(6 pages)

Reg. No. : .....

Code No. : 30579 E Sub. Code : AMCH 41

(CBCS) DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Chemistry — Core

ORGANIC CHEMISTRY — II

(For those who joined in July 2020 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

What are the functional groups present in aldol?

a) Alcohol, carboxylic acid

b) Ketone, alcohol

c) Ketone, aldehyde

d) Aldehyde, alcohol

Which of the following will give primary alcohol with Grignard reagent?

(a) HCOOH (b) CH_3COCH_3

(c) HCHO (d) CH_3CHO

Acetoacetic ester may be used to prepare

(a) Carboxylic acids

(b) Ketones

(c) Heterocyclic compounds

(d) All the above

With methylene iodide malonic ester gives

(a) Glutaric acid (b) Adipic acid

(c) Succinic acid (d) (a) and (b)

Which of the following has minimum angle strain?

(a) Cyclopropane (b) Cyclobutane

(c) Cyclopentane (d) Cyclohexane

The most stable conformation of cyclohexane is

(a) Boat (b) Chair

(c) Half chair (d) Twist boat

2. Aldehydesare reduced to hydrocarbons using hydrazine in the reaction

(a) Wolff Kishner reduction

(b) MPV reduction

(c) Wittig reaction

(d) Reformatsky reaction

3. The most acidic one among the following acids is

(a) CH_3COOH (b) $CH_2ClCOOH$

(c) $CHCl_2COOH$ (d) CCl_3COOH

4. Oxalic acid on heating with concentrated sulphuric acid gives

(a) CO (b) CO_2

(c) H_2O (d) All the above

5. What is Gilman reagent?

(a) Lithium dimethyl cuprate

(b) Diethy lead

(c) Mustard gas

(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) Write a note on Wittig reaction.

Or

(b) Explain Aldol condensation with the mechanism.

12. (a) Discuss the action of heat on α, β, γ – hydroxy acids.

Or

(b) Discuss the chemical properties of amides.

13. (a) Write a note on reformatsky reaction.

Or

(b) How will you prepare aldehydes and ketones from Grignard reagent?

14. (a) How will you prepare acetoacetic ester?

Or

(b) Write a note on nitroso-oxime tautomerism.

15. (a) Write any two methods of preparation of cycloalkanes.

Or

(b) Explain the chemical properties of cycloalkanes.

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 brief account on the preparation, properties and uses of acrolein.

Or

(b) Write a note on :

(i) Knoevengal reaction

(ii) MPV reduction

(iii) Wolff – Kishner reduction

17. (a) Explain the mechanism of ester hydrolysis.

Or

(b) Discuss the chemical properties of urea.

18. (a) Discuss the reactions of diethyl zinc.

Or

(b) Discuss the synthetic applications of Grignard reagent.

19. (a) Discuss the synthetic applications of acetoacetic ester.

Or

(b) Write a note on keto-enol tautomerism.

20. (a) Discuss the synthesis and structure of Civetone.

Or

(b) Write a note on the conformational analysis of methyl cyclohexane.

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(6 pages)

Reg. No. : .....

Code No. : 20310 E **Sub. Code : AMCH 41**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fourth Semester

Chemistry — Core

ORGANIC CHEMISTRY — II

(For those who joined in July 2020 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Prop-2-en-1-ol is commonly known
   (a) Succinaldehyde (b) Acrolein
   (c) Crotonaldehyde (d) Cinnamic acid
2. The reducing agent used in MPV reduction is
   (a) Sodium ethoxide
   (b) Hydrazine
   (c) Aluminium isopropoxide
   (d) (a) and (b)
3. Electrolysis of potassium succinate gives
   (a) $CH_2 = CH_2$ (b) CO_2
   (c) H_2 (d) All the above
4. The hybridization of carboxyl carbon is
   (a) sp (b) sp^2
   (c) sp^3 (d) sp^3d
5. What is Frankland reagent?
   (a) Mustard gas (b) Sulphonal
   (c) Dialkyl Zinc (d) None
6. Which of the following will give a secondary alcohol?
   (a) HCOOH (b) CH_3COCH_3
   (c) HCHO (d) CH_3CHO
7. Which among the following is not an active methylene compound?
   (a) Ethyl malonate
   (b) Ethyl propionate
   (c) Ethyl acetoacetate
   (d) None

8. 4-methyl uracil is formed by the reaction of acetoacetic ester with
   (a) pyridine (b) pyrine
   (c) urea (d) succinic acid
9. The least stable cycloalkane is
   (a) Cyclopropane (b) Cyclobutane
   (c) Cyclopentane (d) Cyclohexane
10. The angle strain in cyclobutane is
    (a) +24°44' (b) –9°44'
    (c) +9°44' (d) –24°44'

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write a note on the structure and reactivity of carbonyl group.

    Or

    (b) Explain Reformatsky reaction with the mechanism.

12. (a) Discuss the structure of carboxylic acid.

    Or

    (b) Explain Hell-Volhard-Zelinsky reaction with mechanism.

13. (a) Give any three synthetic applications of methyl lithium with equations.

    Or

    (b) Write a note on mustard gas.

14. (a) Explain the synthesis of mono and di carboxylic acids from ethyl acetoacetate.

    Or

    (b) Discuss the mechanism of nitro-acinitro tautomerism.

15. (a) Write a note on Sachse-Mohr theory.

    Or

    (b) Explain Coulson and Moffit's concept.

PART C — (5 × 8 = 40 marks)

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

16. (a) Explain with mechanism of nucleophillic addition reactions of carbonyl compounds with

(i) HCN

(ii) $NaHSO_3$

(iii) CH_3MgBr.

Or

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

17. (a) Explain the chemical properties of oxalic acid.

Or

(b) Discuss the mechanism of esterification in detail.

18. (a) Explain the preparation and properties of thio alcohols.

Or

(b) Write a note on :

(i) tetra ethyl lead

(ii) sulphonal

(iii) sulphones.

19. (a) Write a note on amido-imidol tautomerism.

Or

(b) Discuss the synthetic uses of diethyl malonate.

20. (a) Discuss the synthesis and structure of muscone.

Or

(b) Explain Baeyer's strain theory and its limitations.

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(6 pages)

Reg. No. :.....

Code No. : 20311 E **Sub. Code : AMCH 51**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fifth Semester

Chemistry — Core

INORGANIC CHEMISTRY – II

(For those who joined in July 2020 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions, choose the correct answer.

1. Noble gases are ————.
   (a) Monoatomic (b) Diatomic
   (c) Triatomic (d) None of the above

2. Shape of XeF_2 molecule is ————.
   (a) Square planar (b) Trigonal planar
   (c) Pyramidal (d) Linear

3. Which of the following groups of transition metals are called coinage metals?
   (a) Cu, Ag, Au (b) Ru, Rh, Pd
   (c) Fe, Co, Ni (d) Os, Ir, Pt

4. Half filled d-orbitals are observed in ————.
   (a) Sc^{3+} (b) Mn^{2+}
   (c) Fe^{2+} (d) Cr^{3+}

5. The actinides showing +7 oxidation state are ————.
   (a) U, Np (b) Pu, Am
   (c) Np, Pu (d) Am, Cm

6. The separation of lanthanides by ion exchange method is based on ————.
   (a) Size of ions
   (b) Oxidation state of the ions
   (c) Solubility of their nitrates
   (d) Basicity of hydroxides of lanthanides

7. Zone refining is used for the
   (a) concentration of an ore
   (b) reduction of metal oxide
   (c) purification of metal
   (d) reduction of metal sulphide

8. The purpose of smelting an ore is ————.
   (a) To obtain an alloy
   (b) To oxidise it
   (c) To separate volatile impurities
   (d) To reduce it

9. A mixture containing Cu^{2+} and Ni^{2+} can be separated for identification by
   (a) passing H_2S in acid medium
   (b) passing H_2S in alkaline medium
   (c) passing H_25 in neutral medium
   (d) passing H_2S in dry mixture

10. The indicator used in iodimetry is ————.
    (a) Methyl orange (b) Starch
    (c) Phenolphthalein d) KI

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 structure and bonding in Xenon oxide compounds.

    Or

    (b) Describe briefly clathrate compounds and its uses.

12. (a) Outline the study of Zinc group elements in the periodic table.

    Or

    (b) Explain preparation, properties and uses of Wilkinson catalyst.

13. (a) Discuss the magnetic properties of f-block elements

    Or

    (b) Explain the preparation, properties and uses of ceric ammonium sulphate.

14. (a) Write a note on magnetic separation method for the concentration of ore.

    Or

    (b) Explain about extraction of Lithium from its ore.

15. (a) What is common ion effect? Describe its application in qualitative analysis.

    Or

    (b) Describe the theory of Acid-base titration titrations.

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 preparation and properties and structure of XeF_4, XeF_6.

Or

(b) (i) Explain the preparation and properties of $XeOF_4$.

(ii) Write a short note on isolation of noble gases from the atmosphere.

17. (a) Discuss the general characteristics of d-block elements.

