R8264	Sub. Code
	536201

M.Sc. DEGREE EXAMINATION, APRIL – 2023

Second Semester

Chemistry

INORGANIC CHEMISTRY - II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Section A $(10 \times 1 = 10)$

Answer **all** the questions.

1. Arrange the decreasing order of the ionic radius of hydrated alkali metal ion?

   (a) $Li^+ > Na^+ > K^+ > Rb^+ > Fr^+ > Cs^+$

   (b) $Li^+ < Na^+ < K^+ < Rb^+ < Fr^+ < Cs^+$

   (c) $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+ > Fr^+$

   (d) $Li^+ < Na^+ < K^+ < Rb^+ < Cs^+ < Fr^+$

2. In P_4O_{10}, how many number of P-P, P=O, P-O present in the compound

   (a) 0, 12, 4 (b) 2, 4, 12

   (c) 4, 12, 0 (d) 0, 4, 12

3. Number of delta (δ) bond present in $Re_2Cl_8^{2-}$?

   (a) One (b) Two

   (c) Three (d) Zero

4. Which of the following compound exist in liquid state?

(a) Diborane (b) Pentaborane

(c) Decaborane (d) Borane

5. Which of the following species is in increasing order of trans effect

(a) $NH_3 > CN^- > Br^- > C_6H_5^-$

(b) $CN^- > C_6H_5^- > Br^- > NH_3$

(c) $Br^- > CN^- > NH_3 > C_6H_5^-$

(d) $CN^- > Br^- > C_6H_5^- > NH_3$

6. The rate-determining step in octahedral complex substitution is

(a) Dissociative step (b) Associative step

(c) Interchange step (d) None of the above

7. Which of the following organometallic compound is not obey 18-electrons rule,

(a) $[Mn(CO)_6]^+$

(b) $[Cr(\eta^5 - C_5H_5)(CO)_3]^-$

(c) $[Fe(CO)_2(CN)_4]^{2-}$

(d) $[Co(\eta^5 - C_5H_5)_2]$

8. Which of the following is not considered as an organometallic compound?

(a) Ferrocene

(b) Cis-platin

(c) Ziese's salt

(d) Grignard reagent

9. Which of the following radioisotope is used to sterilise surgical instruments?

(a) Iodine-131 (b) Chromium-51

(c) Iodine-123 (d) Cobalt-60

10. Complete the following equation with an appropriate radioactive product after beta decay

$^{24}_{11}Na \rightarrow ?+^{0}_{-1}\beta$

(a) Mg^{23}_{11} (b) Na^{23}_{11}

(c) Na^{22}_{11} (d) Mg^{24}_{12}

Section B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Write short notes on poly anions and isopoly anions of Phosphorous atom?

Or

(b) Explain the structure of Zeolites and its reactivity?

12. (a) Explain the Jemmis MNO rule in polyhedral boranes?

Or

(b) Explain the structure and various types of metal clusters?

13. (a) Explain the types of substitution various reactions in octahedral complexes?

Or

(b) Explain the Trans effect with suitable examples?

14. (a) Explain the structure and bonding behaviours of polynuclear metal carbonyls?

Or

(b) Explain the 18 electron rule with suitable examples?

15. (a) Explain the various types of nuclear reaction?

Or

(b) Write a short note on the application of radioisotopes in neutron activation analysis.

Section C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Explain the structure and properties of heteropoly anions of Mo and W?

17. Describe the structure and bonding behaviours of boranes and carboranes?

18. Explain the synthesis and structure of Metal Organic Framework and its useful applications?

19. Describe the stereochemistry of substitution reaction in octahedral complexes?

20. Explain the inner sphere and outer sphere reaction mechanism of coordination compounds?

21. Explain the structural properties dinitrogen and dioxygen based organometallic compounds?

22. Explain the nuclear reactors and it uses in power production?

23. Describe the radioactive waste management and its disposal?

R8265	Sub. Code
	536202

M.Sc. DEGREE EXAMINATION, APRIL – 2023

Second Semester

Chemistry

ORGANIC CHEMISTRY - II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

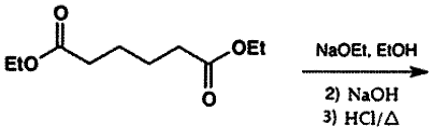
Part A (10 × 1 = 10)

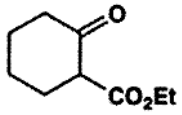
Answer **all** questions.

