agents.

Or

- (b) Discuss in detail about Toxicity of metals and the role of Metallothionins.

20. (a) Describe the structure and properties of Fullerenes and Fullerides.

Or

- (b) Write the synthesis of inorganic materials by solution and Hydrothermal methods.

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

Fourth Semester

Chemistry – Core

PHYSICAL CHEMISTRY – IV

(For those who joined in July 2017 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The molecule which is IR inactive but Raman active is
(a) HCl (b) N₂
(c) SO₂ (d) Protein
- In the Born-Oppenheimer approximation which one of the following order is correct
(a) E_{el} > E_{vib} > E_{rot} > E_{tr}
(b) E_{el} > E_{rot} > E_{vib} > E_{el}
(c) E_{vib} > E_{el} > E_{rot} > E_{tr}
(d) E_{rot} > E_{vib} > E_{el} > E_{tr}

- Consider the following Statements :

An increase in the rate of a reaction for a rise in temperature is due to

- the increase in the number of collisions
- the shortening of the mean free path
- the increase in the number of activated molecules
- the increase in pressure of the system

Which of the statements given above are correct?

- (a) 1 and 2 (b) 2 and 3
(c) 1 and 3 (d) 1, 3 and 4

- Which of the following statements is in accordance with collision theory?

I. Rate is directly proportional to collision frequency

II. Rate depends upon orientation of atoms

III. Temperature determines the rate

- (a) only III (b) only I and II
(c) only II and III (d) all of these

- A vibrational mode in a molecule will be Raman active if

- (a) the polarizability of the molecule changes during the vibration
(b) it is IR active also
(c) the polarizability of the molecule remains the same during the vibration
(d) the excited normal modes have the same symmetry as are of the Cartesian coordinates

- Consider the carbonyl stretching frequency in the IR spectro of the compounds (A) CH₃ CONHCH₃ (B) Ph CONHCH₃ (C) CH₃ CONHPh

Which of the following is the correct increasing order of the carbonyl stretching frequency?

- (a) A < B < C (b) B < A < C
(c) A < C < B (d) C < B < A

- In the Lindemann mechanism of unimolecular reactions the observed order at low concentration is

- (a) 0.1 (b) 1
(c) 1.5 (d) 2

- In the mechanism of reaction

$$\text{H}_2 + \text{Br}_2 \rightarrow 2\text{HBr}$$

the first step is

- (a) dissociation of H₂ into H radicals
(b) dissociation of Br₂ into Br radicals
(c) reaction of H radical with Br₂
(d) reaction of Br radical with H₂

- The aggregation of surfactant molecules is known as

- (a) Micelles (b) Clusters
(c) Gel (d) Colloid

- Which of the following is not a heterogeneous catalyzed reaction?

(a) $2\text{H}_2 + \text{O}_2 \xrightarrow{\text{Pt}} 2\text{H}_2\text{O}$

(b) $\text{CaCClO}_2 \xrightarrow{\text{NiO}} \text{CaCl}_2 + \text{O}_2$

(c) $2\text{SO}_2 + \text{O}_2 \xrightarrow{\text{NO}} 2\text{SO}_3$

(d) $\text{N}_2 + 3\text{H}_2 \xrightarrow{\text{Fe}} 2\text{NH}_3$

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Fundamental and First overtone transition of NO molecule are centred at 1876 cm^{-1} and 3724 cm^{-1} respectively. Evaluate
- the equilibrium vibrational frequency and
 - the exact Zero point Energy.
- Or
- (b) Explain the P and R branch lines of the vibration-rotation spectrum.
12. (a) Write the differences between Raman and IR spectra.
- Or
- (b) Explain polarized and depolarized Raman lines.
13. (a) Explain flash photolysis technique for studying the kinetics of fast reactions.
- Or
- (b) Derive an expression for the relaxation time of fast reactions following first-order kinetics.

Page 5 Code No. : 5059

17. (a) How many Normal modes of vibration are possible for the following molecules HBr , O_2 , OCS (linear), SO_2 (bent), BCl_3 , $\text{HC} \equiv \text{CH}$, CH_4 and CH_3I ?
- Or
- (b) Account for the changes in the vibrational spectra of donor molecules upon coordination in the following complexes.
- Terminal and bridged carbonyls
 - Cis and Trans carbonyls.
18. (a) Explain and derive equation to account for the influence of solvents on reaction between ions in solution according to ARR theory.
- Or
- (b) Derive Bronsted – Bjerrum equation.
19. (a) Discuss the Lindemann theory of unimolecular reactions.
- Or
- (b) Describe Pulse method and stopped flow method for studying kinetics of fast reactions.

Page 7 Code No. : 5059

14. (a) Explain the influence of pressure on Reaction rates in solution.

Or

- (b) Explain the kinetics of decomposition of O_3 and N_2O_5 .

15. (a) Explain Gibbs adsorption isotherm.

Or

- (b) Describe the solubilization of micelles in the light of Laplace's law.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Describe the concept of overtones in vibrational spectra based on the anharmonicity and Harmonicity of the oscillator.
- Or
- (b) (i) Explain the applicability of Born-Oppenheimer approximation for the independent rotations and vibrations of a diatomic molecule. (4)
- (ii) Calculate the force constant for the bond in HCl from the fact that the fundamental frequency is $8.667 \times 10^{13} \text{ S}^{-1}$. (4)

Page 6 Code No. : 5059

20. (a) Explain the kinetics of single substrate enzymatic reaction and derive the rate law.
- Or
- (b) Derive an expression for Freundlich adsorption isotherm explain its limitations and applications.

Page 8 Code No. : 5059

(7 pages)

Reg. No. :

Code No. : 5409

Sub. Code : ZCHE 11

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023

First Semester

Chemistry

Elective—GREEN CHEMISTRY—TECHNIQUES AND APPLICATIONS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Aim of Green chemistry is _____
 - (a) Design chemical products and process that maximize profits
 - (b) Design safer chemical products and processes that reduce or eliminate the use and generation of hazardous substances
 - (c) Design chemical products and processes that work most efficiently
 - (d) Utilize non-renewable energy

6. What is the solvent used for Diels-Alder reaction in Green synthesis?
 - (a) Formaldehyde
 - (b) Ethanol
 - (c) Water
 - (d) Benzene
7. Photolysis of benzophenone (in sunlight) in presence of an alcoholic solvent (preferably isopropyl alcohol) gives _____
 - (a) Benzopinacol
 - (b) Benzoic acid
 - (c) Benzyl alcohol
 - (d) Phenol
8. Which of the following is used as a Friedel-Crafts catalyst?
 - (a) Anhydrous Aluminium chloride
 - (b) Aluminium Flouride
 - (c) Tungsten
 - (d) Activated charcoal
9. Which among the following have a large amount of installed grid interactive renewable power capacity in India?
 - (a) Biomass power
 - (b) Wind power
 - (c) Solar power
 - (d) Small Hydro power

Page 3

Code No. : 5409

2. Green chemistry reduces the use of _____
 - (a) Energy
 - (b) Liquid fuels
 - (c) Gaseous fuels
 - (d) Solid fuels
3. Which one is not the advantage of zeolite catalysed Friedel-Crafts acylation?
 - (a) No solvent is required
 - (b) 0.035 kg aqueous effluent per kg instead of 4.5 kg aqueous effluent per kg
 - (c) Greater than 95% yield of higher purity instead of 85– 95% yield in traditional method
 - (d) Hydrolysis of products and phase separation is necessary
4. Name the enzyme which catalyzes the oxidation-reduction reaction?
 - (a) Transaminase
 - (b) Glutamine synthetase
 - (c) Phosphofructokinase
 - (d) Oxidoreductase
5. Universal solvent is
 - (a) Formaldehyde
 - (b) Water
 - (c) Ethanol
 - (d) Benzene

Page 2

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10. Which of the following is not a disadvantage of Hydro Power?
 - (a) A large land area submerges into the water leading to deforestation
 - (b) It causes dislocation of a large population and rehabilitation
 - (c) It causes ecological disturbances like earthquake
 - (d) It causes calamities like landslides

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) (i) How can we reduce non-renewable resources?
(ii) How do you calculate mass intensity?
- Or
- (b) (i) How do you calculate E factor in green chemistry?
(ii) What does a low E factor Mean?

Page 4

Code No. : 5409

[P.T.O.]

Answer ALL questions, choosing either (a) or (b).

16. (a) Explain the twelve Principles of Green Chemistry.

Or

- (b) Write notes on alternate energy sources and efficient energy improvements.

17. (a) Discuss the applications of zeolites, silica, alumina and clay catalysts in green chemical reactions.

Or

- (b) Discuss the applications of crown ethers in oxidation, substitutions, elimination and esterification reactions.

18. (a) Explain the role of solvents in synthesis.

Or

- (b) Write any two reactions using super critical carbon dioxide and two reactions using super critical water.

Page 6

Code No. : 5409

12. (a) (i) What are the advantages of green catalysts?

- (ii) Why enzyme is a green catalyst?

Or

- (b) What is bio-catalysis? Discuss the role of enzymes in catalytic oxidation and catalytic reduction.

13. (a) Explain Aqueous Phase Diels Alder reaction

Or

- (b) Write notes on Claisen rearrangement.

14. (a) Give a brief note Photoreduction reactions.