Or

(b) Write a note on:

(i) Prussian blue

(ii) Sodium nitroprusside

18. (a) What are lanthanides? Explain solvent extraction method for the separation of lanthanides.

Or

(b) Give the preparation, properties and uses of ThO_2.

19. (a) How does vanadium occur in nature? Describe the extraction of vanadium from Carnonite ore.

Or

(b) Explain Van-Arkel de Boer method and Electrolysis method for purification of metals.

20. (a) (i) How are interfering radicals oxalate and Borate eliminated?

(ii) Explain the theory of complexometric titration.

Or

(b) Explain about co-precipitation and post precipitation.

(6 pages)

Reg. No. : .....

Code No. : 20312 E **Sub. Code : AMCH 52**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fifth Semester

Chemistry — Core

PHYSICAL CHEMISTRY – II

(For those who joined in July 2020 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions, choose the correct answer

1. The intensive property is

(a) ΔV (b) ΔH

(c) ΔG (d) C_P

2. For an ideal gas $\mu_{J.T}$ is

(a) Positive (b) Negative

(c) Zero (d) None of the above

3. For an adiabatic process

(a) T = Constant (b) q = 0

(c) q = Constant (d) w = 0

4. The Third law of thermodynamics states that limit $T \rightarrow 0$

(a) $G = 0$ (b) $H = 0$

(c) $E = 0$ (d) $S = 0$

5. At Equilibrium ΔG is

(a) Positive (b) Negative

(c) Zero (d) None of the above

6. Gibb's Phase rule is

(a) $F = P - C + 2$ (b) $F = C - P + 2$

(c) $P = F - C + 2$ (d) $P = F - C + 1$

7. Cell constant of conducting cell

(a) Specific conductance × conductance

(b) $\frac{\text{Specific conductance}}{\text{Conductance}}$

(c) $\frac{\text{Conductance}}{\text{Specific conductance}}$

(d) $\frac{1}{\text{Specific conductance}}$

8. The conductance of a strong electrolyte is high on the application of high potential. This is known as

(a) Wien effect

(b) Falken Hagen effect

(c) Debye – Falken hagen effect

(d) A symmetric effect

9. The concentration of hydrogen ion could not be determined by using

(a) Glass electrode

(b) Calomel electrode

(c) Hydrogen electrode

(d) Quinhydrone electrode

10. The chemical reaction takes place at the cathode of a galvanic cell is

(a) Oxidation

(b) Reduction

(c) Hydrolysis

(d) None of the above

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Explain the type of system with example.

Or

(b) Describe the jouce-thomson experiment. Bring out its significance of the liquefaction of gas.

12. (a) Derive an expression for the variation of entropy with pressure at constant temperature.

Or

(b) Derive Clausius – Clapeyron equation.

13. (a) Explain k_p and k_x and show their relationship.

Or

(b) State the law of mass action and derive the equilibrium. Constant of an equilibrium.

14. (a) How will you determine the solubility of a sparingly soluble sat by conductance?

Or

(b) Derive Henderson's equation for the pH of a buffer solution.

15. (a) Write a note on Weston Standard Cell.

Or

(b) Write a note on polarization.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) State and explain Zeroth law of thermo dynamics.

Or

(b) Deduce an expression for the change in internal energy and change in temperature during the reversible adiabatic expansion of an ideal gas.

17. (a) Derive the entropy change in isothermal expansion of a ideal gas.

Or

(b) (i) What do you understand from the sign of free energy of a reaction? (2)

(ii) Describe the relationship between k_p and k_C.

18. (a) Derive an expression for the variation of entropy with volume at a constant temperature.

Or

(b) Describe the phase diagram of water system.

19. (a) Discuss the Debye Huckel Onsagor theory for strong electrolyses.

Or

(b) State Ostwald's dilution law and derive the relation between degree of dissociation and dissociation constant.

20. (a) What are concentration cells? Derive expression for the emps of concentration cell with transference.

Or

(b) Derive an expression for the determination of liquid junction potential using concentration cell.

———————

(7 pages) **Reg. No. :** .....

Code No. : 20313 E **Sub. Code : AMCH 53**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fifth Semester

Chemistry — Core

ORGANIC CHEMISTRY – III

(For those who joined in July 2020 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

The essential condition for optical isomerism is

(a) presence of symmetric carbon atom

(b) presence of sp^3 carbon atom

(c) presence of asymmetric atom

(d) absence of sp^3 carbon atom

2. Epimers differ in the configuration of

(a) one asymmetric carbon

(b) two asymmetric carbon

(c) three asymmetric carbon

(d) all the above

3. Which of the following show cis-trans isomerism?

(a) C_2H_5Br (b) C_2H_5Cl

(c) $(CH)_2(COOH)_2$ (d) CH_3CHO

4. The torsional bond angle of staggered conformation is

(a) $\pm 90°$ (b) $\pm 120°$

(c) $\pm 180°$ (d) $\pm 360°$

5. Reagent used in Fridel-Craft reaction is

(a) $-NH_3$

(b) $-AlCl_3$

(c) H_2O

(d) Con. H_2SO_4. Con. HNO_3

6. Which one is O-P directive in nature?

(a) –OH

(b) $-NH_2$

(c) (a) and (b)

(d) $-NO_2$

In pyridine the hybridisation of nitrogen atom is

a) sp

b) sp^2

c) sp^3

d) sp^3d

Quinoline is a

a) Five membered heterocyclic

b) Fused ring heterocyclic

c) Six membered heterocyclic

d) All the above

Alizarin is syntherised from

a) quinoline

b) autroquinone

c) napthaquinone

d) phenantraquinone

When napthalene is oxidised with V_2O_5 gives

(a) pthalic acid

(b) 1, 4-naptha quinone

(c) pthalic anhydride

(d) pthalonic acid

PART B — (5 × 5 = 25 marks)

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

11. (a) Write notes on : (2½ × 2 = 5)

(i) Partial asymmetric synthesis

(ii) Absolute synthesis.

Or

(a) Discuss two steps involved in determining R, S notation.

12. (a) Explain geometrical isomerism in oximes.

Or

(b) Differentiate between conformations and configurations.

13. (a) What are benzenoid and non benzenoids compounds? Give suitable examples. (2½ × 2 = 5)

Or

(b) Explain SN^1 reaction mechanism with example.

14. (a) Compare the basicity of pyridine, pipesidine and pyrrole.

Or

(b) Explain the following :

(i) Hanizsch synthesis. (2 + 3 = 5

(ii) Skraup synthesis.

15. (a) Classify dyes according to chemical constitution with examples. (5

Or

(b) Explain the following reactions :

(i) Elbs reaction

(ii) Diels-Alder reaction.

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 different types of symmetry elements. (4 × 2 = 8

Or

(b) Discuss the following terms : (2 × 4 = 8

(i) Stereospecificity

(ii) Stereoselectivity.

17. (a) Explain the following terms : (2 + 3 + 3 = 8)

(i) 1, 3 diaxial interaction

(ii) sequence rules for E-Z notation

(iii) Give one example for syn-anti isomerism.

Or

(b) Write down the factors affecting the stability of conformations. (4 × 2 = 8)

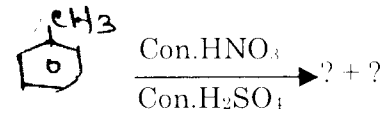
18. (a) Write the mechanism of the following reactions : (2 × 4 = 8)

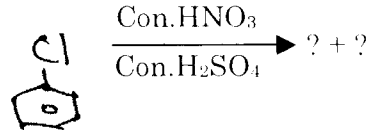
(i) Nitration of benzene

(ii) Acylation of benzene

Or

(b) Complete the reaction and write the mechanism. (2 × 4 = 8)

(i) 

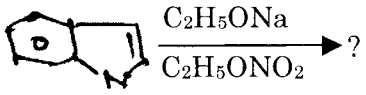
(ii) 

19. (a) (i) Draw and discuss the molecular orbital diagram of pyridine.

(ii) Compare the basicity of pyridine with pyrrole.

Or

(b) Complete the following equations : (4 × 2 = 8

(i) 

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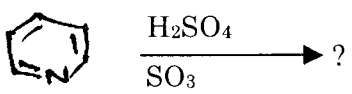
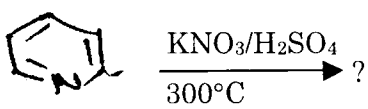
(iii) 

(iv) 

20. (a) Discuss the preparation of the following : (2 × 4 = 8

(i) Aluzarin (ii) Indigo

Or

(b) Derive the structure of napthalene.

(6 pages) Reg. No. :.....