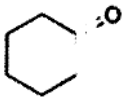
1. What type of reaction takes place upon treatment of a ketone with HCN to form a cyanohydrin?

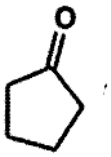
   (a) Nucleophilic substitution
   (b) Electrophilic substitution
   (c) Electrophilic addition
   (d) Nucleophilic addition

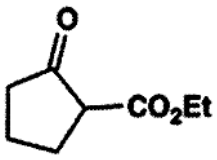
2. Which is the main product of the following intramolcular Claisen condensation?



(a) 

(b) 

(c) 

(d) 

3. Lithium diisopropyl amide (LDA employs ———— in the Wittig reaction.

(a) Alpha alkylation

(b) Beta alkylation

(c) Gamma alkylation

(d) None of the above

4. Which Intermediate is formed in Volff's reaction?

(a) Ketene (b) Carbene

(c) Carbanion (d) Carbocation

5. Which of the following is the definition of chirality?

(a) A molecule with a mirror image

(b) The superimposability of an object on its mirror image

(c) The non-superimposability art object on its mirror image

(d) A molecule that has a carbon atom with four different substituents

6. The cumulated double bond is presence of

(a) Spirane

(b) Allene

(c) Biphenyls

(d) Binaphythyls

7. Ketene formation takes place in

(a) Norrish Type-I

(b) Norrish Type-II

(c) Both (a) and (b)

(d) None of these

8. In Paterno Buchi reaction which pecies ———— is formed.

(a) Thioetane

(b) Oxepan

(c) Oxetane

(d) All of these

9. First sigmatropic reaction discovered as

(a) Schemidt rearrangement

(b) Cope rearrangement

(c) Claisen rearrangement

(d) None of these

10. Reaction between ozone and alkene to give an ozonide is

(a) Ene reaction

(b) 3-Dipolar cycloaddition

(c) Cheletropic reaction

(d) Barton reaction

Part B (5 × 5 = 25)

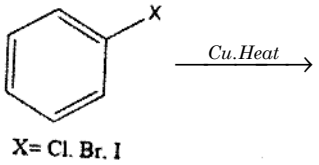
Answer **all** questions, choosing either (a) or (b).

11. (a) What is Michael reaction? Give me example with mechanism.

Or

(b) Write the example with mechanism of Darzen condensation.

12. (a) Predict the product and mechanism of the following organic reaction:



Or

(b) What is Stevens rearrangement? Give me example with suitable mechanism.

13. (a) Explain the diastereoselectivity of Felkin-Ahn model.

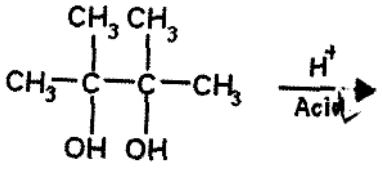
Or

(b) Write the stereochemistry of allenes.

14. (a) Explain the olefin metathesis mechanism.

Or

(b) Predict the product with suitable mechanism of the following reaction:



15. (a) Set up an FMO approach for the stereochemical course of 1,3 - sigmatropic reaction is photochemically allowed/difficult process.

Or

(b) What is cope rearrangement reaction? Give me mechanism.

