R0923

Sub. Code
536201

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Chemistry

INORGANIC CHEMISTRY – II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the following objective questions by choosing the correct option.

1. Which of the following oxoacids of nitrogen has most acidic character? (CO1, K2)

   (a) NO_2 (b) N_2O_3

   (c) NO (d) N_2O_5

2. Among the following which is the first heteropoly compound? (CO1, K2)

   (a) $(NH_4)_2[PMo_{12}O_{40}]$

   (b) $(Cl_2)_3[BrMo_{10}O_{38}]$

   (c) $(NH_4)_3[PMo_{12}O_{40}]$

   (d) $(NO_3)_2[BrMo_{10}O_{38}]$

3. The styx code for B_4H_{10} is ———————— (CO2, K3)

   (a) 4020 (b) 4018

   (c) 4012 (d) 4030

4. Which of the following is the suitable 18 electron count for $[Fe_2(CO)_9]$? (CO4, K6)

(a) 36 (b) 28

(c) 34 (d) 32

5. Among the following which is nucleophilic reagents? (CO3, K4)

(a) ROR (b) PCl_3

(c) $AICl_3$ (d) H^+

6. Which statement about the trans-effect and trans-influence is correct? (CO3, K4)

(a) The trans-influence is a ground-state effect, whereas the trans-effect has a kinetic origin

(b) The trans-effect is a ground-state effect, whereas the trans-influence has a kinetic origin

(c) Both the trans-effect and trans-influence are ground-state effects

(d) Rates of substitution are affected by the trans-effect but have nothing to do with the trans-influence of ligands

7. How many valance electrons are exist in Fe in $Fe(CO)_5$ complex? (CO4, K6)

(a) 3 (b) 7

(c) 4 (d) 5

8. Complete the following reaction; Ni(s) + 4(CO)g → ———— (CO4, K4)

(a) $Ni(CO)_2 + 2CO$ (b) $Ni(CO)_3 + CO$

(c) $Ni(CO)_4$ (d) All

9. The type of radiation with the greatest ability to penetrate matter is (CO5, K5)

(a) Alpha (b) Visible light

(c) Gamma (d) β^-

10. The intensity of a light beam decreases by 50% in a sample of 1.0 cm path length. The percentage of transmittance in the same sample with 3.0 cm path length, would be (CO5, K5)

(a) 50.0 (b) 25.0

(c) 16.67 (d) 12.5

Part B (5 × 5 = 25)

Answer **all** the questions not more than 500 words each.

11. (a) What are Zeolites? How they can be used in Ion-exchange, water purification and softening processes. (CO1, K2)

Or

(b) Describe the synthesis of hydrazine. Write Wollf-Kishner reduction reaction using hydrazine. (CO1, K2)

12. (a) Determine the structure of Co2(CO)8. (CO4, K6)

Or

(b) How to find the structure of B_5H_9 based on Wade's rule? (CO4, K6)

13. (a) Discuss on the substitution reaction of cis and trans Pt(II) complexes with suitable examples. (CO3, K4)

Or

(b) (i) Discuss the reaction mechanism of group transfer reaction via bridging ligand. (CO3, K4)

(ii) What is anation reaction? Give one example.

14. (a) How nuclear waste can be classified? Brief on any two. (CO5, K5)

Or

(b) Describe plant indicators and the necessary precautions in use of plants as pollution indicators. (CO5, K5)

15. (a) Calculate the nuclear binding energy per nucleon for Li-7 isotope. Its measured mass is 7.01600 amu.(m_p=1.007276 amu, m_n=1.008665 amu and m_e=0.0005486 amu) (CO5, K5)

Or

(b) What are nuclear forces? How they can be classified? Brief on the properties of strong nuclear force with suitable example. (CO5, K5)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Classify the following polyhedral heteroboranes according to their valence electron count: $C_2B_7H_{13}$, SB_9H_{11}, $CPB_{10}H_{11}$. (CO2, K3)

Or

(b) How MOF can be utilized as catalyst and drug carrier? (CO2, K3)

17. (a) Write a note on Wade's rule with suitable example. (CO2, K3)

Or

(b) Describe Jemmis rule. Why $B_{20}H_{16}$ is stable as a neutral species? Justify. (CO2, K3)

18. (a) What is mean by aquation reaction? Explain the mechanism and how various factors affecting the rate of six coordinated Cobalt(III) amine complexes. (CO3, K4)

Or

(b) Define ISO polyacids. Discuss in detail about ISO poly Acids of chromium (CO1, K2)

19. (a) Discuss the structure and bonding of $CO_2(CO)_8$ complex. (CO4, K6)

Or

(b) Explain the following preparation methods for metal carbonyls. (CO4, K4)

(i) Reductive carbonylation

(ii) Metathesis reaction

20. (a) (i) Define stellar energy. (CO5, K5)

(ii) Illustrate on the Proton — Proton and Carbon-Nitrogen Cycles.