Or

- (b) (i) What is Strecker synthesis?

- (ii) Discuss the mechanism of Strecker synthesis

15. (a) Write notes on renewable energy sources.

Or

- (b) Give a brief account of hydroelectric and geothermal Power.

Page 5

Code No. : 5409

19. (a) Discuss the effects of solvents on microwave assisted synthesis.

Or

- (b) (i) What do you mean by sonochemistry?

- (ii) Discuss the Principle of sonochemistry

- (iii) Write notes on ultra sound assisted Cannizzaro reaction

20. (a) Explain the Principle, Types and Applications of Fuel Cells.

Or

- (b) Write note on

- (i) Hydroelectric Power

- (ii) Biomass

- (iii) Wind Power and

- (iv) Geothermal power

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Code No. : 5409

(6 pages)

Reg. No. :

Code No. : 5415

Sub. Code : ZCHE 21

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Chemistry

Elective — NANO SCIENCE AND
NANO TECHNOLOGY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Synthesis of nanomaterials from the bulk materials is called _____
- (a) Top-down method
(b) Bottom up method
(c) Synchronised method
(d) Sonolysis method

2. Fullerene is an allotrope of _____
- (a) Carbon (b) Sulphur
(c) Phosphorus (d) none of the above
3. A catalyst _____ the speed of a chemical reaction.
- (a) Increases
(b) Decreases
(c) Both (a) and (b)
(d) First increases then decreases
4. Natural bone is a _____
- (a) Composite (b) Nano composite
(c) Nanofiber (d) Whisker
5. CNT is _____ times stronger than steel of the same mass.
- (a) 10 (b) 25
(c) 50 (d) 1000
6. What are the advantages of nanocomposite packages?
- (a) Lighter and biodegradable
(b) Enhanced thermal stability conductivity and mechanical strength
(c) Gas barrier properties
(d) All of the above

Page 2

Code No. : 5415

7. The processing of separation consolidation and deformation of materials by one atom or one molecule is called as _____
- (a) Biotechnology
(b) Physics
(c) Nanobiotechnology
(d) Chemistry
8. The hybridization of carbon in graphene is _____
- (a) sp (b) sp^2
(c) sp^3 (d) dsp^2
9. Organic nanorobots are a combination of DNA cells of _____
- (a) Polymer (b) Starch
(c) Virus and bacteria (d) Fullerene
10. One of the main interests of research using nanorobots is _____
- (a) medicine
(b) astronomy
(c) marine engineering
(d) coastal studies

Page 3

Code No. : 5415

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Describe the electronic properties of nanomaterials.
- Or
- (b) Discuss the classification of nanoparticles based on dimension.
12. (a) Write a note on physical vapor deposition.
- Or
- (b) Describe the nucleation process for growth of nanoparticles.
13. (a) Discuss in detail about the classification of Nanocomposites.
- Or
- (b) Explain the properties of Nanocomposites.
14. (a) Discuss in detail about fullerenes.
- Or
- (b) How will you synthesize graphene by chemical vapor deposition?

Page 4

Code No. : 5415

[P.T.O.]

15. (a) What are dendrimers? Mention its biomedical applications?

Or

- (b) Write comprehensive note on nanomedicines.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Discuss in detail
- (i) surface energy
 - (ii) surface reconstruction
 - (iii) surface area to volume ratio.

Or

- (b) Give a comprehensive note on magnetic properties of nanomaterials.

17. (a) Discuss the bottom-up and Top-down approaches in nanoparticles synthesis.

Or

- (b) Give the synthesis of nanomaterials using laser ablation and chemical vapour deposition methods.

18. (a) Discuss in detail about the polymer based nanocomposites.

Or

- (b) Explain polybutylene terephthalate (PBT) based nanocomposites.

19. (a) Give a brief account on functionalized graphene polymer nanocomposites (FPNS).

Or

- (b) Discuss in detail the optical and mechanical properties of CNT.

20. (a) Discuss the materials used in tissue engineering.

Or

- (b) Highlight the recent developments in modern cancer chemotherapy.

(6 pages)

Reg. No. :

Code No. : 5406

Sub. Code : ZCHM 11

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL, 2023.

First Semester

Chemistry — Core

AROMATICITY AND ORGANIC REACTION
MECHANISM

(For those who joined in July 2021 onwards)

Time : Three hours

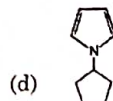
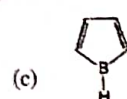
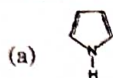
Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- The bond length of C-C bonds in benzene is
(a) 110 pm (b) 156 pm
(c) 121 pm (d) 139 pm
- Which of the following compound is not aromatic?



- In pseudo unimolecular reactions :
(a) Both the reactants are present in low concentration
(b) Both the reactants are present in same concentration
(c) One of the reactants is present in excess
(d) One of the reactants is non-reactive
- What does Hammett LFER tell us about a reaction?
(a) Possible reaction pathways
(b) Nature of the intermediates
(c) Solvent effects towards a reaction
(d) Kinetics and thermodynamics relationship of a reaction
- What is the hybridization of singlet carbene?
(a) sp (b) sp³
(c) sp³ d (d) sp²
- Nitrene is an intermediate in one of the following reactions
(a) Schmidt rearrangement
(b) Birch reduction
(c) Baeyer-Villiger oxidation
(d) Wolff rearrangement

Page 2

Code No. : 5406

- _____ reaction converts N-oxide to an alkene and a hydroxylamine

- Cope elimination
- Hofmann degradation
- Chugaev reaction
- Pyrolytic elimination

- Reaction of alcohol with SOCl₂ is _____

- S_N1 (b) S_N2
- S_NAr (d) S_Ni

- Wittig reagent is _____

- Ph₃P (b) [Ph₃PCFH₃]⁺I⁻
- Ph₃P=CH₂ (d) Ph₃PPh₃

- NaBH₄ is a _____

- Oxidation reagent
- Reduction reagent
- Photochemical reagent
- Neutral reagent

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

- (a) Discuss about the aromaticity of Azulene and syndromes.

Or

- Explain the Musulin-Frost diagram with two examples.

- (a) Write about cross over experiment and isotope labelling for trapping the intermediates in organic reaction.

Or

- Describe the Stereo chemical evidence of reaction with example.

- (a) Write short notes on Simmons Smith cyclopropanation with example.

Or

- What is Fenton and MeCombie reactions explain its synthetic importance.

- (a) Give mechanism of S_N2 and S_N1 process with example.

Or

- What are factors influencing the elimination reactions and give an example of each?

Page 3

Code No. : 5406

Page 4

Code No. : 5406

[P.T.O.]

15. (a) What is Mannich reaction? Explain with example.

Or

(b) Write about Dieckmann condensation with mechanism.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) (i) Write an account on the structure, aromaticity and synthesis of annulenes and heteroannulenes. (6)

(ii) Cyclooctatetraene is antiaromatic, whereas its dianion aromatic, why and discuss with structure. (2)

Or

(b) Brief about structure and synthesis of Adamantane and Congressane.

17. (a) Give short notes on non-kinetic methods of determination of reaction mechanism with proper examples.

Or

(b) (i) Write about Grunwald-Winstein equation and its applications. (4)

(ii) Discuss about Primary and Secondary isotopic effects with example. (4)

18. (a) Write three methods of preparation of carbenes, three reactions of carbenes, difference between singlet and triplet carbenes and how can you differentiate the single and triplet carbenes by reactions.

Or

(b) (i) Brief about generation reactions of Nitrenes. (4)

(ii) Write the mechanism of Schmidt and Beckmann rearrangements. (4)

19. (a) (i) Describe about Neighboring group participation mechanism involving Non-classical Carbonium ion. (4)

(ii) Discuss about Chugaev and Cope elimination, mechanism and example. (4)

Or

(b) What are the factors influencing nucleophilic substitution reactions, give examples of each factor.

20. (a) Write about Sharpless epoxidation, Wittig reaction with mechanism.

Or

(b) Discuss about Bucherer reaction and Smiles rearrangement with mechanism.

(7 pages)

Reg. No. :

Code No. : 5407 Sub. Code : ZCHM 12

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

First Semester

Chemistry – Core

FUNDAMENTALS OF INORGANIC CHEMISTRY,
NUCLEAR CHEMISTRY AND INORGANIC
POLYMERS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- HCL is an example of _____
(a) Dipole-dipole interactions
(b) Van der Waals interaction
(c) Dipole-induced dipole interactions
(d) London interaction
- Which of the following is aprotic solvent?
(a) N_2O_4 (b) HF
(c) CH_3OH (d) H_2SO_4
- Who invented nuclear fission?
(a) Marie curie (b) Otto Hahn
(c) Hans Bethe (d) Rutherford
- The artificially produced radio active elements are known as _____
(a) Ions (b) Radio isotopes
(c) Radiant (d) Transmutations
- Carbon has the highest catenation character because _____
(a) carbon is more electro negative
(b) carbon has higher ionisation potential value
(c) carbon-carbon bond is strong
(d) carbon has only one stable isotope
- Which of the following is an inorganic polymer?
(a) Teflon (b) Perspex
(c) Silicones (d) Backelite

- Hydrogen bond plays a vital role in determining substance properties and structure which of the following may not an example?
(a) Proteins (b) Nucleic acids
(c) Water (d) Methane molecule
- Antibonding molecular orbitals are produced by _____
(a) Constructive interaction of atomic orbitals
(b) Destructive interaction of atomic orbitals
(c) The overlap of the atomic orbitals of two negative ions
(d) All of these
- Lattice energy is inversely proportional to sum of radii of _____
(a) Cation only (b) Anion only
(c) Anion and cation (d) Ions
- Acetic acid is weak acid because _____
(a) It is highly ionised
(b) It is weakly ionised
(c) Its aqueous solution is acidic
(d) It contains the -COOH group

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Explain the applications of redox potentials.
Or
(b) Discuss the effect of chemical forces on boiling point.
- (a) Draw the molecular orbital energy level diagram for NO molecule.
Or
(b) (i) What are the limitations of valence Bond theory?
(ii) What is the basic idea of the VSEPR theory?
- (a) Explain the solvent system of acid-base concept.
Or
(b) Give example for amphoterism in liquid NH_3 and liquid SO_2 .