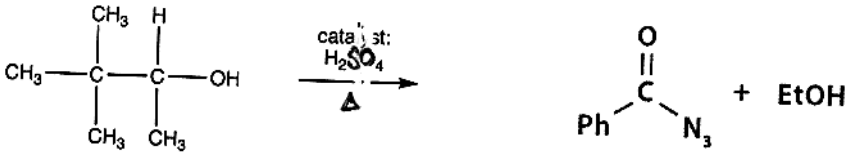
Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Discuss the mechanism and applications of Knoevenagel condensation.

17. Describe the Backmann rearrangement with mechanism and applications.

18. Complete the following reactions with suitable the mechanisms:



19. Describe briefly the stereochemistry of binaphythyls and spiranes.

20. Discuss briefly about the Paterno-Buchii reaction with suitable example.

21. What is Pschorr reaction? explain with a suitable example.

22. Explain with examples the stereochemical course of 1,3- and 1-5-sigmatropic rearrangements.

23. Discuss about the cheletropic elimination reaction.

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R8266

Sub. Code
536203

M.Sc. DEGREE EXAMINATION, APRIL – 2023

Second Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** questions.

1. The wave length λ associated with a particle of mass m moving with velocity γ is given by

(a) $\lambda = \frac{h}{m\gamma}$ (b) $\lambda = \frac{m}{h\gamma}$

(c) $\lambda = \frac{m\gamma}{h}$ (d) $\lambda = \frac{h\gamma}{m}$

2. An electron is in a box 2nm across. What will be the lowest energy for the electron?

(a) 0.01 eV (b) 0.08375 eV

(c) 0.2 eV (d) 1.5 eV

3. Which of the following molecule or ions possesses an invertion centre (centre of symmetry)?

(a) $[PF_6]^-$ (b) SiH_4

(c) BF_3 (d) PF_5

4. Which of the following belongs to the C_{3V} point group?

(a) SO_3 (b) BBr_3

(c) NH_3 (d) $AlCl_3$

5. Rate of gaseous phase reaction depends on

(a) Temperature (b) Pressure

(c) Concentration (d) T, P and concentration

6. A Catalyst alters which of the following in a Chemical reaction.

(a) Entropy (b) Enthalphy

(c) Internal energy (d) Activation energy

7. In adiabatic expansion of a system in which its temperature changes from a value T_1 to T_2 the entropy will be

(a) Increases

(b) Decrease

(c) Remain unchanged

(d) Above all

8. The standard free energy of formation of $NO(g)$ is

(a) 84.8 kJ/mol (b) 86.8 kJ/mol

(c) 88.8 kJ/mol (d) 90.8 kJ/mol

9. At 15°C out of H_2, CH_4, CO_2, NH_3, which gas will be adsorbed maximum by Charcoal?

(a) H_2 (b) CH_4

(c) CO_2 (d) NH_3

10. Which kind of Catalysis can be explained on the basis of adsorption theory?

(a) Homogeneous catalysis

(b) Hetrogeneous

(c) Negative catalysis

(d) Auto catalysis

Part B $(5 \times 5 = 25)$

Answer **all** questions, choosing either (a) or (b).

11. (a) Most harmonic oscillators are damped and if undriven eventually come to a stop. Why? – Explain.

Or

(b) Write down the equation of time period for linear harmonic oscillator.

12. (a) Explain in detail about SALCs.

Or

(b) State and explain mutual exclusion rule for molecule with centre of symmetry.

13. (a) Explain $H_2 - Br_2$ photochemical reactions.

Or

(b) Write notes on Fast reaction kinetics.

14. (a) Explain the concept of fugacity and fugacity coefficient.

Or

(b) Write briefly about partial molar quantities.

15. (a) Explain Freundlich adsorption isotherm.

Or

(b) Write short notes on Heterogeneous catalysis.

Part C

$(5 \times 8 = 40)$

Answer any **five** questions.