Code No. : 20402 E **Sub. Code : CACH 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Select the shape of d-orbital

(a) spherical (b) elliptical

(c) dumb-bell (d) ring

2. Calculate the bond order of N_2 molecule

(a) 2 (b) 3

(c) 1 (d) 0

3. Select the electrophile from the following:

(a) NH_3 (b) CN^-

(c) NO_2^+ (d) OH^-

4. Focus the ion which acts as a nucleophile

(a) BF_3 (b) NO_2^+

(c) Br^- (d) H^+

5. Identify the kinetic gas equation from the following:

(a) $PV = (1-3)mNc^2$ (b) $P_1V_1 = P_2V_2$

(c) $E = mc^2$ (d) $\lambda = h/p$

6. Indicate the force which is defined as the force of friction between two layers of a liquid moving past one another with different velocities

(a) Viscosity (b) Surface tension

(c) Kinetic energy (d) Potential energy

7. Predict the type of glass which has the composition of silica 45%, sodium oxide 4%. potassium oxide 3% and lead oxide 44%

(a) Jena glass (b) Soda glass

(c) Pyrex glass (d) Flint glass

8. Identify the substance which is not explosive

(a) RDX (b) TNT

(c) Pyrex glass (d) Nitroglycerine

9. Predict the use of penicillin

(a) Sedatives

(b) Diabetes

(c) Antibiotic

(d) Anaesthtics

10. Choose the drug which is used as an antipyretic

(a) Aspirin

(b) Diclofenac

(c) Ibuprofen

(d) All of them

PART B — ($5 \times 5 = 25$ marks)

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

Each answer should not exceed 250 words.

11. (a) Explain the shapes of atomic orbitals.

Or

(b) Analyse the MO diagram of O_2 molecule.

12. (a) Illustrate briefly the heterolytic and homolytic cleavage with examples.

Or

(b) Explain in details the addition and elimination reactions with suitable examples.

13. (a) Summarise the postulates of kinetic theory of gases.

Or

(b) Discuss briefly the conductors, insulators and semiconductors.

14. (a) Explain briefly the manufacture of glass.

Or

(b) Describe the preparation of TNT, picric acid and gunpowder.

15. (a) Analyse the mode of action of sulpha drugs. How are prontosil and sulphadiazine prepared?

Or

(b) Judge the uses of penicillin, chlorampenicol and streptomycin.

PART C — ($5 \times 8 = 40$ marks)

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

Each answer should not exceed 600 words.

16. (a) State and explain the concept of VSEPR theory. Using the theory, explain the structure of H_2O and NH_3 molecules.

Or

(b) Describe briefly the MO diagrams of N_2 and HF molecules.

17. (a) Differentiate briefly the carbonium ions, carbanions and free radicals. How are they prepared?

Or

(b) Distinguish between substitution and polymerisation reactions with suitable examples.

18. (a) Derive the vander Waals gas equation.

Or

(b) (i) Explain the Trouton's rule and its significance.

(ii) Explain briefly surface tension. (6+4)

19. (a) Discuss the manufacture of cement.

Or

(b) Explain briefly how the optical glass, coloured glass and lead glass are prepared.

20. (a) Summarise the cause and treatment of diabetes and cancer.

Or

(b) Choose one example and define the following:

(i) Analgesics

(ii) Antipyretics

(iii) Hypnotics

(iv) Sedatives

———————

...iges) **Reg. No. :** .....

...ode No. : 30626 E **Sub. Code : CACH 21**

... (CBCS) DEGREE EXAMINATION, APRIL 2022.

Second Semester

Chemistry — Allied

ALLIED CHEMISTRY – II

(For those who joined in July 2021 onwards)

...me : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Which of the following ligands is bidentate?

a) EDTA (b) Ethylenediamine

c) Acetato (d) Pyridine

The IUPAC name of $Na_3[Fe(C_2O_4)_3$ is

a) Sodium trioxalatoferrate (III)

b) Sodium trioxalatoiron (III)

c) Sodium tris (oxalate) ferrate (III)

d) Sodium tris (oxalate) iron (III)

3. sp^3 hybridisation leads to which shape of the molecule

(a) Tetrahedron (b) Octahedron

(c) Linear (d) Plane triangle

4. The sufficient condition for optical activity is

(a) absence of chiral centre

(b) presence of chiral centre

(c) absence of symmetry

(d) presence of symmetry

5. Kohlraush's law can be used to determine

(a) λ_α for weak electrolytes

(b) absolute ionic mobilities

(c) solubility of sparingly soluble salts

(d) all of these

6. The electrical work done by the galvanic cells is given by the expression

(a) $W_{max} = -nFE$ (b) $\Delta G = -nFE$

(c) $-\Delta G = W_{max}$ (d) all of the above

7. Which one of the following is aldohexose?

(a) glucose (b) fructose

(c) ribose (d) surcrose

Amino acids are the building blocks of

a) carbohydrates (b) vitamins

c) proteins (d) fats

Sulpha drugs are used for

a) Precipitating bacteria

b) Stopping the growth of bacteria

c) Decreasing the size of bacteria

d) Removing bacteria

Which of the following is an antimalarial drug?

a) Insulin

b) Penicillin

c) Aspirin

d) Chloroquine

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

a) On the basis of Pauling's theory, explain the structure and magnetic properties of $K_4[Fe(CN)_6]$

Or

b) State and explain effective atomic number concept. Give examples.

12. (a) Write short notes on Resonance effect with examples.

Or

(b) What is meant by resolution? Describe two methods for resolving racemic mixture.

13. (a) State and explain Ostwald dilution law.

Or

(b) What are conductometric titration? Explain the following type of titrations curves

(i) HCl is titrated against NaOH

(ii) CH_3COOH is titrated against NH_4OH

14. (a) How are carbohydrates classified? Give an example for each.

Or

(b) Describe the preparation and properties of amino acids.

15. (a) Write briefly about Diabetes, causes and prevention.

Or

(b) Write a note on (i) Analgesics (ii) antipyretics

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) How does Werner's coordination theory explain the formation of complex compounds?

Or

(b) Write short notes on biological role of haemoglobin and chlorophyll.

17. (a) Explain briefly the geometry of methane and ethylene molecules.

Or

(b) (i) Write a note on element of symmetry with suitable examples.

(ii) Discuss the optical activity of tartaric acid.

18. (a) What is a glass electrode? Describe how the pH of a solution is determined using a glass electrode.

Or

(b) Explain the potentiometric titration between acid-base and Redox titration.

19. (a) Explain the preparation and properties of glucose.

Or

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

20. (a) Write briefly about airborne diseases and waterborne diseases.

Or

(b) Name any three important Indian medicinal plants and discuss the uses of each of one of them.

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(6 pages) **Reg. No. :** .....

Code No. : 20403 E **Sub. Code : CACH 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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 :

1. Chlorophyll is a ———— complex.
   (a) Magnesium-porphyrin
   (b) Manganese-porphyrin
   (c) Zinc-porphyrin
   (d) Iron-porphyrin complex

2. Structure of chromium hexa carbonyl is
   (a) Tetrahedral (b) Octahedral
   (c) Square-planar (d) None of the above

3. Melting point of fumaric acid is ————.
   (a) High (b) Low
   (c) Normal (d) Very low

4. Hybridisation in ethylene molecule is
   (a) sp^3 (b) sp^2
   (c) sp (d) sp^3d

5. In Daniell cell the cathode is
   (a) Zinc electrode
   (b) Copper electrode
   (c) Iron electrode
   (d) All the above

6. pH value of a neutral solution is
   (a) 0 (b) 7
   (c) 10 (d) 14

7. Both glucose and fructose reduce
   (a) Fehling's solution
   (b) Tollen's reagent
   (c) Barfoed's reagent
   (d) All the above

8. Example for sulphur containing amino acid is

(a) Cysteine (b) Methionine

(c) Both (a) and (b) (d) Lysine

9. Substances which reduce the elevated temperature of the body are

(a) Antipyretics (b) Sulpha drugs

(c) Antibiotics (d) None of the above

10. The leaves of kilkkaynelli contains

(a) Phyllanthin (b) Tetracyclin

(c) Amoxycillin (d) Ampicillin

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) How will you estimate the hardness of water?

Or

(b) Write down the postulates of Werner's co-ordination theory.

12. (a) Explain resonance effect in detail with examples.

Or

(b) Explain the optical isomerism of tartaric acid.

13. (a) Discuss the Kohlrausch law in detail.

Or

(b) Write notes on calomel electrode.

14. (a) Write down the industrial preparation method of glucose and fructose.

Or

(b) Explain iso electric point in detail with example.

15. (a) Write notes on air-borne diseases with examples.

Or

(b) Write notes on diabetes and its treatment.

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 application of EDTA in qualitative and quantitative analysis.

Or

(b) Discuss in detail about metal carbonyls.

17. (a) Write notes on :

(i) Inductive effect

(ii) Hyper-conjugation

Or

(b) Discuss sp^3, sp^2 and sp hybridisation with suitable examples.

18. (a) Define pH. How will you determine pH of a solution using glass electrode?

Or

(b) What is meant by corrosion? Explain any four method for its prevention.

19. (a) Explain the different classification of proteins with examples.

Or

(b) Discuss the classification of carbohydrates with examples.

20. (a) Write short note on :

(i) Antimalarials

(ii) Antibiotics.

Or

(b) Explain in detail about Indian medicinal plants.

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(6 pages)

Reg. No. : .....