14. (a) Write a note on management of nuclear waste.

Or

(b) Neutron activation analysis is a non-destructive analysis. Justify.

15. (a) What are carboranes? How are they prepared?

Or

(b) (i) What is meant by degree of polymerization?

(ii) Define capping rule.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

Each answer should not exceed 600 words.

16. (a) Give an account on:

(i) Group — electronegativity, (ii) Induced dipole interactions.

Or

(b) Give a detailed account on the applications and limitations of Slater rules.

Page 5 Code No. : 5407

17. (a) (i) Write down the Born-Landé equation for determining the lattice energy of a crystal and explain the terms in it.

(ii) Write a note on apicophilicity.

Or

(b) Show how the LCAO approximation gives rise to bonding and antibonding orbitals. Illustrate your answer by reference to three different diatomic molecules.

18. (a) (i) Describe the applications of HSAB.

(ii) Explain acid base reactions in liquid H_2SO_4 .

Or

(b) (i) Give an account of acid base anomalies.

(ii) Write a note on general characteristics of solvents.

19. (a) What is meant by nuclear transmutation? Discuss the nuclear transmutations brought about by protons.

Or

(b) (i) Outline the applications of radioactive isotopes in radiometric titrations.

(ii) What do you mean by neutron evaporation?

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20. (a) (i) How is borazine prepared? Explain the difference between benzene and borazine.

(ii) What are isopoly and heteropoly acids?

Or

(b) What are inorganic metal clusters? Explain the bonding in trinuclear and tetranuclear clusters.

(8 pages)

Reg. No. :

Code No. : 5408 Sub. Code : ZCHM 13

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2023

First Semester

Chemistry – Core

QUANTUM MECHANICS AND SPECTROSCOPY – I

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Linear momentum operator along 'x' axis - P_x is known as

(a) $(\hbar/i) \left(\frac{\partial^2}{\partial x} \right)$ (b) $(\hbar/i) \left(\frac{\partial}{\partial x} \right)$

(c) $(\hbar/i) \left(\frac{\partial}{\partial x} \right)$ (d) $(\hbar/i) \left(\frac{\partial^2}{\partial x^2} \right)$

7. The wave number transition is 200 cm^{-1} . In what part of the electromagnetic spectrum does this come?

- (a) Microwave
(b) Ultra violet - visible
(c) Infrared
(d) Radiowave

8. Which of the following radiation brings about rotational transitions?

- (a) IR (b) UV
(c) Microwave (d) Visible

9. Which of the region of IR spectra appears between (1400 to 600) cm

- (a) Functional group region
(b) Finger Print region
(c) Low Frequency region
(d) None of the mentioned

10. In Raman spectroscopy, the radiation lies in the _____

- (a) Microwave region (b) Visible region
(c) UV region (d) x - ray

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2. All quantum mechanical operators
(a) Linear only
(b) Hermitian only
(c) Linear and Hermitian
(d) Neither Linear nor Hermitian

3. The normalized wave function must have _____ norm

- (a) Finite (b) Infinite
(c) Zero (d) Complex

4. If 'n' denotes the quantum number and 'c' the velocity of light, the energy of particle of mass 'm' in a box of length 'l' is proportional to _____

- (a) l^2 (b) m^2
(c) n^2 (d) $c^{1/2}$

5. Which of the following highlights the Variation Principle?

- (a) $E_{\text{True}} - E_{\text{Cal}} > 0$ (b) $E_{\text{True}} - E_{\text{Cal}} \geq 0$
(c) $E_{\text{True}} > E_{\text{Cal}}$ (d) $E_{\text{True}} \leq E_{\text{Cal}}$

6. The bond order of O_2^+ molecule is

- (a) 3 (b) 2.5
(c) 3.5 (d) 4

Page 2 Code No. : 5408

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) State the Heisenberg's uncertainty Principle. Calculate the uncertainty in the velocity of an electron with an uncertainty 10^{-15} m in its position.

Or

- (b) Which of the following are Eigen Function with respect to the $\frac{d^2}{dx^2}$ operator? Find the Eigen values for the Eigen Functions

- (i) $\cos x$
(ii) $\sin x$
(iii) exponential (x^2)
(iv) x^3
(v) $\log x$

12. (a) Calculate the length of a one - dimensional box for which the difference between the lowest energy levels of a molecule becomes comparable to its average kinetic energy at a given temperature.

Or

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[P.T.O.]

Answer ALL questions, choosing either (a) or (b).

- (b) Calculate for the spacing between energy levels for an electron (mass = 9.1×10^{-31} Kg) in a one - dimensional box of length 1.0 \AA
13. (a) Show that the probability of having three electrons in a '1s' orbital is zero.

Or

- (b) Why does He_2^+ exist, while He_2 does not?
14. (a) Discuss the factors which determine the width and intensity of spectral lines.

Or

- (b) Discuss the effect of isotopic substitution on the energy levels and rotational spectrum of a diatomic molecule.
15. (a) Discuss Mutual exclusion principle with suitable examples.

Or

- (b) (i) Define Stokes and anti - Stokes lines and explain their origin.
- (ii) Which set of lines, Stokes or anti-Stokes is weaker?

16. (a) Prove that P_x and L_x operators are hermitian.

Or

- (b) Show that if two operators \hat{A} and \hat{C} are Hermitian then the product ($\hat{A}\hat{C}$) is also Hermitian if and only if \hat{A} and \hat{C} commute.

17. (a) (i) What do you mean by degeneracy? What is the degeneracy of a particle of mass 'm' in a three dimensional cubical box of width 'a' having the energy equal to 6 in unit of $[(h^2)/(8ma^2)]$

- (ii) What are spherical harmonics? How are they obtained for 'd' - orbitals?

Or

- (b) Verify that the following functions are eigen functions of the simple harmonic oscillator

(i) $\psi = \exp(-1/2 \beta x^2)$

(ii) $\psi = x \exp(-1/2 \beta x^2)$

18. (a) State Harte's Fock Self consistent field theory.

Or

- (b) Discuss the salient Features of HMO method and explain it's application to ethylene.

19. (a) (i) Why is the rotational spectroscopy studied only in gaseous state of atoms or molecules?

- (ii) The roaigonal energy and rotational constant of CO molecule are $6.5 \times 10^{13} \text{ s}^{-1}$ and $1.743 \times 10^{11} \text{ s}^{-1}$ respectively. Find the rotational quantum number.

Or

- (b) (i) What are the degeneracies of the following diatomic rotational energy levels?

(1) 0 (2) $h^2/4\pi^2 I$

- (ii) HCl, but not Cl_2 absorbs microwave radiation and gives pure rotational spectrum. Explain.

20. (a) Explain in detail about the anharmonic oscillator model in vibrational spectroscopy.

Or

- (b) (i) Explain the origin of Rayleigh and Raman scattering.

- (ii) Discuss the applications of Raman spectroscopy.

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Chemistry - Core

STEREOCHEMISTRY, ORGANIC REAGENTS AND
PHOTOCHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

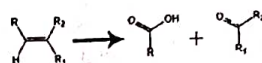
PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Which among the following is a prochiral molecule?
(a) Lactic acid (b) propionic acid
(c) acetic acid (d) tartaric acid
- Biphenyl exhibits _____
(a) constitutional isomerism
(b) stereoisomerism
(c) atropisomerism
(d) topomerism

- Preferred conformation of 1,2-dichlorocyclohexane is
(a) cis - e, a (b) cis - a, e
(c) trans - e, e (d) trans - a, a
- Which is the most stable conformation of cis-1,4-di-t-butylcyclohexane
(a) chair (b) boat
(c) twist boat (d) gauche
- IBX oxidizes toluene to _____
(a) benzoic acid
(b) benzyl alcohol
(c) benzophenone
(d) benzaldehyde
- The reagent used for the following conversion



- Lemieux-Johnson reagent
- Lemieux-Von Rudloff reagent
- Luche reagent
- Fetizon's reagent

- Di-pi methane rearrangement involves _____ intermediate
(a) carbonium ion (b) carbanion
(c) carbene (d) biradical
- _____ reaction involves δ -H transfer
(a) Paterno-Buchi (b) Mc Lafferty
(c) Barton (d) di-pi methane
- Claisen rearrangement is
(a) 1,3-Sigmatropic reaction
(b) 3,3-Sigmatropic reaction
(c) 1,5-Sigmatropic reaction
(d) 1,7-Sigmatropic reaction
- The reaction shown is a/an _____ reaction



- electrocyclic
- cycloaddition
- sigmatropic
- cheletropic

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Explain Cram's chelation model with an example.