Or

(b) Explain nuclear fusion reaction and their application (CO5, K5)

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R0924

Sub. Code
536202

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Chemistry

ORGANIC CHEMISTRY — II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. Carbanion formation in the presence of a base is the easiest in (CO1, K2)

   (a) CH_3CHO (b) CH_3COCH_3

   (c) $CH_3COCH_2CH_3$ (d) $CH_3COCH_2COCH_3$

2. The Claisen condensation is often used in preparing (CO1, K2)

   (a) β – hydroxyl ester (b) α – hydroxyl ester

   (c) γ – keto ester (d) β – keto ester

3. The Hofmann rearrangement has an intermediate that is electronically similar to that in the (CO2, K3)

   (a) Pinnacol rearrangement

   (b) Claisen rearrangement

   (c) Cope rearrangement

   (d) Beckmann rearrangement

4. Consider the following, (CO2, K4)

$CH_3\overset{\oplus}{\underset{I}{C}}HCH_3$, $CH_3\overset{\oplus}{\underset{II}{C}}HOCH_3$, $CH_3\overset{\oplus}{\underset{III}{C}}HOCCH_3$

what is the correct order of their stability.

(a) I > II > III (b) III > II > I

(c) II > I > III (d) III > I > II

5. Choose correct statement for Allenes. (CO3, K3)

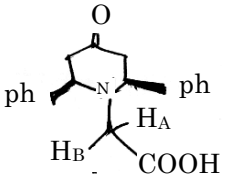
(a) Planar molecule

(b) Two π bonds are perpendicular to each other

(c) Two π bonds are parallel to each other

(d) All of the above

6. In the compound given below, the hydrogens marked A and B are, (CO3, K2)



(a) Isotopic (b) Homotopic

(c) Enantiotopic (d) Diastereotopic

7. Hydrogenation of alkenes can be carries out in the presence of (CO4, K2)

(a) Copper (b) Zinc

(c) Aluminium (d) Nickel

8. Mercaptans can be produced by photochemical addition of ———— to alpha olefins. (CO4, K3)

(a) Hydrogen sulphide

(b) Sulphur

(c) Hydrogen

(d) Paraffins

9. Ene reaction is a ————. (CO5, K2)

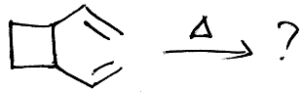
(a) 2π electron electrocyclic reaction

(b) 4π electron electrocyclic reactions

(c) 6π electron electrocyclic reaction

(d) None of these

10. The product of the following reaction is

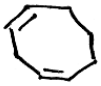


(CO5, K2)

(a) 

(b) 

(c) 

(d) 

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

Answer **all** the questions not more than 500 words each.

11. (a) What are enamines? How they are formed? (CO1, K2)

Or

(b) Explain the reaction and mechanism of Claisen reactions. (CO1, K5)

12. (a) Write the reaction and Mechanism of witting reactions. (CO2, K3)

Or

(b) What are nitrenes? Discuss their structure. (CO2, K4)

13. (a) What are stereoselective and stereospecific reactions? (CO3, K3)

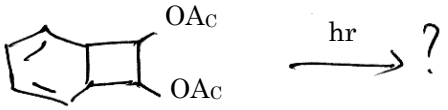
Or

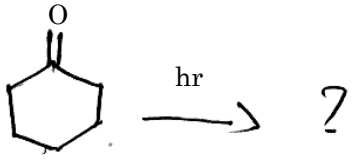
(b) Explain the configuration of allenes. (CO3, K2)

14. (a) Give the reaction and mechanism of Ullmann reactions. (CO4, K3)

Or

(b) Predict the product : (CO4, K1)

(i) 

(ii) 

15. (a) Illustrate cheleotropic reaction with a suitable example. (CO5, K1)

Or

(b) Explain the reaction and stereochemical aspects of cope reaction. (CO5, K4)

Part C (5 × 8 = 40)

Answer **all** the questions not more that 1000 words each.