Code No. : 20399 E **Sub. Code : CMCH 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

First Semester

Chemistry — core

Non-Major — INORGANIC CHEMISTRY — I

(For those who joined in July 2021 onwards)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Select the electronic configuration of copper from the following :
   (a) [Ar] $3d^8\,4s^2$ (b) [Ar] $3d^9\,4s^2$
   (c) [Ar] $3d^{10}\,4s^1$ (d) [Ar] $3d^5\,4s^1$

2. Name the principle which tells that electrons are filled in the orbitals in the order of energy.
   (a) Hund's rule
   (b) Aufbau principle
   (c) Pauli's Exclusion Principle
   (d) Heisenberg's uncertainty principle

3. Identify the atom which has the highest ionisation energy
   (a) Be (b) Mg
   (c) Ca (d) Ba

4. Predict the ion which has the highest ionic radius
   (a) Na^+ (b) K^+
   (c) Rb^+ (d) Cs^+

5. Express the compound which has highest melting point
   (a) NaCl (b) Cl_2
   (c) CCl_4 (d) CH_4

6. Find out the molecule which has sp^2 hybridisation
   (a) BF_3 (b) NH_3
   (c) BeH_2 (d) PCl_5

7. Predict the element which has the highest electronegativity
   (a) Na (b) K
   (c) Cs (d) Li

8. Identify the glass which has an approximate composition of SiO_2 75%, sodium oxide 15%, calcium oxide 8% and aluminium oxide 2%

(a) Soda glass (b) Flint glass

(c) Pyrex glass (d) Safety glass

9. Select the primary standard used in volumetric analysis from the following

(a) NaOH (b) Mohr's salt

(c) H_2SO_4 (d) HCl

10. Calculate the normality of oxalic acid if 63 g of oxalic acid dissolved in one litre of water

(a) 1 N (b) 0.5 N

(c) 0.1 N (d) 0.01 N

SECTION 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 Sommerfield theory of atomic model.

Or

(b) Examine the stability half-filled and fully filled orbitals with suitable examples.

12. (a) Discuss briefly the classification of elements in the long form of the periodic table.

Or

(b) Explain how the ionic and atomic radii vary along the groups and the periods with suitable examples.

13. (a) Examine the Fajan's rule and its applications.

Or

(b) Sketch the structure of CO_2 and H_2O.

14. (a) Discuss the diagonal relation between Be and Al.

Or

(b) Describe the chemistry of Portland Cement.

15. (a) Analyse the mechanism of precipitation.

Or

(b) Distinguish the following :

(i) Meal ion indicators and pH indicators. (3)

(ii) Acid-base titrations and redox titrations. (4)

SECTION C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) State and explain the Schrodinger wave equation and significance of Ψ and Ψ^2.

Or

(b) Describe briefly the black body radiation and Bohr's theory of atom.

17. (a) Explain briefly how the electron affinity and electronegativity of elements vary along the groups and periods.

Or

(b) (i) Discuss the various factors affecting ionisation energy. (5)

(ii) How is electronegativity determined by Pauling's method? (5)

18. (a) (i) State Born-Lande equation and explain its significance. (5)

(ii) Describe the factors affecting the lattice energy. (5)

Or

(b) Compare the VBT and MOT.

19. (a) Discuss the structure of any four types of silicates.

Or

(b) Explain briefly the allotropes of phosphorus.

20. (a) Illustrate the confirmatory tests for carbonate, sulphate, borate, phosphate and nitrate.

Or

(b) Analyse the principle of precipitation from homogeneous solution.

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ges) Reg. No. :.....

ode No. : 30624 E Sub. Code : CMCH 21

. (CBCS) DEGREE EXAMINATION, APRIL 2022.

Second Semester

Chemistry — Core

ORGANIC CHEMISTRY - I

(For those who joined in July 2021 onwards)

e : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

IUPAC name of the copound $CH_2 = CHCN$ is

(a) Ethenenitrile (b) Vinyl cyanide

(c) Cyanoethene (d) 2-Propene nitrile

Weakest acid among the following is

(a) CH_3COOH (b) $CH_2ClCOOH$

(c) $CHCl_2COOH$ (d) CCl_3COOH

Which of the following compounds is used as an antiknock compound?

(a) Ethyl lithium (b) Tetraethyl lead

(c) Ethyl acetate (d) Lead acetate

Conformational isomerismis due to

(a) rotation about a single bond

(b) structural changes

(c) restricted rotation about a double bond

(d) change in direction of light

The most stable conformation of cyclohexane is the

(a) Haworth form (b) Boat form

(c) Chair form (d) Newman form

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

(a) Write a structural formula of the following compounds

(i) 2-Methyl pent-2-en-1-ol

(ii) Ethyl ethanoate

(iii) 4-Cyano-3-methoxy butanoic acid

(iv) 4-Amino-2-ethyl-2-pentenal

(v) 3, 5-Octadiene

Or

(b) Describe the Inductive effect with suitable examples.

3. SN^2 mechanism proceeds through the formation of

(a) Free radical (b) Carbonium ion

(c) Carbanion (d) Transition state

4. Which of the following is an example of elimination reaction

(a) Chlorination of methane

(b) Dehydraton of ethanol

(c) Nitration of benzene

(d) Hydroxylation of ethylene

5. The Hell-Volhard-Zelinsky reaction specific for _____.

(a) Replacement of beta hydrogen

(b) Replacement of alpha hydrogen

(c) Replacement of beta carbon

(d) Replacement of alpha carbon

6. In succinic acid, $HOOC(CH_2)_nCOOH$, n is equal to

(a) 2 (b) 1

(c) 3 (d) 4

7. Which of the following compounds will react with methyl magnesium iodide followed by acid hydrolysis to give ethyl alcohol?

(a) Ethylene (b) Acetaldehyde

(c) Formaldehyde (d) Acetone

12. (a) Write a note on Diels-Alder reaction.

Or

(b) State and explain Saytzeff's rule with an example.

13. (a) Write the reaction mechanism of addition of carbonyl compounds with HCN.

Or

(b) Explain Meerwein Ponndorf-Verley reduction reaction.

14. (a) Write a note on Reformatsky reaction with example.

Or

(b) Explain synthesis and applications of Saccharin.

15. (a) What is Bayer's strain theory? Illustrate with suitable example.

Or

(b) Write a note on (i) Dihedral angle (ii) Torsional strain.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Explain resonance effect and repetition with example.

Or

(b) Describe the formation and stability of carbenes and nitrenes.

17. (a) Explain the preparation, properties and uses of vinyl chloride.

Or

(b) Discuss the effect of substrate, solvent, nucleophile and leaving group in S_N^1 reactions.

18. (a) Discuss the following reactions : (i) Aldol condensation (ii) Wittig reaction

Or

(b) Describe the preparation and properties of Succinic acid.

19. (a) (i) Explain the preparation and properties of methyl lithium.

(ii) Write a note on preparation and properties of benzene sulphonic acid.

Or

(b) What are Grignard reagents? Explain their preparation and properties.

20. (a) Explain the conformational analysis of n-butane with energy diagram.

Or

(b) Describe the preparation and synthetic uses of ethyl acetoacetate.

(8 pages) Reg. No. : .....

Code No. : 20400 E **Sub. Code : CMCH 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Organic compounds can be classified even based on the functional groups. Identify the one which is not a functional group?
   (a) Isocyanide
   (b) Isocyano
   (c) Carboxyl
   (d) Carbonyl

2. Select the incorrect statement form the following.
   (a) Fission of covalent bond leads to the generation of intermediate organic species
   (b) Intermediate organic species are stable and long-lived
   (c) The presence of reactive intermediates is confirmed by their detection by spectroscopic methods
   (d) None of the mentioned

3. When an unsymmetrical reagent adds on unsymmetrical alkene in the present of peroxide, the negative part of the reagent gets attached to the carbon of carbon-carbon double bond which carries more number of hydrogen atoms. The rule is called _____.
   (a) Saytzaff rule
   (b) Anti-Markovnikov rule
   (c) Markovnikov rule
   (d) None

4. Which of the following is not true for SN_1 reactions
   (a) They occur through a single step concerted reaction
   (b) Tertiary alkyl halides generally react halides through this mechanism
   (c) Concentration of nucleophyll does not after the rule of the reaction.
   (d) They are favoured by polar solvent

5. The reaction of ethyl formate with an excess of CH_3MgI followed by hydrolysis gives _____.

(a) Ethanol

(b) N-propyl alcohol

(c) Propanal

(d) Iso-prophyl alcohol

6. Which factor will increase the reactivity of carbonyl group.

(a) Presence of a group with +I effect

(b) Presence of a group with -I effect

(c) Presence of a large alkyl group

(d) Both (a) and (b)

7. Organozinc compound is used in the following organic reaction.

(a) Haloform reaction

(b) Hofmann reaction

(c) Cannizzaro reaction

(d) Reformat sky reaction

8. β, β' –dichlorodiethyl sulphide is _____

(a) Mustard gas (b) Water gas

(c) Producer gas (d) Natural gas

9. With respect to the conformers of ethane, which of the following statement is true?

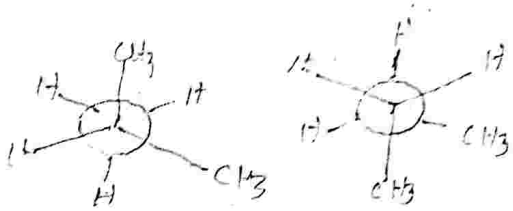
(a) Bond angle remains same but bond length changes

(b) Bond angle changes but bond length remains same

(c) Both bond angle and bond length change

(d) Both bond angle and bond length remain same

10. The structures below are _____



(a) Not isomers

(b) Conformation isomers

(c) Structural isomers

(d) Cis-trans isomers

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Unlite inductive effect, electromeric effect is not a permanent polarisation effect. Elaborate the statement

Or

(b) Explain the IUPAC rules for naming alkenes.