Or

- Discuss asymmetric synthesis using enzymes.

- (a) Analyze the conformations of 1,2-disubstituted cyclohexane and explain related properties.

Or

- Draw the most stable conformation for following molecules and explain why?

- trans-1,2-dichlorocyclohexane
- cis-1,3-dihydroxycyclohexane

- (a) Compare the mechanism and stereochemistry of Woodward and Prevost hydroxylation.

Or

- Discuss the speciality of 1,3-dithiane in Umpolung synthesis.

14. (a) Briefly discuss Norrish Type I and Type II reactions

Or

- (b) Write a short note on cis-trans isomerization.

15. (a) Thermal cyclisation of 1,3-butadiene is a conrotatory process. Substantiate using FMO method.

Or

- (b) Using FMO method discuss the stereochemistry of 1,5-sigmatropic migration.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Giving examples differentiate stereospecific and stereoselective synthesis.

Or

- (b) Explain how allenes and spiranes exhibit optical isomerism though they do not have asymmetric atoms.

17. (a) Discuss the various conformations and properties of perhydrophenanthrene.

Or

- (b) State Curtin-Hammett principle. Briefly discuss two applications.

Page 5 Code No. : 5412

18. (a) How are the following used in organic synthesis?

- (i) Merrifield resin (ii) Vaska's catalyst

Or

- (b) Write short notes on (i) Gilman's reagent (ii) Luche reagent

19. (a) Explain (i) quantum efficiency (ii) Paterno-Buchi reaction.

Or

- (b) Write short notes on (i) Jablonski diagram (ii) Di-pi methane rearrangement

20. (a) Using correlation diagram method discuss the stereochemical course of 4+2 cycloaddition.

Or

- (b) Write short notes on (i) Cope rearrangement (ii) Fluxional tautomerism

Page 6 Code No. : 5412

M.Sc.(CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Chemistry – Core

COORDINATION COMPOUNDS AND SOLID STATE CHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Among $[\text{Co}(\text{NH}_3)_6]^{3+}$, $[\text{Ir}(\text{NH}_3)_6]^{3+}$, $[\text{Fe}(\text{bpy})_3]^{3+}$ and $[\text{Rh}(\text{NH}_3)_6]^{3+}$, the Δ_0 is the highest for
- (a) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (b) $[\text{Ir}(\text{NH}_3)_6]^{3+}$
 (c) $[\text{Fe}(\text{bpy})_3]^{3+}$ (d) $[\text{Rh}(\text{NH}_3)_6]^{3+}$

5. The spin-only magnetic moment (in BM) value of $[\text{FeF}_6]^{3-}$ and $[\text{Co}(\text{CN})_5(\text{H}_2\text{O})]^{3-}$ respectively are
- (a) 0 and 1.73 (b) 5.92 and 1.73
 (c) 4.47 and 1.73 (d) 5.92 and 3.87
6. The paramagnetic susceptibility is _____ to the absolute temperature.
- (a) directly proportional
 (b) inversely proportional
 (c) remains constant
 (d) same
7. The number of Schottky defects present in NaCl at room temperature is approximately _____.
- (a) 10^{18} defects / cm^3 (b) 10^6 defects / cm^3
 (c) 10^3 defects / cm^3 (d) 10^2 defects / cm^3
8. The ability of certain metals and alloys to conduct electricity without resistance is called
- (a) semiconductivity (b) conductivity
 (c) superconductivity (d) resistivity
9. An example for antifluorite structure is _____
- (a) CaF_2 (b) Na_2O
 (c) TeO_2 (d) CaCO_3

2. In CrF_2 , Cr(II) is octahedrally surrounded by six F ligands with two longer Cr-F bonds and four shorter ones because of _____.
- (a) Jahn-Teller distortion
 (b) Lattice energy
 (c) Steric hindrance
 (d) Repulsive energy
3. The final product containing chromium in the reaction between $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$, $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ and H_2O^+ is _____
- (a) $[\text{Cr}(\text{NH}_3)(\text{H}_2\text{O})_4\text{Cl}]^{2+}$
 (b) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$
 (c) $[\text{Co}(\text{NH}_3)_5\text{Cl}]^{2+}$
 (d) $[\text{Cr}(\text{H}_2\text{O})_5\text{Cl}]^{2+}$
4. The CORRECT statement regarding the thermodynamic stability and kinetic reactivity of metal ion complexes is that
- (a) Most stable complexes are less reactive
 (b) There exists a dependence on the bulkiness of the ligand
 (c) There exists no direct relation between these two phenomena
 (d) There exists a dependence on the size of the metal ion

10. _____ is used to determine the nature of semiconductors.
- (a) Mobility of charge carriers
 (b) Concentration of charge carriers
 (c) Hall coefficient
 (d) Conductivity

PART B — (5 × 5 = 25 marks)

Answer ALL the questions, choosing either (a) or (b).
 Each answer should not exceed 250 words.

11. (a) List the salient features of CFT.
 Or
 (b) Describe the factors affecting CFSE.
12. (a) What is trans effect? What product is obtained when $[\text{PtCl}_4]^{2-}$ is treated with
- (i) NH_3 followed by R_3P
 (ii) R_3P followed by NH_3
- Or
 (b) Write in detail about the complementary and non complementary electron transfer reactions.

13. (a) Give reasons for the following.
- Two distinct advantages of Faraday method over Guoy method
 - The magnetic moment of 3d transition elements corresponds to spin only value

Or

- (b) Discuss the magnetic properties of lanthanides.

14. (a) Derive an expression to calculate number of Schottky defects in a crystal.

Or

- (b) Sketch and explain the structure of
- Fluorite
 - Zinc blende,

15. (a) Write briefly about the optical and electrical properties of semiconductors.

Or

- (b) Illustrate Hall effect. Explain the experimental setup for the measurement of Hall voltage with its application.

Page 5 Code No. : 5413

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 600 words.

16. (a) Discuss the applications of CFT.

Or

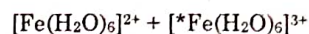
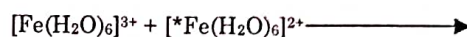
- (b) State Jahn-Teller effect. Explain it with suitable examples.

17. (a) Write briefly on chelate and template effect.

Or

- (b) Explain the mechanism of the following reaction and speculate why the rate of electron transfer is slow

$$(K_{II} = 4 \text{ L mol}^{-1} \text{ s}^{-1})$$



18. (a) State and explain the types of magnetism in coordination complexes with A and E ground state.

Or

- (b) Compare the magnetic properties of O_h and T_d complexes of Fe(II), Co(II), Ni(II) and Cu(II).

Page 6 Code No. : 5413

19. (a) Write the crystal structure of the following compounds

- (i) CdI_2 (ii) CsCl (iii) Wurtzite (iv) Rutile

Or

- (b) (i) Explain briefly line defects and plane defects.
(ii) Elaborate on the determination of crystal structure by rotating crystal method.

20. (a) Discuss how band theory explains the conduction in metals, insulators and semiconductors.

Or

- (b) Account on the properties and applications of superconductors.

Code No. : 5414

Sub. Code : ZCHM 23

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Second Semester

Chemistry — Core

ELECTROCHEMISTRY AND SPECTROSCOPY — II

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL the questions.

Choose the correct answer :

1. For an aqueous solution Debye-Huckel Limiting Law is given by
- (a) $\log \gamma_{\pm} = 0.509 |Z_+ Z_-| \sqrt{\mu}$
 (b) $\log \gamma_{\pm} = 0.509 |Z_+ Z_-| \mu$
 (c) $\log \gamma_{\pm} = -0.509 |Z_+ Z_-| \sqrt{\mu}$
 (d) $\log \gamma_{\pm} = -0.509 |Z_+ Z_-| \mu$

6. Appearance of continuum after progression in electronic spectrum indicates that the _____.
- (a) Dissociation (b) Pre dissociation
 (c) Ionisation (d) None of the above
7. Which of the following systems will not show ESR spectrum?
- (a) Cl^- (b) N_2^-
 (c) NO_2 (d) I_2^-
8. $^3J_{\text{HH}}$ coupling constants depend on
- (a) Magnetic field strength
 (b) Relative orientation of the coupled protons
 (c) Sample concentration
 (d) 90° Pulse width
9. The correct order of the isomeric shift in Mössbauer spectra (^{57}Fe source) of high spin iron compound is
- (a) $\text{Fe(II)} > \text{Fe(III)} > \text{Fe(IV)}$
 (b) $\text{Fe(III)} > \text{Fe(II)} > \text{Fe(IV)}$
 (c) $\text{Fe(IV)} > \text{Fe(III)} > \text{Fe(II)}$
 (d) $\text{Fe(IV)} > \text{Fe(II)} > \text{Fe(III)}$

2. Example of highly non polarisable electrodes
- (a) Glass (b) Calomel
 (c) Mercury (d) Silver
3. Which one of the following conductometric titrations will show a linear increase with volume of the titrant added up to the break point and an almost constant conductance afterwards?
- (a) A strong acid with a strong base
 (b) A strong acid with a weak base
 (c) A weak acid with a strong base
 (d) A weak acid with a weak base
4. The output of a voltammetric analysis of an electroactive analyte is
- (a) Current – Time curve
 (b) Charge – Time curve
 (c) Current – Potential curve
 (d) Charge – Temperature curve
5. UV PES spectrum of a molecule shows a single sharp line. Then the electron is ejected from _____.
- (a) Bonding Molecular Orbital
 (b) Anti-bonding molecular orbital
 (c) Non-bonding orbital
 (d) None of the above

10. NQR spectra is observed in _____ region.
- (a) Microwave (b) Radio frequency
 (c) X-ray (d) UV/Visible

PART B — (5 × 5 = 25 marks)

Answer ALL the questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Discuss the thermodynamic treatment of electrified interface leading to the derivation of Lippmann equation.
- Or
- (b) Explain the following :
- (i) Wein effect
 (ii) Debye-Falkenhagen effect.
12. (a) Discuss the principle and applications of cyclic voltammetry.
- Or
- (b) Calculate the Liquid Junction Potential at 25°C between two solutions of HCl having mean ionic activities of 0.01 and 0.001 respectively. The transference number of H^+ ion (t_+) in HCl may be taken as 0.83.