16. (a) Write a short notes on organozine and organo cupper. (CO1, K2)

Or

(b) Explain the reaction, mechanism and stereochemical aspects of Darzen reaction. (CO1, K3)

17. (a) Give the generation and struction of carbene. (CO2, K3)

Or

(b) Write the reaction, mechanism and stereochemistry of curtius rearrangement. (CO2, K4)

18. (a) Explain the absolute configuration of Biphenyls adn Spiranes. (CO3, K2)

Or

(b) Discuss the principle of stereoselectivity with examples. (CO3, K6)

19. (a) Explain the Norrish types I and II reaction. (CO4, K4)

Or

(b) Write the reaction of addition to alkenes and alkynes. (CO4, K3)

20. (a) Explain the reaction and stereochemical aspects of Ene reactions. (CO5, K4)

Or

(b) Discuss the decomposition of cyclic azo compounds. (CO5, K6)

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R0925

Sub. Code
536203

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Chemistry

PHYSICAL CHEMISTRY – II

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

Part A (10 × 1 = 10)

Answer **all** the following objective type questions by choosing the correct option.

1. The degeneracy of the energy level with n=6 in a hydrogen atom (CO1, K5)

   (a) 16 (b) 9

   (c) 36 (d) 25

2. Acceptable wave function for a quantum particle must be (CO1, K5)

   (a) odd (b) even

   (c) single valued (d) continous

3. The point group of fullerene (C_{60}) is (CO2, K3)

   (a) oh (b) Td

   (c) Ih (d) Cz

4. According to matrix multiplication $C_2 \times \sigma_v^{y_2}$ = (CO2, K3)

   (a) σ_V^{x2} (b) σ_V^{y2}

   (c) C_2 (d) $\in$

5. Which method is useful in the study of fast reaction (CO3, K2)

(a) Stopped flow method

(b) Shock wave method

(c) NMR

(d) All of the above

6. In clock reaction addition of KNO_3 increased the rate it is due to (CO3, K2)

(a) Primary salt effect

(b) Secondary salt effect

(c) Ionisation

(d) Catalysis

7. In which of the process entropy is increased highly (CO4, K2)

(a) dissolution of salt

(b) condensation of water

(c) Sublimation of naphthalene

(d) Melting of ice

8. A binary mixture of A_2 and B_2 will show negative deviation from Raoult's law when (CO4, K2)

(a) A-A and B-B interaction are stronger than A-B

(b) A-A and B-B interaction are weaker than A-B

(c) Both A-A and B-B interaction are equal to A-B

(d) Either A-A or B-B interaction is equal to A-B

9. Which one is slows down the reaction rate (CO5, K3)

(a) Catalytic Promotor

(b) Homogenous catalyst

(c) Heterogeneous catalyst

(d) Catalytic Poison

10. Choose the Semiconductor Proto catalyst (CO5, K3)

(a) Si (b) Zno

(c) Ge (d) None

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

Answer **all** the questions not more than 500 words each.

11. (a) Explain John-Teller effect and its consequences. (CO1, K5)

Or

(b) Outline quantum chemical tunneling with example. (CO1, K5)

12. (a) Explain mutual exclusion Principle with example. (CO2, K3)

Or

(b) Illustrate the SALC Procedure. (CO2, K3)

13. (a) Develop the mechanism of H_2 and Br_2 reaction. (CO3, K2)

Or

(b) Discover the uses of flash Photolysis. (CO3, K2)

14. (a) Interpret Gibbs – Duhem equation. (CO4, K2)

Or

(b) Explain Debye - Huckel limiting law. (CO4, K2)

15. (a) Predict the difference between physisorption and chemisorption. (CO5, K3)

Or

(b) Construct the mechanism of hydrocarbon conversion. (CO5, K3)

Part C (5 × 8 = 40)

Answer **all** the questions not more than 1000 words each.

16. (a) Solve schordinger equation for a particle in one dimensional box. (CO1, K5)

Or

(b) Summarise perturbation theory. (CO1, K5)

17. (a) Explain the spectroscopic application of group theory by considering H_2O molecule. (CO2, K3)

Or

(b) Illustrate SALC applications of ethylene. (CO2, K3)

18. (a) Develop MM mechanism of an enzyme catalysed reaction. Analyse the kinetics. (CO3, K2)

Or

(b) Identify the mechanism involved in acid and base catalysis. (CO3, K2)

19. (a) Interpret the function of partial molar quantities. (CO4, K2)

Or

(b) Prove the applications of Debye - Huckel theory. (CO4, K2)

20. (a) Construct Langmiur adsorption isotherm. (CO5, K3)

Or

(b) Predict the role of semiconductor catalysis. (CO5, K3)

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R0926	Sub. Code
	536051

M.Sc. DEGREE EXAMINATION, APRIL – 2024

Second Semester

Chemistry

Elective : NATURAL PRODUCTS AND INTRODUCTORY BIOCHEMISTRY

(CBCS – 2022 onwards)

Time : 3 Hours Maximum : 75 Marks

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

Answer **all** the following objective type questions by choosing the correct option.