12. (a) Suggest a possible reason, why the peroxide effect is obtained for HBr and not for Hcl.

Or

(b) Write note on Saytzaff rule.

13. (a) Explain condensation reactions of carbonyl compounds with suitable example.

Or

(b) Explain the reaction of acetone with

(i) NH_2-NH_2 with presence of $Na+C_2H_5OH$

(ii) Aluminium isopropoxide in iso-propyl alcohol

14. (a) What is a tonyl groups? How is it important in organic chemistry?

Or

(b) How the following prepared from toluene sulphonic acid?

(i) Chloramine-T

(ii) Saccharin

15. (a) Draw the staggered and eclipsed conformation of ethane represented by saw horne and Newmann.

Or

(b) Chair conformation of cyclohexane is more stable than boat conformation. Why?

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 of the mode of formation of carbonium ion and carbanion. What determines their relative stabilities?

Or

(b) Write notes on (i) Mesomeric effect (ii) Hyper conjugation effect (iii) Steric effect

17. (a) Discuss the effect of substrate and solvent in SN_2 reaction with example.

Or

(b) Explain with example (i) Ozonolysis (ii) Hofmann rule (iii) Diels alder reaction

18. (a) Which is more acidic? Why.

(i) Acetic acid or Trichloroacetic acid

(ii) 2-chloro butanoic acid or 4- chloro butanoic acid

Or

(b) Write the preparation and any two uses of

(i) Oxalic acid

(ii) Succinic acid

19. (a) How the following are prepared form grignard reagent?

(i) Acetic acid

(ii) Acetone

(iii) 2-butanol

Or

(b) Write the preparation and any two chemical properties of

(i) Benzene sulphonic acid

(ii) Benzene sulphonyl chloride

20. (a) Starting from diethyl mulonate, how would you prepare the following.

(i) Monocarboxylic acid

(ii) Dicarboxylic acid

(iii) α, β unsaturated carboxylic acid

Or

(b) Comment on relative stability of chair and boat conformation of cyclohexane and its monosubstituted derivatives.

(6 pages) Reg. No. : .....

Code No. : 20401 E **Sub. Code : CMCH 31**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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 :

1. The relation for root mean square velocity is

(a) $\frac{\sqrt{8RI}}{\pi m}$ (b) $\sqrt{\frac{3RT}{m}}$

(c) $\frac{\sqrt{2RI}}{m}$ (d) None of these

2. The number of vibrational modes of CO_2 and H_2O molecules are

(a) 4, 3 (b) 2, 2

(c) 3, 2 (d) 2, 4

3. For an ideal solution

(a) $\Delta H_{mix} = 0$ (b) $\Delta H_{mix} < 0$

(c) $\Delta H_{mix} > 0$ (d) None of these

4. Addition of small amount of NaCl to phenol water system

(a) Increases the CST

(b) Decreases the CST

(c) Does not alter the CST

(d) Increases the freezing point of the mixture

5. Each Na^+ ion in NaCl lattice is surrounded by

(a) 1 Cl^{-1}ion (b) 8 Cl^{-1}ion

(c) 4 Cl^{-1}ion (d) 6 Cl^{-1}ion

6. Bragg's equation is

(a) $n\lambda = 2d\sin\theta$ (b) $n\lambda = d\sin\theta$

(c) $n\lambda = 2d\cos\theta$ (d) $n\lambda = d\cos\theta$

7. In nuclear reactors, heavy water is used as

(a) projectile (b) fuel

(c) moderator (d) coolant

8. Fuel used in nuclear reactor is

(a) thorium (b) sodium

(c) uranium (d) petroleum

9. Emission of light as a result of a chemical reaction is called

(a) phosphorescence

(b) chemiluminescence

(c) thermoluminescence

(d) fluorescence

10. The energy associated with a photon is given by

(a) $E = h\lambda$ (b) $E = h\gamma$

(c) $E = hc$ (d) $E = hc^2$

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 postulates of the kinetic theory of gases.

Or

(b) Derive the relation between C_{rms}, C_{av}, C_{mp}.

12. (a) Explain static method of measurement of vapour pressure.

Or

(b) State Raoult's law of ideal solutions, Explain azeotropic distillation.

13. (a) Explain Schottky and Frenkel defects in crystals and their consequences.

Or

(b) Explain conductors, insulators, semiconductors.

14. (a) Write briefly the gaseous diffusion method for separation of isotopes.

Or

(b) Write the applications of ratio isotopes.

15. (a) State Beer - Lambert law and Grothus - Draper law and explain.

Or

(b) Explain photosensitization and its importance.

PART C — (5 × 8 = 40 marks)

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

16. (a) Write notes on :

(i) Collision number

(ii) Collision diameter

(iii) Mean free path

(iv) Maxwell's law of distribution of molecular velocities.

Or

(b) Explain the types and origin of Vanderwaal's forces.

17. (a) Derive Duhem - Marqule's equation.

Or

(b) What is CST? Discuss the phenol - water system.

18. (a) Write the differences between crystalline solids and amorphous solids.

Or

(b) Derive Bragg's equation.

19. (a) Explain Geiger - Muller counter.

Or

(b) Explain power and breeder reactors.

20. (a) Explain the method of determination of quantum yield.

Or

(b) What is phosphorescence? Explain it.

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(6 pages) **Reg. No. : .....**

Code No. : 20408 E **Sub. Code : CNCH 32**

U.G. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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 water pollution is caused by
   (a) Marine dumping
   (b) Sewage
   (c) Oil leaks and spills
   (d) All the above

2. Tritiated water is a
   (a) pure water
   (b) distilled water
   (c) deionised water
   (d) radioactive form of water

3. The amount of hardness is expressed in
   (a) mg/L
   (b) g/ml
   (c) grains per gallon
   (d) (a) and (c)

4. The estimate of oxygen required for the portion of organic matter in wastewater is called as
   (a) BOD (b) COD
   (c) TDS (d) None of the above

5. A chemical coagulant added to the water acts to facilitate bonding between particles is known as
   (a) Coagulation (b) Filtration
   (c) Flocculation (d) Osmosis

6. The removal of calcium, magnesium, in hard water is termed as
   (a) water softening
   (b) water purification
   (c) water turbidity
   (d) hazardous

7. The removal of biodegradable organic matter is known as
   (a) Primary treatment
   (b) Secondary treatment
   (c) Permutit process
   (d) Chemical precipitation

8. The final stage of the multi-stage wastewater cleaning process is called as
   (a) Primary treatment
   (b) Secondary treatment
   (c) Tertiary treatment
   (d) All the above

9. The water pollution prevention Act 1974 was enacted to provide
   (a) to prevent the soil water
   (b) to establish the agriculture
   (c) water pollution
   (d) the prevention and control of water pollution

10. The failures of the Ganga action plan was that
    (a) top-down
    (b) end of the pipe interventions
    (c) bureaucratic exercise
    (d) all the above

PART B — (5 × 5 = 25 marks)

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

11. (a) How the environment is affected by the agricultural discharges?

Or

(b) Write a note on pharmaceutical pollutants.

12. (a) Write on total hardness.

Or

(b) Discuss on turbidity and salinity of water.

13. (a) Describe on ion exchange process of water purification.

Or

(b) Write a short note on desalination.

14. (a) How the biological processes are playing a significant role in the waste water treatment?

Or

(b) Explain chemical precipitation.

15. (a) Illustrate the importance of lakes and rivers.

Or

(b) Explain the water prevention and control of pollution act of 1974.

PART C — (5 × 8 = 40 marks)

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

16. (a) Discuss on the following in water pollution.

(i) detergents (4)

(ii) pathogens. (4)

Or

(b) (i) How the sewage (4)

(ii) and domestic (4)

wastes are creating pollution in water bodies.

17. (a) Explain the following :

(i) BOD

(ii) COD.

Or

(b) (i) Describe on the WHO standards for drinking water. (4)

(ii) What do you understands on biological water quality parameters of drinking water? (4)

18. (a) Write a note on :

(i) sedimentation. (4)

(ii) flocculation. (4)

Or

(b) (i) How the permutit process is useful in the purification of water? (5)

(ii) Write a short note on reverse osmosis. (3)

19. (a) Explain in terms of waste water treatment (i) aerobic (ii) anaerobic processes.