13. (a) The photoelectron spectrum of O_2 was recorded using the electromagnetic radiation of wavelength 58.43 nm. Two peaks were found with kinetic energies 9.30 eV and 5.20 eV. Calculate the ionisation energies corresponding to these two peaks.

Or

- (b) Discuss the vibrational progression in electronic spectra.
14. (a) How can lines due to spin-spin splitting be differentiated from those of the chemical shift?

Or

- (b) For the following molecules give the number of lines expected in a resolved ESR spectrum
- (i) methyl radical
- (ii) naphthalene anion.
15. (a) With the help of Mössbauer spectra how can you differentiate between $FeSO_4$ and $FeCl_3$?

Or

- (b) Deduce the mass spectral splitting pattern of butanal.

Page 5 Code No. : 5414

PART C — (5 × 8 = 40 marks)

Answer ALL the questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the structure of electrified interface with reference to Helmholtz-Perrin and Gouy-Chapmann theories.

Or

- (b) Derive Debye-Huckel Limiting Law equation. How can it be verified?

17. (a) Discuss the theories of Hydrogen Overvoltage.

Or

- (b) Derive Butler-Volmer equation.

18. (a) Summarize the features of X-ray photoelectron spectroscopy and give its applications.

Or

- (b) Elucidate the fate of electronically excited molecules with reference to dissociation, fluorescence, phosphorescence.

Page 6 Code No. : 5414

19. (a) (i) Elucidate the splitting pattern of NMR signal in AMX system.
- (ii) The chemical shift of benzene protons is lower than that of olefinic protons. Why?

Or

- (b) Why does anisotropy occur in g -value of ESR? Discuss anisotropic g factors and its effect in hyperfine splitting.

20. (a) Arrive at the NQR spectral pattern for the following nuclei under the conditions indicated and explain.

(i) $^{127}I: I = 5/2 \quad \eta = 0 \quad B_0 = 0$

(ii) $^{35}Cl: I = 3/2 \quad \eta = 0 \quad B_0 \neq 0$

Or

- (b) (i) What is recoil energy? Discuss its effect and how is it eliminated while recording Mössbauer spectra.

- (ii) Discuss the following :

(i) Molecular ion peak

(ii) Metastable ion.

Page 7 Code No. : 5414

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023

Third Semester

Chemistry – Core

ORGANIC SPECTROSCOPY AND
REARRANGEMENT

(For those who joined in July 2021–2022 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- 1.
- λ_{\max}
- for the following compound is



- (a) 262nm (b) 298nm
(c) 245nm (d) 255nm

2. Solution of Iodine in benzene shows an intense band around 300nm due to _____.
- (a) $\pi \rightarrow \pi^*$ transition
(b) $n \rightarrow \pi^*$ transition
(c) charge transfer complex
(d) extensive conjugation
3. The separation between the centers of the peaks of a doublet (in Hz) is called as _____.
- (a) spin constant
(b) coupling constant
(c) spin-spin coupling
(d) chemical shift
4. The $^1\text{H-NMR}$ spectrum of $\text{CH}_3\text{OCHClCH}_2\text{Cl}$ will exhibit
- (a) 3 proton doublet, 1 proton singlet and 2 proton doublet
(b) 3 proton singlet, 1 proton singlet and 2 proton doublet
(c) 3 proton singlet, 1 proton triplet and 2 proton doublet
(d) 3 proton triplet, 1 proton triplet and 2 proton triplet

Page 2

Code No. : 7418

5. Which of the following compounds undergoes McLafferty rearrangement?
- (a) acetone (b) butanone
(c) pentan-3-one (d) pentan-2-one
6. The mass of metastable ion produced when a fragment of m/z 77 decomposes by loss of acetylene to a fragment of m/z 51 is _____.
- (a) 116.25 (b) 0.66
(c) 33.7 (d) 26
7. Signals are not visible for _____ in HETCOR.
- (a) methyl carbon
(b) methylene carbon
(c) quarternary carbon
(d) all the above
8. Which of the following carbons produces a negative peak in DEPT-135 spectrum?
- (a) CH (b) CH_2
(c) CH_3 (d) R_4C
9. Reagent used in Dakin rearrangement is _____.
- (a) $\text{H}_2\text{O}_2/\text{NaOH}$ (b) $\text{CF}_3\text{CO}_3\text{H}$
(c) SeO_2 (d) HIO_4

Page 3

Code No. : 7418

10. Oxidation of acetophenone using perbenzoic acid gives
- (a) acetone
(b) phenyl acetate
(c) benzaldehyde
(d) methylbenzoate

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) State Axial haloketone rule. Discuss two applications of the rule.
- Or
- (b) What are the factors that affect IR absorption frequency of Carbonyl compounds?
12. (a) How is NOE useful in stereochemical analysis?

Or

- (b) Briefly explain chemical exchange.

Page 4

Code No. : 7418

[P.T.O.]

13. (a) Write a short note on McLafferty rearrangement.

Or

(b) With examples explain the fragmentation pattern in alcohols and acids.

14. (a) Explain ^1H - ^{13}C COSY spectrum with an example.

Or

(b) Write a short note on DEPT.

15. (a) Discuss the mechanism and migratory aptitude of groups in dienone-phenol rearrangement.

Or

(b) Describe the steps involved in Von-Richter rearrangement.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss the effect of solvents and hydrogen bonding on λ_{max} values.

Or

(b) State octant rule. Explain how it is used to determine stereochemistry of steroids.

Page 5 Code No. : 7418

17. (a) Explain the factors influencing chemical shift of protons.

Or

(b) Write short notes on non-first order spin-spin splitting.

18. (a) Explain the following techniques

(i) FAB

(ii) CI

Or

(b) How is MALDI-MS and TOF techniques useful in ionization?

19. (a) Propose a structure for a compound of molecular formula $\text{C}_9\text{H}_8\text{O}$, whose mass spectrum shows molecular ion peak at m/z 132, base peak at m/z 131 and a significant peak at m/z 103. Its IR spectrum has a strong absorption at 1690cm^{-1} . The UV spectrum has an intense band at 284nm and weak band at 308nm . The compound shows following ^1H NMR absorptions: δ 6.7(1H dd, $J = 16\text{Hz}$ $J = 8\text{Hz}$), 7.4 (5H m), 7.45 (1H d, $J = 16\text{Hz}$), 9.75 (1H d, $J = 8\text{Hz}$).

Or

Page 6 Code No. : 7418

(b) A compound with molecular formula $\text{C}_8\text{H}_8\text{O}_2$ shows bands at 3200cm^{-1} and 1700cm^{-1} in its IR spectrum. The ^1H NMR spectrum shows peaks at $\delta = 10.9\text{ppm}$ (1H s), 7.2ppm (5H s) and 3.6ppm (2H s). The ^{13}C NMR has four peaks at $\delta = 130\text{ppm}$, one peak at $\delta = 178.3\text{ppm}$ and another peak at $\delta = 41\text{ppm}$. Its mass spectrum shows a strong molecular ion peak at m/z 136 and base peak at m/z 91. Suggest a structure for the compound.

20. (a) (i) Explain the term memory effect.

(ii) Show Ring contraction or enlargement in rearrangement with Demjanov reaction as example.

Or

(b) Discuss the mechanism and migratory aptitude of groups in

(i) Dakin rearrangement

(ii) Benzilic acid rearrangement

Page 7 Code No. : 7418



(7 pages)

Reg. No. :

Code No. : 5-418

Sub. Code : ZCHM 31

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL, 2023.