1. Pyridine reacts with a mixture of KNO_3 and H_2SO_4 at 300°C to give (CO1, K1)

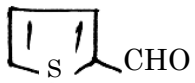
   (a) 1 – nitropyridine

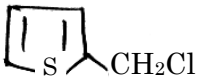
   (b) 2 – nitropyridine

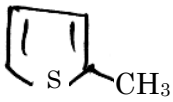
   (c) 3 – nitropyridine

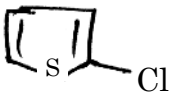
   (d) 4 – nitropyridine

2. Thiophene react with HCHO in presence of aqu. HCl to give ———— (CO1, K2)

   (a) 

   (b) 

   (c) 

   (d) 

3. Steroids compounds which extracted from animals (CO2, K3)

(a) Phytosterols (b) Stigmasterol

(c) Mycosterols (d) Zoosterols

4. Among the following, the natural product that is a steriod and contains an α,β – unsaturated ketone is (CO2, K4)

(a) Estrone (b) Prostaglandin

(c) Cortisone (d) Morphine

5. Which is not the characteristic feature of alkaloids? (CO3, K4)

(a) Complex molecular structure and nitrogen in the molecule

(b) Basic in nature

(c) Biosynthetically derived

(d) Acidic in nature only

6. The optimum alkaloids are present in plant as salt of ———— (CO3, K2)

(a) Benzoic acid (b) Tartaric acid

(c) Meconic acid (d) Acetic acid

7. How is penicillin recovered after the fermentation process? (CO4, K4)

(a) As penicillin

(b) As sodium penicillin

(c) As calcium penicillin

(d) As pottassium penicillin

8. Which vitamin is also known as anti-sterility vitamin? (CO4, K3)

(a) Vitamin – A (b) Vitamin – D

(c) Vitamin – E (d) Vitamin – K

9. Which among the following is not a disaccharide (CO5, K4)

(a) Dextrose (b) Lactose

(c) Sucrose (d) More than one above

10. Chemical compounds involved in the process of metabolism is known as ———— (CO5, K3)

(a) Metabolites (b) Radicals

(c) Catabolites (d) Intermediates

Part B (5 × 5 = 25)

Answer **all** questions not more than 500 words each.

11. (a) Explain the synthesis and properties of imidazole. (CO1, K4)

Or

(b) Compare the electrophilic substitution reaction of oxazole and thiazole compound (CO1, K3)

12. (a) Discuss the structure and stereochemistry of cholesterol. (CO2, K5)

Or

(b) Explain the structural features of bile acids. (CO2, K4)

13. (a) Elucidate the structure and stereochemistry of Quinine. (CO3, K6)

Or

(b) Classify the terpenoids. (CO3, K4)

14. (a) Discuss the structural features of streptomycin. (CO4, K5)

Or

(b) Explain the chemistry and physiological action of thiamin. (CO4, K4)

15. (a) Discuss the classification of carbohydrate. (CO5, K6)

Or

(b) Distinguish between catabolism and anabolism. (CO5, K5)

Part C (5 × 8 = 40)

Answer **all** questions not more than 1000 words each.

16. (a) Explain and illustrate heterocyclics. (CO1, K4)

Or

(b) Compare the reactivities of puries and pyrimidines. (CO1, K2)

17. (a) Classify the types of steroids with examples. (CO2, K3)

Or

(b) Explain optical rotary dispersion (ORD) and circular dichroism (CD). (CO2, K4)

18. (a) Describe the biosynthesis of alkaloids. (CO3, K6)

Or

(b) Elucidate the structure of camphor. (CO3, K5)

19. (a) Explain the structure and stereochemistry of penicillin. (CO4, K4)

Or

(b) Discuss the role of vitamine E and B12. (CO4, K3)

20. (a) Discuss the replication of DNA. (CO5, K4)

Or

(b) Illustrate oxidative phosphorylation. (CO5, K5)

———————