Or

(b) How the biological and chemical processes are useful in waste water treatment?

20. (a) (i) Write in detail on ganga action plan. (4)

(ii) Discuss on rain water harvesting. (4)

Or

(b) (i) List out the stresses on the Indian rivers and their effects. (5)

(ii) Write a short note on drip irrigation. (3)

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(6 pages)

Reg. No. : .....

Code No. : 20012 E **Sub. Code : SACH 11 / AACH 11**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

First / Third Semester

Chemistry – Allied

CHEMISTRY - I

(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 atomic orbital is spherical in shape?
   (a) 3P (b) 2S
   (c) 3D (d) 4f

2. The Sp^3d^2 hybridisation of control atom of a molecule would lead to ———— geometry.
   (a) trigonal bipyramid (b) square planar
   (c) tetrahedral d) octahedral

3. Which of the following is the most stable carbocation?
   (a) $CH_3 - CH_2$ (b) $(CH_3)_2 - CH$
   (c) $(CH_3)_3 - C$ (d) $C_6H_5 - CH_2$

4. An example for electrophillic substitution reaction is
   (a) chlorination of methane
   (b) nitration of benzene
   (c) conversion of methylchloride to methyl alcohol
   (d) formation of ethylene from ethyl alcohol

5. Which of the following is the principal law of photochemistry?
   (a) Raoult's and Dalton's law
   (b) Raoult's and Henry's law
   (c) Grothus – Draper and Stark – Einstein law
   (d) Lambert's and Deer's law.

6. In photochemical reactions, absorption of ———— radiation takes place.
   (a) UV and visible (b) radio
   (c) only visible (d) visible and X ray

7. Which of the following is a biodegradable polymer?
   (a) Nylon – 6 (b) PVC
   (c) Polythene (d) Cellulose

8. Polymers which has amide linkage is ————

(a) terylene (b) nylon - 66

(c) teflon (d) bakelite

9. On increasing the lubrication, the efficiency of the machine ————

(a) decreases (b) increases

(c) no change (d) none

10. A lubricating oil ————

(a) minimises wear and tear of moving paris

(b) helps in keeping the parts cool

(c) washes and carries away dirt

(d) all the above

PART B — (5 × 5 = 25 marks)

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

11. (a) Write salient features of hybridisation.

Or

(b) State and explain Hunds rule with suitable example.

12. (a) Explain electrophites with example.

Or

(b) Discuss nucleophiltic substitution reaction with suitable example.

13. (a) What are photochemical reactions? Explain with an example.

Or

(b) Write note on bioluminescence.

14. (a) Write note on natural rubber.

Or

(b) How are the following prepared? Mention their uses.

(i) PVC (ii) Terylene

15. (a) What are the criterias for good lubricating oils?

Or

(b) How is sun screens prepared? What are its uses?

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 with example.

(i) Ionic bond

(ii) Covalent bond

Or

(b) Write note on

(i) SP^3 hybridisation

(ii) Valence bond theory

17. (a) Explain reaction intermediates with example.

Or

(b) How is free radicals prepared? Explain any two reactions of them.

18. (a) How will you differentiate thermal reactions from photochemical reactions?

Or

(b) Explain

(i) Fluorescence

(ii) Chemi luminescence

19. (a) Differentiate plastics, fibers and elastomers.Give example.

Or

(b) Explain the preparation and uses of the following

(i) LDPF

(ii) Epoxy resins

(iii) Nylon - 66

20. (a) How are the following prepared? What are their uses?

(i) Shampoo

(ii) Tooth Paste

Or

(b) Discuss

(i) Solid Lubricants

(ii) Greases

(6 Pages)

Reg. No. : .....

Code No. : 30290 E Sub. Code : SACH 21/ AACH 21

(BCS) DEGREE EXAMINATION, APRIL 2022

Second/Fourth Semester

Chemistry — Allied

ALLIED CHEMISTRY — II

(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 :

How many benzene rings are in anthracene?

(a) 2 (b) 3

(c) 4 (d) 1

The main constituent of gobar gas is

(a) Methane (b) Propane

(c) Butane (d) None of these

Aspirin is ————

(a) Phenyl salicylate (b) Ethylsalicylate

(c) Methyl salicylate (d) Acetyl salicylic acid

Which is used to cure jaundice?

(a) Neem (b) Keezhanelli

(c) Thulsi (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.

(a) Explain aromaticity and Huckel's rule.

Or

(b) (i) Naphthalene + $H_2/Ni \rightarrow$

(ii) Naphthalene + air/$V_2O_5 \rightarrow$

(iii) Anthracene + $K_2Cr_2O_7/H_2SO_4 \rightarrow$

2. Anthracene + $H_2/Ni \rightarrow$?

(a) declain

(b) tetralin

(c) 9, 10 dihydroanthracene

(d) perhydro anthracene

3. Uranium isotope used in nuclear reactor

(a) U^{235} (b) U^{238}

(c) U^{236} (d) U^{237}

4. The method used to separate isotope is

(a) diffision number (b) oxmosis

(c) oxidation method (d) none of these

5. Deoxy ribose is a ————

(a) pentose sugar (b) hexose sugar

(c) heptose sugar (d) none of these

6. Which one base is not in RNA?

(a) adenine (b) thymine

(c) uracil (d) cytosine

7. The chemical used to slowdown the setting of cement is ————

(a) Lime (b) Gypsum

(c) Clay (d) Sand

12. (a) Distinguish between nuclear fission and nuclear fusion.

Or

(b) What are radio isotopes? How are they used in medicinal fields?

13. (a) What is meant by isoelectricpoint? Explain with suitable example.

Or

(b) What are artificial sweeteners? Explain with example.

14. (a) How is Portland cement prepared?

Or

(b) Explain the role nitrogen in plant growth.

15. (a) Explain the cause of diabetes. Give two example of hypoglycemic drug.

Or

(b) Write a note on medicinal plants.

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 structure of benzene.

Or

(b) Write the chemical reactions of anthracene.

17. (a) Write a note on :

(i) n/p ratio

(ii) Binding energy.

Or

(b) Explain group displacement law and radio active series.

18. (a) What are carbohydrates? Explain its classification with example.

Or

(b) Distinguish between DNA and RNA. Explain the types of RNA.

19. (a) Explain the manufacture of Joap by Mill's process.

Or

(b) Discuss the manufacture of glass.

20. (a) What are antibiotics? Explain its classification with examples.

Or

(b) Write a note on :

(i) Analgesic

(ii) Sulpha drugs

(iii) Antimalarials.

———————

(6 pages) **Reg. No. :** .....

Code No. : 20013 E **Sub. Code : SACH 21/ AACH 21**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Second/Fourth Semester

Chemistry – Allied

ALLIED CHEMISTRY – II

(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 is not an aromatic compound?
   (a) Benzene
   (b) Cyclo hexane
   (c) Naphthalene
   (d) Aniline

2. Sulphonation of naphthalene takes place in ——— position
   (a) 3 (b) 4
   (c) 1 (d) 2

3. During the emission of α particle by a radio active element the mass number of the product is reduced by ———
   (a) 1 (b) 2
   (c) 3 (d) 4

4. The isotope used in carbon dating is
   (a) C_{14} (b) C_{12}
   (c) C_{13} (d) None of these

5. Glucose is an ———
   (a) Aldopentose (b) aldo hexose
   (c) keto pentose (d) keto hexose

6. Which of the following is a conjugate protein?
   (a) Glyco protein
   (b) Phosphoprotein
   (c) Chromoprotein
   (d) All the above

7. The chief raw material used in manufacture of glass is

(a) Silica

(b) Alkali metals

(c) Acid

(d) Transition metal salt

8. Detergents are the sodium salt of ————

(a) Carboxylic acids

(b) Malonic acid

(c) Sulphonic acid

(d) Benzene sulphonic acid

9. High blood glucose level is called ————

(a) Hyperglycemia (b) Hypo glycemia

(c) Macrosomia (d) None of these

10. Chloramphenicol is ————

(a) An antiseptic

(b) Antibiotic

(c) Anti pyretic

(d) Anti malarial

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write a note on benzenoid compounds and non benzenoid compounds.

Or

(b) Write the general characteristics of aromatic compounds.

12. (a) Write a note on nuclear stability.

Or

(b) Explain the method of separation of isotopes.

13. (a) Explain the classification of carbohydrates.

Or

(b) Write the classification of protein

14. (a) Write a note on

(i) Gobar gas (ii) CNG

Or

(b) How will you prepare

(i) Super phosphate of lime

(ii) Triple super phosphate

(iii) Mixed fertilizer

15. (a) Write a note on

(i) Sulpha drugs

(ii) Analgesics

Or

(b) Explain hereditary diseases.

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 chemical reactions of anthracene.

Or

(b) Write a note on

(i) Haworth synthesis

(ii) Diels Alder reaction

(iii) Oxidation reactions of benzene

17. (a) Write a note on

(i) Radio carbon dating

(ii) Stellar energy

Or

(b) Explain the uses of radio isotopes.