Third Semester

Chemistry - Core

ORGANIC SPECTROSCOPY AND
REARRANGEMENTS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. A carbonyl group will cause a sharp dip at about _____ cm^{-1} .
(a) 1700 (b) 2800
(c) 3400 (d) 1200
2. The finger print region in IR spectroscopy is _____
(a) 4000 to 1000 cm^{-1} (b) 1500 to 400 cm^{-1}
(c) 200 to 1400 cm^{-1} (d) 2999 to 1200 cm^{-1}

7. INADEQUATE is a method often used to find _____ couplings between adjacent atoms.
(a) ^{13}C (b) ^{12}C
(c) ^9F (d) ^{14}N
8. The first two-dimensional experiment, COSY was proposed by _____.
(a) Jean Jecner
(b) Madam Curie
(c) Newton
(d) Christy Catherine Mary
9. The benzilic acid rearrangement reaction of a cyclic diketone leads to _____.
(a) Ring expansion
(b) Ring contraction
(c) Ring fusion
(d) Isomers
10. Carbon to oxygen migration is seen in _____ rearrangement
(a) Curtius (b) Dakin
(c) Pinacol (d) Arndt-Eistert

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3. A proton H_b is coupled to four equivalent protons H_a . The multiplicity and the relative intensity of lines in the signal H_b is?
(a) Doublet, 1 : 4
(b) Triplet, 1 : 4 : 6
(c) Quintet, 1 : 4 : 6 : 4 : 1
(d) Quartet, 1 : 4 : 6 : 4
4. H_2 , CH_4 , C_2H_6 and C_6H_6 exhibit which PMR spectra?
(a) Singlet (b) Doublet
(c) Triplet (d) Quintet
5. Which species of the following is used to bombard the sample in mass spectroscopy?
(a) Alpha particles
(b) Neutrons
(c) Electrons
(d) Protons
6. Separation of ions in mass spectrometer take place on the basis of which of the following?
(a) Mass (b) Charge
(c) Molecular weight (d) Mass to charge ratio

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PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) State and explain Beer-Lambert's law.
Or
(b) Explain axial haloketone rule and how it is used determination of conformation.
12. (a) Compare CW and FT NMR spectra.
Or
(b) Explain vander Waals deshielding in NMR spectroscopy.
13. (a) (i) Explain Base peak in mass spectrometry.
(ii) State and explain nitrogen rule in mass spectrometry.
Or
(b) Write a short note on Chemical ionisation technique in mass spectroscopy.
14. (a) Explain 1H-1H COSY with one example.
Or
(b) What is inadequate spectrum? Explain.

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[P.T.O.]

15. (a) Explain Migratory aptitude in molecular rearrangements.

Or

- (b) What is Benzil- Benzilic acid rearrangement? Explain its mechanism.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)

16. (a) Explain how maximum absorption values are affected in uv-visible absorption spectroscopy with special reference to solvent effect and hydrogen bonding.

Or

- (b) State and explain how Woodward- Fieser Rules are used to calculate maximum absorption values of conjugated dienes in uv-visible absorption spectroscopy.

17. (a) Explain spin-spin coupling in NMR spectroscopy.

Or

- (b) Explain chemical exchange in NMR spectroscopy.

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18. (a) State Me Lafferty rearrangement. Explain the mechanism of this rearrangement in

- (i) Pentanal
(ii) Pentan-2-One
(iii) Ethylacetate

Or

- (b) Outline Fragmentation pattern of alcohols, aldehydes, ketones and esters in MS

19. (a) A compound molecular mass 164 absorbs at 220 nm ϵ_{\max} 1880. In infra red spectrum, absorption bands are formed at 3077 cm^{-1} (w), 1745 cm^{-1} (s) 1608 cm^{-1} (m), 1497 cm^{-1} (m) and 1456 cm^{-1} (m).

In NMR, the signals formed are (i) 2.7 τ singlet (10.5 squares), (ii) 5.70 τ triplet ($J = 7.3$ cps, 6.2 squares), (iii) 7.07 triplet ($J = 7.3$ cps, 6.7 squares) and (iv) 7.98 τ singlet (10.2 squares). Determine the structure of the compound.

Or

- (b) An organic compound with molecular formula $\text{C}_7\text{H}_{12}\text{O}_4$ molecular mass 160 absorbs at 212 nm ϵ_{\max} 60 in the ultraviolet spectrum.

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- (i) In infra-red, the bands are formed at (1) 2941-2857 (m), (2) 1742 (s), (3) 1460 (m), (4) 1056 (s) and (5) 1260 cm^{-1} (s). In the NMR spectrum, three signals are observed.

- (ii) (1) Singlet 7.5 τ (5.3 squares), (2) triplet 8.71 τ (16.5 squares, $J = 7.2$ cps) and (3) quartet 5.84 τ (10.8 squares, $J = 7.2$ cps). Determine the structure of the compound.

20. (a) What is Brook rearrangement? Explain mechanism and migratory aptitude

Or

- (b) Explain memory effect in molecular rearrangement with one example.

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(6 pages)

Reg. No. :

Code No. : 5419

Sub. Code : ZCHM 32

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2023.

Third Semester

Chemistry – Core

SPECTRAL METHODS – I ORGANO METALLIC
AND ANALYTICAL METHODS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

- Which of the following transitions are of weak intensities and lie in the visible region?
(a) $n \rightarrow n^*$ (b) $\sigma \rightarrow \sigma^*$
(c) $\pi \rightarrow \pi^*$ (d) $n \rightarrow o^*$
- Which of the following is an application of electronic spectroscopy?
(a) Detection of impurities
(b) Control of purification
(c) Study of kinetics of the chemical reaction
(d) All of the mentioned

- Which of the following is correct about Wilkinson's catalyst?
(a) It is an ionic complex
(b) It is a paramagnetic complex.
(c) It is a square planar complex.
(d) It is a tetrahedral complex.
- Thermal analysis is defined as _____
(a) Measurement of concentration of materials as a function of temperature
(b) Measurement of solubility of materials as a function of temperature
(c) Measurement of physical properties as a function of temperature
(d) Measurement of line positions of crystals as a function of temperature
- What are the two main techniques for thermal analysis?
(a) FTG AND DGG
(b) MSP AND FCT
(c) TGA AND DTA
(d) TSA AND DGF

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- The energy required to remove an electron from the highest occupied atomic orbital is known as _____
(a) Ionization energy
(b) Kinetic energy
(c) Binding energy
(d) Vibrational energy
- The PES of H₂O gives _____ peaks
(a) 3 (b) 2
(c) 1 (d) 4
- Which of the following is not considered as an organometallic compound?
(a) Ferrocene (b) Cis-platin
(c) Ziese's salt (d) Grignard reagent
- _____ carbonyl is not Stable
(a) U(CO)₆ (b) Cr(CO)₆
(c) Ni(CO)₄ (d) Fe(CO)₅
- Wilkinson's catalyst is
(a) Ni (b) [(C₆H₅)₃P]₃RhCl
(c) LiAlH₄ (d) Fe₂O₃

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PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

- (a) Write a note on selection rule of electronic transitions of d² ion.
Or
(b) Write briefly about Tanabe Sugano diagrams.
- (a) Explain briefly about types of PES.
Or
(b) Explain briefly about PE spectra of oxygen molecule.
- (a) Write briefly about synthesis of metal complexes with alkyl systems.
Or
(b) Write a note on synthesis and reactions of ferrocene.
- (a) Write briefly about insertion reactions.
Or
(b) Write briefly about Fischer Tropsch process.

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[P.T.O.]

15. (a) Write the principles of TGA.

Or

(b) Write the steps involved in emission spectroscopy based on plasma sources.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) Give a detailed account on Electronic spectra of lanthanide and actinide complexes

Or

(b) Write the explanations involved in effect of solvent polarity on CT spectra.

17. (a) Discuss the application and limitation of Koopman's theorem.

Or

(b) Discuss the principle involved in ESCA.

18. (a) Discuss the structure of trinuclear and tetranuclear carbonyls.

Or

(b) Discuss the structure and bonding in beryllocene.

19. (a) Discuss hydrogenation and hydro formylation reactions.

Or

(b) Ziegler-Natta polymerization and mechanism of stereo regular polymer synthesis.

20. (a) Discuss the steps in Thermometric titrations.

Or

(b) Discuss about principle and applications of spectrofluorimetry.

(6 pages)

Reg. No. :

Code No. : 5420

Sub. Code : ZCHM 33

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2023.

Third Semester

Chemistry – Core

GROUP THEORY AND CHEMICAL
THERMODYNAMICS

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. What is the symmetry of CH_3Cl ?
(a) C_{2v} (b) C_{3v}
(c) D_{3h} (d) no symmetry
2. What is the symmetry of CFHIBr ?
(a) No symmetry (b) C_{3v}
(c) D_{3h} (d) T_d
6. Fugacity is most helpful in
(a) representing actual behaviour of real gases
(b) representing actual behaviour of ideal gases
(c) the study of chemical equilibria involving gases at atmospheric pressure
(d) none of these
7. Bosons have symmetrical wave functions. They do not obey _____.
(a) Aufbau principle
(b) Pauli's Exclusion Principle
(c) Hund's Rule of Maximum Multiplicity
(d) Heisenberg's Uncertainty Principle
8. The wave function of fermions is not _____.
(a) Continuous (b) Single Valued
(c) Symmetric (d) Differentiable
9. Entropy change of an irreversible process has a _____ value.
(a) Positive (b) Negative
(c) Zero (d) Both (a) or (b)

Page 3

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3. When is a vibrational mode of a molecule IR active?
(a) when the vibrational mode has the same symmetry as a component of the molecule's electric dipole moment vector
(b) when the vibrational mode has the same symmetry as a component of the molecule's polarizability
(c) vibrational modes of molecules are Raman active only; they cannot be IR active at the same time
(d) none of the above
4. The number of vibrational degrees of freedom for NH_3 is
(a) 6 (b) 7
(c) 4 (d) 5
5. Chemical potential of any constituent of an ideal solution depends on the _____ of the solution?
(a) Temperature (b) Pressure
(c) Composition (d) All the above

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10. A reversible process is performed in such a way that
(a) at the conclusion of process, both system and surroundings can be restored to their initial states without producing any change
(b) it should not leave any trace to show that the process had ever occurred
(c) it is carried out infinitely slowly
(d) all of the mentioned

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) What are symmetry elements? Give example.
Or
(b) Give example for a plane of symmetry.
12. (a) Explain Vibrational modes as bases for group representations.
Or
(b) Explain Normal mode analysis for POCl_3 molecule.