16. Describe the simple harmonic oscillator.

17. What is non-ridid rotator? Explain its spectrum.

18. Discuss the SALC procedure for ethylene of butadiene.

19. Explain Michelis-Mentan mechanism of enzyme catalysis.

20. Derive Gibbs-Duhem equation.

21. Explain and derive Gibbs adsorption isotherm.

22. Discuss Langmuir – Rideal mechanism.

23. Derive BET adsorption isotherm.

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R8267	Sub. Code
	536051

M.Sc. DEGREE EXAMINATION, APRIL – 2023

Second Semester

Chemistry

NATURAL PRODUCTS AND INTRODUCTORY BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A $(10 \times 1 = 10)$

Answer **all** questions.

1. The molecular formula of caffeine is

   (a) $C_8H_{10}N_4O_2$ (b) $C_9H_{12}N_4O_2$

   (c) $C_7H_8N_4O_2$ (d) $C_7H_{10}N_4O_2$

2. DEAD means

   (a) Diethyl Azodicarboxglate

   (b) Diazopropyl Azoicarboxylate

   (c) Dithyl Azocarboxylate

   (d) None of the above

3. Which of the following regulates the female reproductive cycle?

   (a) Testosterone (b) Estrogens

   (c) Glucocorticoids (d) None of the above

4. Steroids have

(a) Sterol nucleus with two alkyl chain attached to the ring D of cholesterol

(b) Sterol nucleus with two CH_3 between C and D ring and A and B ring of cholesterol

(c) Sterol nucleus with CH_3 between C ring and D ring of cholesterol

(d) Sterol nucleus but lack the alkyl chain attached to the ring D of cholesterol

5. What is an alkaloid?

(a) A natural, basic component with at least on nitrogen atom

(b) A man made, acidic compound made of mostly nitrogen and carbon

(c) A natural acidic compound derived form animal fat

(d) A natural basic compound consisting mainly of carbon and hydrogen atom

6. Which formula is correlate with tricuylic nature of abietic acid

(a) $C_{20}H_{34}$ (b) $C_{20}H_{28}O_2$

(c) $C_{20}H_{30}O_2$ (d) $C_{19}H_{34}$

7. Vitamin B1deficiency disease is

(a) Beriberi (b) Jaundice

(c) Cold (d) All of these

8. Which is the leading cause of blindness in children world wide?

(a) Glaucoma (b) Cateracts

(c) Colour blindness (d) Retonopathy

9. Which of the following biomolecule simply refer to as "Staff of life".

(a) Lipids (b) Proteins

(c) Vitamins (d) Carbohydrates

10. For a reaction is ΔG° is positive, then _____.

(a) The products will be favored

(b) The reactants will be favored

(c) The concentration of the reactants and products will be equal

(d) All of the reactant will be converted into products

Part B $(5 \times 5 = 25)$

Answer **all** the questions, choosing either (a) or (b).

11. (a) Write the uric acid synthesis by Behrend and Roosen method

Or

(b) Explain the total synthesis of imadazole.

12. (a) Discuss the synthesis of estrone.

Or

(b) Explain the octane rule and oxial halo ketone rule with their applications.

13. (a) Write general structural of elucidation method of alkaloids.

Or

(b) Write the synthesis of cadimine via carvone.

14. (a) Deduce the structure of penicillin.

Or

(b) Explain the steps involved in the structural elucidation of vitamin B2.

15. (a) What do you mean by catabolic and anabolic processes?

Or

(b) Write a note on mitochondrial electron transport.

Part C $(5 \times 8 = 40)$

Answer any **five** questions.

16. Deduce the structure of caffine along with synthesis.

17. Elucidate the structure of ergosterol by discussing its structural features in detail.

18. (a) Provide the details about the position of double bond and nature of double bond.

(b) Shortly discuss the sterochemistry of cholesterol.

19. Write the structure of quinine with the synthesis.

20. What is isoprere rule? Write the classification of terpene based on the isoprene with and cyclic structure.

21. Write the chemistry of ascorbic acid and riboflavin with structural features.

22. Write the DNA replication, transcription and translation.

23. Write the steps involved in the glyolysis pathway and provide the details of the meta protein electron transfer mechanism.

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