18. (a) Write a note on

(i) Artificial sweeteners

(ii) Colour reactions of protein

Or

(b) Explain the classification of amino acids with suitable examples.

19. (a) Explain the classification of detergents.

Or

(b) Write a note on

(i) Cleansing action of soap

(ii) Advantages of gaseous fuel over solid and liquid fuel

20. (a) Write a note on

(i) Waterborne diseases

(ii) Airborne diseases

Or

(b) Write a note on

(i) TB (ii) Typhoid

(iii) Asthma (iv) Malaria

(6 pages) Reg. No. : .....

Code No. : 20022 E **Sub. Code : SECH 5 A/ AECH 51**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fifth Semester

Chemistry

Major Elective — POLYMER CHEMISTRY

(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 is a thermosetting polymer?
   (a) Rubber (b) Nylon
   (c) Phenolic resins (d) Polystyrene

2. Which of the following polymer exhibit a lower value of molar cohesion?
   (a) Wool (b) Polystyrene
   (c) Silk (d) Vulcanised rubber

3. The number – average molecular weight is determined by ———
   (a) Osmometry (b) Physical balance
   (c) Chemical balance (d) Electrogravimetry

4. The substance used in the vulcanization of rubber is
   (a) Copper (b) Sulphur
   (c) Chromium (d) Zinc

5. Bulk polymerization requires which type of monomer?
   (a) Gaseous
   (b) Liquid
   (c) Solid
   (d) Both liquids and gaseous

6. The technique used to produce polymeric films is
   (a) Film casting
   (b) Compression moulding
   (c) Injection moulding
   (d) Die casting

7. The termoplastic is
   (a) cross - linking (b) insoluble
   (c) amorphous (d) solid

8. In which of the following, poly propylene cannot be used?
   (a) insulating cables and wires
   (b) furniture
   (c) automobile appliances
   (d) home appliances

9. Which of the following is a stable silicon bonded linkage?
   (a) Si = Si (b) – Si – Si –
   (c) – Si – O – Si – (d) – Si – Si – O –

10. Which of the following is a conducting polymer?
    (a) Polyprrole (b) Polyaniline
    (c) Polyacetylene (d) All the above

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 structure?

Or

(b) What is meant by chain polymerization? Explain it briefly with examples.

12. (a) What is meant by vulcanization? Explain with example.

Or

(b) What is meant by polymer degradation? Explain briefly the thermal and photo degradation.

13. (a) What is bulk polymerization? Explain briefly.

Or

(b) What is meant by 'Blow casting'? Give its characteristic properties.

14. (a) Write down the preparation, uses and any two properties of polyester.

Or

(b) Write down the differences between natural rubber and synthetic rubber.

15. (a) What are conducting polymers? Explain briefly.

Or

(b) Explain the properties of fire resistant polymers.

PART C — (5 × 8 = 40 marks)

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

16. (a) How are polymers classified based on thermal response? Explain them with suitable examples.

Or

(b) Based on crystallinity, how are polymers classified? Explain them in detail.

17. (a) What is meant by Tg? Explain briefly the factors affecting it.

Or

(b) Describe the viscosity - average molecular weight and its importance.

18. (a) Discuss briefly the rotational casting processing.

Or

(b) Explain briefly the emulsion polymerization and solution polymerization techniques.

19. (a) What are epoxy resins? How are they prepared? Write down their uses.

Or

(b) Explain the preparation, properties and uses of PVC.

20. (a) What are biomedical polymers? Explain any three of them.

Or

(b) What are silicones? How are they prepared? Write down their uses and properties.

———————

...ges) **Reg. No. :** .....

...ode No. : 30303 E **Sub. Code : SECH 6 A**

... (CBCS) DEGREE EXAMINATION, APRIL 2022.

Sixth Semester

Chemistry — Major Elective

GREEN CHEMISTRY

(For those who joined in July 2017 onwards)

...me : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Greener synthesis aims to develop the _____ reaction conditions.

(a) cold (b) hot

(c) mild (d) strong

_____ selectivity means differentiation among various functional groups in a poly functional molecule.

(a) chemo (b) regio

(c) enantio (d) diastereo

In the catechol synthesis _____ is used as biocatalyst.

(a) Enzyme (b) E-coli

(c) Hormone (d) None of these

To minimize the waste product formation is the _____ principle.

(a) second (b) sixth

(c) seventh (d) first

_____ catalytic reagents are superior to stoichiometric reagents in a chemical synthesis.

(a) specific (b) second-class

(c) selective (d) effective

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

(a) Write short notes on the calculation of atom economy.

Or

(b) Write short notes on the elimination reaction in atom economy.

(a) Mention any five applications of supercritical fluids.

Or

(b) Explain the green reagent dimethyl carbonate.

3. For CO_2, the critical pressure is _____ atm.

(a) 74 (b) 73

(c) 72.8 (d) 73.8

4. _____ is the first example of an ionic liquid

(a) Ammonia

(b) Hcl

(c) DMSO

(d) Ethyl ammonium nitrate

5. _____ catalysts are the most ideal, green catalysts and these are finding applications.

(a) Bio (b) Acid

(c) Base (d) Photo

6. The supported _____ catalysts exhibit a remarkable high activity in the Suzuki coupling and in the Heck reactions.

(a) platinum (b) Nickel

(c) Palladium (d) Zinc

7. In the Biocatalytic way adipic acid can be synthesized from _____.

(a) D-glucose (b) L-glucose

(c) Mannose (d) None of these

13. (a) Write short notes on solid supported catalyst.

Or

(b) Explain the heterogeneous catalyst.

14. (a) Explain the green synthesis of Para acetamol

Or

(b) Write one of the ultrasound assisted reactions

15. (a) Explain the versatile bleaching agents

Or

(b) Write short notes on analgesic drugs.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Write short notes on

(i) Calculation of mass intensity

(ii) Calculation of mass productivity

Or

(b) Explain
(i) Need for green chemistry
(ii) Scope of green chemistry

17. (a) Write short notes on
(i) Acidic ionic liquid
(ii) Neutral ionic liquid

Or

(b) Explain
(i) Hydrogenation
(ii) Hydroformylation

18. (a) Write short notes on
(i) TAML Catalyst
(ii) Microbial Oxidation

Or

(b) Explain
(i) Neutral templating method
(ii) Microbial reduction

19. (a) Write short notes on
(i) Ibuprofen
(ii) Diels- Alder reaction

Or

(b) Explain the oxidation of toluene and alcohols.

20. (a) Discuss the twelve principles of green chemistry.

Or

(b) Write about the green chemistry in sustainable developments.

(6 pages)

Reg. No. : .....

Code No. : 20026 E **Sub. Code : SECH 6 A**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Sixth Semester

Chemistry

Major Elective — GREEN CHEMISTRY

(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. Green chemistry ———— the consumption of non-renewable resources.

   (a) Reduces (b) Non-reduce

   (c) Enhance (d) None of these

2. ———— selectivity means control of absolute stereochemistry.

   (a) Diastereo (b) Chemo

   (c) Regio (d) Enantio

3. For CO_2, the critical temperature is ———— °C.

   (a) 31 (b) 35

   (c) 32 (d) 33

4. Ethyl ammonium nitrate is the first example of an ————

   (a) Ionic solid (b) Ionic liquid

   (c) Gas (d) All the above

5. The supported ———— catalysts exhibit a remarkable high activity in the suzuki coupling and in the heck reaction.

   (a) Platinum (b) Nickel

   (c) Palladium (d) Zinc

6. TiO_2 is used as a ———— catalyst in removing water pollutants.

   (a) acid (b) basic

   (c) photo (d) bio

7. In the catechol synthesis ———— is used as biocatalyst.

   (a) E-coli (b) Enzymes

   (c) Hormones (d) None of these

8. The greener synthesis of Ibuprofen by ———— can dramatically reduce the waste product generation.

   (a) BVC (b) BHC

   (c) GHC (d) DTTP

9. To minimize the waste product formation is the ———— principle.

   (a) first (b) second

   (c) third (d) tenth

10. The substance to be used in chemical reactions should not be ————

    (a) Harmless (b) Acidic

    (c) Basic (d) Hazardous

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 need for green chemistry.

    Or

    (b) Write short notes on the calculation of atom economy.

12. (a) Explain the green reagent dimethyl carbonate.

    Or

    (b) Mention any five applications of super critical fluids.

13. (a) Explain the solid supported catalyst.

    Or

    (b) Write short notes on modified bio catalyst.

14. (a) Explain the green synthesis of adipic acid.

    Or

    (b) Write about the green synthesis of catechol.

15. (a) Mention the choice of starting materials in green chemistry.

Or

(b) Explain the combinational green chemistry.

PART C — (5 × 8 = 40 marks)

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

16. (a) Mention and explain the various types of selectivity.

Or

(b) Write short notes on :

(i) Calculation of mass productivity

(ii) Carbon efficiency.

17. (a) CO_2 as a super critical fluid - Discuss.

Or

(b) Write short notes on :

(i) Acidic ionic liquid

(ii) Neutral ionic liquid.