Page 4

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[P.T.O.]

13. (a) What are partial molar quantities?

Or

(b) Define Chemical Potential and arrive at Gibbs-Duhem equation.

14. (a) Explain Ensembles.

Or

(b) Write note on Heat capacity of diatomic gases.

15. (a) Compare reversible and irreversible processes.

Or

(b) Explain Electrokinetic effect.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Explain Schoenflies symbols.

Or

(b) Discuss the Construction of multiplication Table for C_{2v} .

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17. (a) Explain mutual exclusion principle.

Or

(b) Discuss determination of hybridization of atomic orbitals in PF_5 .

18. (a) Derive Duhem-Margules equation and apply it to Raoult's law.

Or

(b) Define activity coefficient and explain a method of determination for a non electrolyte.

19. (a) Explain population inversion.

Or

(b) Derive Rotational partition function and explain.

20. (a) Explain Applications of irreversible thermodynamics to biological systems.

Or

(b) Enumerate Entropy change due to coupling of chemical reactions.

Page 6 Code No. : 5420

M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2023

Fourth Semester

Chemistry – Core

SYNTHETIC STRATEGIES IN ORGANIC
CHEMISTRY

(For those who joined in July 2021–2022)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

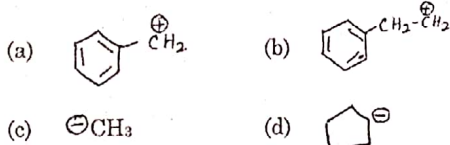
Answer ALL questions.

Choose the correct answer :

1. Which of the following is used as a reagent in a witting reaction?

- (a) Mono phenyl phosphonium ylide
(b) Diphenyl phosphonium ylide
(c) Triphenyl phosphonium ylide
(d) None of the above

4. Which of the following synthon is most stable?



5. Which of the following is Adam's catalyst?

- (a) Platinum dioxide (b) Selenium dioxide
(c) Titanium dioxide (d) Manganese dioxide

6. Reduction of isoquinoline with Lithium tetraethyl borohydrid gives _____

- (a) Quindine
(b) Octahydro isoquinoline
(c) Piperidine
(d) Tetrahydro isoquinoline

7. When oestriol is heated with potassium hydrogen sulphate, it undergoes dehydration to yield _____

- (a) Oestrone (b) Oestradiol
(c) Hexoestrol (d) Oestradiol - 17 α

2. What is the precursor used for Acyloin condensation?

- (a) Alcohol (b) Ester
(c) Phenol (d) Aldehyde

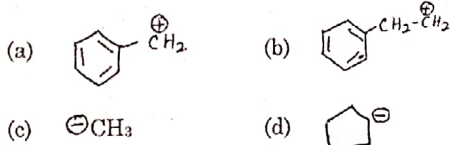
3. Which of the following statement best describes retrosynthesis?

- (a) The reaction conditions required to convert the product of a reaction back to the original starting materials
(b) A strategy used by design a synthesis of a target molecule by working back from the target to simple starting material
(c) The design of a synthetic scheme using cheap traditional reagents rather than expensive modern reagents
(d) The design of reaction conditions such that an equilibrium reaction is pushed towards the products rather than the starting materials

Page 2

Code No. : 7422

4. Which of the following synthon is most stable?



5. Which of the following is Adam's catalyst?

- (a) Platinum dioxide (b) Selenium dioxide
(c) Titanium dioxide (d) Manganese dioxide

6. Reduction of isoquinoline with Lithium tetraethyl borohydrid gives _____

- (a) Quindine
(b) Octahydro isoquinoline
(c) Piperidine
(d) Tetrahydro isoquinoline

7. When oestriol is heated with potassium hydrogen sulphate, it undergoes dehydration to yield _____

- (a) Oestrone (b) Oestradiol
(c) Hexoestrol (d) Oestradiol - 17 α

8. When bile acid is dehydrated by heating in a vaccum followed by catalytic reduction gives _____

- (a) 5 α - cholanic acid (b) 5 β - Cholanic acid
(c) Coprostane (d) Both (a) and (b)

9. When camphor is distilled with iodine, it yields _____

- (a) Carvacrol (b) Cymene
(c) α - Pinene (d) Menthol

10. The chemical name of vitamin C is _____

- (a) Ascorbic acid (b) Niacin
(c) Riboflavin (d) Biotin

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Explain the mechanism of Hofmann-Löffler freytag reaction.

Or

(b) Write down the mechanism of wittig reaction.

12. (a) Write short notes on synthon - synthetic equivalent.

Or

(b) Write short notes on one group disconnection of alcohols.

13. (a) Write down the applications of DMSO.

Or

(b) Explain Heck and Negishi reaction.

14. (a) Write short notes on Diels hydrocarbon.

Or

(b) Write down the conversion of oestrone to oestriol.

15. (a) Write down the synthesis of squalene.

Or

(b) Write down the synthesis of vitamin A₁.

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Discuss Peterson olefination reaction and its applications.

Or

(b) Explain Ugi reaction.

17. (a) Discuss the Reterosynthesis of Ci - Jasmone.

Or

(b) Discuss the Reterosynthesis of Trihexyl phenydl.

18. (a) Explain the Preparation and applications of DDQ.

Or

(b) Discuss the preparation and applications of Adam's catalyst.

19. (a) Write down the conversion of cholesterol to progesterone, testosterone, 5-β- cholanil acid.

Or

(b) How is the constitution of sidechain established in cholesterol?

20. (a) Write down the syntehsis of α - pinene.

Or

(b) Explain the structural elucidation and synthesis of Zingiberene.

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which of the following enzyme oxygenate the substrate?
- (a) Cytochrome P450
(b) Super Oxidase Dismutase
(c) Peroxidase
(d) Catalase

7. The proton nmr of HD molecule gives _____

- (a) three lines with equal intensity
(b) two lines with equal intensity
(c) two lines with 1:2 intensity
(d) three lines with 1:2:1 intensity

8. A metal with effective spin of S gives _____ number of ESR transitions.

- (a) S (b) 2S
(c) 3S (d) 4S

9. The radiative transition ${}^2E \rightarrow {}^4A_2$ is called _____

- (a) Internal Conversion
(b) Inter System Crossing
(c) Phosphorescence
(d) Fluorescence

10. $*[Ru(bpy)_3]^{+2} + MV^{+2} \rightarrow [Ru(bpy)_3]^{+3} + MV^+$ is _____ reaction.

- (a) Reductive quenching
(b) Energy quenching
(c) Photo isomerisation
(d) Oxidative quenching

2. In deoxy haemoglobin the co-ordination number of Iron is _____

- (a) 6 (b) 5
(c) 3 (d) 4

3. The enzyme carboxy peptidase is _____ shaped.

- (a) sickle (b) olive leaf
(c) egg (d) dumb bell

4. The number of molybdenum atoms in xanthine oxidase is

- (a) 3 (b) 4
(c) 1 (d) 2

5. The Mossbauer Spectrum of deoxy hemerythrin exhibits as

- (a) a doublet (b) two doublets
(c) quintet (d) triplet

6. Quadrupole splitting is seen for _____ ion.

- (a) high spin Fe(III) (b) low spin Fe(II)
(c) high spin Fe(II) (d) both (a) and (b)

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) Discuss the structure and dioxygen bonding of hemerythrin.

Or

- (b) Write a note on in vivo nitrogen fixation.

12. (a) Explain the structure and reactions of SOD.

Or

- (b) Discuss the structure and catalytic activity of carbonic anhydrase.

13. (a) Elucidate the structure of $Fe_3(CO)_{12}$ by Mossbauer spectroscopy:

Or

- (b) Distinguish the Mossbauer spectrum of $K_4[Fe(CN)_6]$ and $K_3[Fe(CN)_6]$.

14. (a) Sketch and explain the ${}^{31}P$ nmr of HPF_2 different conditions of J_{P-F} and J_{P-H} .

Or

- (b) Sketch and explain the ESR spectrum of high spin Co(II) and Ni(II).

15. (a) Write a note on Adamson's rules.

Or

(b) Describe types different of photo physical processes by using the energy level diagram of Cr(III).

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 600 words.

16. (a) Write a note on electron transport sequence in photosynthesis.

Or

(b) Describe the structure and functions of Vitamin-B₁₂.

17. (a) Write a note on (i) structure and dioxygen binding of hemocyanin (ii) structure and functions of carboxy peptidase.

Or

(b) Explain inhibition and poisoning of xanthine oxidase and aldehyde dehydrogenases.

18. (a) Write a note on Mossbauer spectrum of Rubredoxin and Ferredoxin [2Fe-2S]⁺.

Or

(b) Sketch and explain the Mossbauer spectrum of (i) FeSO₄·7H₂O (ii) Na[Fe(CN)₅NO] (iii) Fe(CO)₅.

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19. (a) Explain fluxional behaviour by NMR and ³¹P nmr of P₄S₃.

Or

(b) (i) Write a note on hyperfine splitting
(ii) EPR of bis(salicylaldimine)copper(II).

20. (a) Give a brief account on the role of [Ru(bpy)₃]⁺² as a photosensitizer in photo reduction and photo oxidation of H₂O.

Or

(b) (i) Describe the photochemical conversion of N₂ to NH₃.

(ii) Give a brief account on different types of photochemical processes.

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PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. The temperature of a gas is 100 K it is heated until it is 200K then, what do you understand regarding kinetic energy in this process?
(a) Halved
(b) Tripled
(c) Quadrupled
(d) Doubled

6. Which of the following is true about Michaelis-Menten kinetics?

- (a) K_m , the Michaelis constant, is defined as that concentration of substrate at which enzyme is working at maximum velocity
- (b) It describes single substrate enzymes
- (c) K_m , the Michaelis constant is defined as the dissociation constant of the enzyme – substrate complex
- (d) It assumes covalent binding occurs between enzyme and substrate

7. Radiative process from the following is

- (a) Fluorescence
- (b) Intersystem crossing
- (c) Internal conversion
- (d) All

8. The G-value is the number of molecules formed per _____ of energy,

- (a) 1 eV
- (b) 10 eV
- (c) 100 eV
- (d) 1000 eV

2. In a single-component system, if degree of freedom is zero, maximum number of phases that can co-exist _____

- (a) 0
- (b) 1
- (c) 2
- (d) 3

3. The effect of ionic strength on the kinetics is called as

- (a) Ionic effect
- (b) Electrophoretic effect
- (c) Salt effect
- (d) Solvent effect

4. Explosive reactions are the type of

- (a) Fast reactions
- (b) Chain reactions
- (c) Slow reactions
- (d) Surface reactions

5. In any unimolecular reaction _____

- (a) Only one reacting species is involved in the rate determining step
- (b) The order and the molecularity of slowest step are equal to one
- (c) The molecularity of the reaction is one and order is zero
- (d) Both (a) and (b)

9. Which property of surfactants depends on the hydrophobic effect?

- (a) CMC
- (b) Micelle
- (c) Polarity
- (d) Non-polarity

10. Which of the following lowers the surface tension between two liquids or between a liquid and a solid?

- (a) Reverse micelles
- (b) Surface active agent
- (c) Counter ion
- (d) Catalyst

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).

Each answer should not exceed 250 words.

11. (a) Describe a method to calculate the vibrational heat capacity.

Or

- (b) State the Phase rule and by using it explain the phase diagram of a system of two solids and a liquid.

12. (a) Explain simple collision theory and obtain an expression for the rate of a bimolecular gas phase reaction $A + B \rightarrow \text{Products}$.

Or

- (b) With a neat sketch of potential energy surface, explain the meaning of saddle point and comment on its importance.
13. (a) Illustrate the relaxation method for studying the fast reactions.

Or

- (b) Explain the principle and instrumentation of flash photolysis.
14. (a) What do you mean by radiolysis of water? Explain the reactions of hydrated electrons.

Or

- (b) Define fluorescence and phosphorescence and explain the mechanisms.
15. (a) Distinguish physisorption and chemisorption.

Or

- (b) Discuss the application of B.E.T. equation. How to determine the surface area of solid?

Page 5 Code No. : 5424

PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) (i) Derive an expression for thermal conductivity in a gas.
(ii) Derive Poiseuille formula.

Or

- (b) (i) State Lever rule. (2)
(ii) What is salting out and explain with example? (3)
(iii) Explain the phase diagram of a system of three liquids consisting of two pairs of partially miscible liquids.

17. (a) What are the various elementary processes in a chain reaction? Discuss the kinetics and mechanism of decomposition of acetaldehyde.

Or

- (b) Write notes on H_2O_2 - explosive reaction. Explain the terms first explosion limit and second explosion limit.

Page 6 Code No. : 5424

18. (a) Explain the salient features of RRK theory of unimolecular reactions and obtain an expression for k_1 .

Or

- (b) Discuss Michaelis - Mention kinetics of enzyme catalysis.
19. (a) Explain how are excited state (i) pK_a and (ii) red-ox potentials determined.

Or

- (b) (i) Explain the Photosensitisation and chemiluminescence. (3)
(ii) Derive Stern-Volmer equation and its applications. (5)
20. (a) Explain Langmuir - Rideal and Langmuir - Hinshelwood mechanisms on surfaces.

Or

- (b) (i) What is zeta Potential? (2)
(ii) Explain the kinetics of heterogeneous catalysis with the examples. (6)

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SELECTED TOPICS IN CHEMISTRY

(For those who joined in July 2021 onwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. What are the three types of calculations commonly performed in computational chemistry
(a) Energy prediction, geometry optimization, frequency prediction
(b) Energy prediction, molecular dynamics, protein folding
(c) NMR spectroscopy, IR spectroscopy, UV-Vis spectroscopy
(d) None of the above

5. Which of the following is a technique used to extract and concentrate analytes from a liquid sample onto a small sorbent material?
(a) Solid-phase extraction
(b) Solvent extraction
(c) Thin-layer chromatography
(d) Gas chromatography
6. Which of the following is a carrier gas commonly used in gas chromatography?
(a) Nitrogen (b) Water
(c) Methanol (d) Ethanol
7. Which of the following is a primary type of transducer?
(a) Thermistor (b) Strain gauge
(c) Thermocouple (d) None of the above
8. Which of the following is an example of a passive transducer?
(a) Thermistor (b) Photodiode
(c) Strain gauge (d) None of the above

2. Which of the following basis sets includes additional functions to account for diffuse electron density?
(a) Minimal basis sets
(b) Split valence basis sets
(c) Polarized basis sets
(d) Diffuse basis sets
3. What is the purpose of an electrochemical cell in corrosion?
(a) To generate electricity from corrosion
(b) To measure the rate of corrosion
(c) To prevent corrosion
(d) To promote corrosion
4. What is the purpose of a reference electrode in electrochemical corrosion measurement?
(a) To measure the potential difference between the metal being corroded and the environment
(b) To provide a standard potential against which other potentials can be measured
(c) To measure the rate of corrosion
(d) To prevent corrosion

9. What is the most commonly used type of MRI contrasting agent?
(a) Gadolinium-based agents
(b) Manganese-based agents
(c) Fe(III)-based agents
(d) Fe(II)-based agents
10. Which of the following is a merit of Fe(II)-based MRI contrasting agents?
(a) High toxicity
(b) Long half-life
(c) High efficacy
(d) Difficult elimination from the body

PART B — (5 × 5 = 25 marks)

Answer ALL questions, choosing either (a) or (b).
Each answer should not exceed 250 words.

11. (a) What are the types of calculations commonly performed in computational chemistry? What information do they provide?

Or

- (b) What are the different computational methods used in computational chemistry? How do they differ?

12. (a) What is corrosion inhibition and how is it classified? Give mechanism of inhibitor action in acidic medium.

Or

- (b) What are potentiodynamic polarization monitoring and impedance monitoring?

13. (a) What is ion exchange chromatography? Explain it.

Or

- (b) What are the basic components of a high-performance liquid chromatography (HPLC) system and how are they used in separation techniques?

14. (a) What are chemical sensors? Give examples.

Or

- (b) What are enzyme-based biosensors? Give examples.

15. (a) What are the different types of nuclear imaging, and how do they differ?

Or

- (b) How were MRI contrasting agents developed, and what are the different types of contrasting agents?

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PART C — (5 × 8 = 40 marks)

Answer ALL questions, choosing either (a) or (b)
Each answer should not exceed 600 words.

16. (a) (i) What are Ab initio methods, and how do they differ from other computational methods in computational chemistry?
(ii) Explain the semi-empirical methods used in computational chemistry and their applications.

Or

- (b) Explain the different types of basis sets commonly used in computational chemistry and their relative strengths and weaknesses.

17. (a) What is corrosion? What are the different types of corrosion? What are the electrochemical principles of corrosion and how do they relate to corrosion prevention?

Or

- (b) How do pH, environmental factors such as temperature, humidity, and pollutants which affect the corrosion?

18. (a) How is micro extraction used in environmental monitoring?

Or

- (b) What is solid-phase nano extraction (SPNE)?

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19. (a) (i) What is a sensor, and how do they work?
(ii) What are transducers, and how do they relate to sensors?

Or

- (b) (i) What is an enzyme-based biosensor, and how does it work?
(ii) What are some potential applications of sensors and biosensors?

20. (a) (i) What are the different types of MRI contrasting agents, and how were they developed?

- (ii) What are the advantages and disadvantages of Gadolinium-based MRI contrasting agents?

Or

- (b) (i) What are targeted and organ-specific contrast agents, and how do they improve medical imaging?

- (ii) How are radio isotopic imaging agents used in nuclear imaging, and what are their requirements for effective use?