18. (a) Explain : (i) Microbial oxidation (ii) Microbial reduction.

Or

(b) Write notes on :

(i) Neutral templating agents

(ii) TAML catalyst.

19. (a) Write short notes on the green synthesis of the following (i) paracetamol (ii) citral.

Or

(b) Give an account of the microwave assisted reactions in organic solvents.

20. (a) Write short notes on :

(i) Versatile bleaching agents

(ii) Analgesic drugs.

Or

(b) Give an account of the importance of green chemistry in day to day life.

———————

s) **Reg. No. : .....**

de **No. : 30286 E** **Sub. Code : SMCH 61**

CBCS) DEGREE EXAMINATION, APRIL 2022

Sixth Semester

Chemistry — Core

INORGANIC CHEMISTRY — III

For those who joined in July 2017 onwards)

Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

hoose the correct answer :

n example of a bidentate ligand is

a) NO^- (b) en

c) NO_2^- (d) Cl^-

he coordination number of cobalt in $Co(OH_2)_6]^{2+}$ is

a) 2 (b) 12

c) 4 (d) 6

he Ziegler-Natta catalyst is formed between

a) Triethyl aluminium and titanium halide

b) Triethyl aluminium and silver halide

c) Triethyl aluminium and platinum halide

d) Triethyl aluminium and carbon halide

he oxidation state of Rhodium in Wilkinson atalyst is

a) +3 (b) +2

c) +1 (d) 0

When the source of light is not sun light then the photo voltaic cell is used as

(a) Photo transmitter (b) Photo detector

(c) Photo diode (d) Photo

Which of the following are the principle laws of photochemistry?

(a) Grotthus-Draper and Stark-Einstein law

(b) Lambert's and Raman's law

(c) Raoult and Hentry law

(d) Beer law and Ohm law

3. Which of the following does not obey EAN rule?

(a) $Fe(CO)_5$ (b) $V(CO)_6$

(c) $K_4[Fe(CN)_6]$ (d) $Mn_2(CO)_{10}$

4. $[Ni(CN)_4]^{2-}$ and $[NiCl_4]^{2-}$ complex ions are

(a) Both paramagnetic

(b) Both diamagnetic

(c) Paramagnetic and diamagnetic

(d) Diamagnetic and paramagnetic

5. Anation is

(a) The substitution of uncharged ligand by an anionic ligand

(b) The substitution of an uncharged by another uncharged lignad

(c) The substitution of an anionic ligand by an uncharged ligand

(d) The substitution of an anionic ligand by another anionic lingand

6. Which ion is kinetically inert?

(a) Cr^{2+} (b) Co^{3+}

(c) Fe^{3+} (d) Co^{2+}

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 bidentate and tridentate ligands? Give two examples for each case.

Or

(b) Discuss the salient features of VB theory.

12. (a) List out the salient features of CFT.

Or

(b) How is the stability constant of metal complex determined by job's method?

13. (a) Differentiate labile and inert complexes.

Or

(b) What is trans-effect? Write down any two of its applications.

14. (a) Describe briefly Mansanto acetic acid process.

Or

(b) State (i) EAN rule and (ii) 18 electron rule.

15. (a) State Adamson's rules.

Or

(b) Write the photo substitution reaction of Cr(III) complex.

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 structural isomerism in octahedral and tetrahedral complexes.

Or

(b) Explain the postulates of VB theory. Give its merits and limitations.

17. (a) Explain the d-orbital splitting in octahedral and tetrahedral complexes.

Or

(b) Explain any two applications of CFT theory. What are the limitations of CFT?

18. (a) Explain the outer sphere and inner sphere electron transfer reactions with mechanism.

Or

(b) Discuss the factors affecting the rate of substitution of reaction in square planar.

19. (a) Describe the mechanism of hydroformylation of alkene using co-based catalyst.

Or

(b) Discuss briefly the structure and bonding in metal carbonyls.

20. (a) Explain the

(i) photo redox reaction of Co(III) complexes and

(ii) Photo isomerisation in Pt(II) complexes.

Or

(b) Enumerate the photochemical conversion and storage of solar energy.

———————

ages)

Reg. No. : .....

Code No. : 30287 E Sub. Code : SMCH 62

(CBCS) DEGREE EXAMINATION, APRIL 2022

Sixth 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.

How many number of –OH group is present in glucose?

(a) 4 (b) 5

(c) 6 (d) 7

Hydrolysis of sucrose gives ————

(a) glucose (b) fructose

(c) glucose + fructose (d) starch

———— is a cyclic monoterpene.

(a) Limonene (b) α – terpineol

(c) Menthol (d) All the above

Which of the following is a piperidine alkaloid?

(a) nicotine (b) quinine

(c) pyridine (d) piperine

How many NMR signals will get for mesitylene?

(a) 1 (b) 2

(c) 3 (d) 4

———— is a chromophoric group.

(a) $-NH_2$ (b) $-NR_2$

(c) $\diagdown C=0$ (d) $-OH$

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

(a) Write the classification of carbohydrates.

Or

(b) What is epimerisaiton? Explain.

3. Which of the following is least acidic?

(a) Phenol

(b) O-nitrophenol

(c) 2,4-dinitrophenol

(d) 2,4,6-trinitrophenol

4. Which of the following molecule will undergo cannizaro reaction?

(a) formaldehyde (b) benzaldehyde

(c) p-anisaldehyde (d) all the above

5. Which of the following rearrangement involves the migration of a group to electron deficient oxygen?

(a) Beckmann rearrangement

(b) Dakin reaction

(c) Curtium rearrangement

(d) Benzil – benzilic acid rearrangement

6. The rearrangement of an acylazide to isocyanate is called ————

(a) Beckmann Rearrangement

(b) Curtius rearrangement

(c) Schmidt rearrangement

(d) Lossen rearrangement

12. (a) Explain the acidic character of phenol.

Or

(b) What is knovenagel reaction? Give it's mechanism.

13. (a) What is Dakin reaction? Explain.

Or

(b) State and Explain the mechanism of curtius rearrangement.

14. (a) What is isoprene rule? Explain.

Or

(b) Write the synthesis of nicotine.

15. (a) Discuss the application of IR spectra in functional group detection.

Or

(b) Draw and explain the NMR spectrum of benzyl alcohol.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Give the structure and reactions of glucose.

Or

(b) Write the interconversions of aldoses and ketoses.

17. (a) Write the preparation and uses of Vanillin and Coumarin.

Or

(b) How will you prepare the following compounds?

(i) quinol. (2)

(ii) mandelic acid. (3)

(iii) cinnamic acid. (3)

18. (a) Write the mechanism of any two rearrangements involves the migration of a group to electron electro deficient carbonatom.

Or

(b) Explain the following :

(i) Fries rearrangement. (4)

(ii) Beckmann rearrangement. (4)

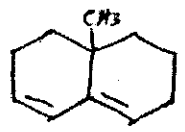
19. (a) Describe the structural elucidation of camphor.

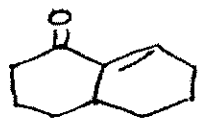
Or

(b) Explain general methods for the determination of structure of alkaloids.

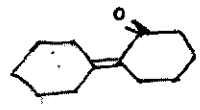
20. (a) Calculate the λ_{max} for the following compounds.

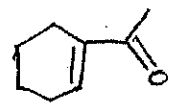
(i) (ii)





(iii) (iv)





Or

(b) (i) How will you distinguish cis and trans isomers using UV spectroscopy? (4)

(ii) Explain the NMR spectrum of acetone. (4)

(6 pages)

Reg. No. : .....

Code No. : 20010 E **Sub. Code : SMCH 62**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022

Sixth Semester

Chemistry — Main

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 is a keto hexose?
   (a) Glucose (b) Fructose
   (c) Sucrose (d) Cellulose

2. Which is an example of Kiliani synthesis?
   (a) Glucose → Arabinose
   (b) Arabinose → Glucose
   (c) Glucose → Fructose
   (d) Fructose → Glucose

3. Terephthalic acid is
   (a) Ortho isomer (b) Para isomer
   (c) Meta isomer (d) None of these

4. Phenol is
   (a) acidic (b) basic
   (c) neutral (d) none of these

5. In which rearrangement benzamide gives aniline?
   (a) Bechmann (b) Curtius
   (c) Hofmann (d) Claisen

6. Baeyer-Villiger oxidation is carried out using _____.
   (a) Mineral acids (b) Picric acid
   (c) Peracids (d) None of these

7. The alkaloid in black pepper is
   (a) Reserpine (b) Nicotine
   (c) Coniine (d) Piperine

8. Which is an acyclic terpenoid?
   (a) Menthol (b) Limonene
   (c) α-Terpineol (d) Citral

9. Which gives only one NMR signal?
   (a) CH_3CH_2OH (b) CH_3COCH_3
   (c) CH_3-CH_2-CH_3 (d) CH_3CH_2Cl

10. TMS is
    (a) Trimethyl silane
    (b) Tetra methyl silane
    (c) Trimethylene siliane
    (d) Tetra methyl sulphur

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 structure of starch.

Or

(b) Classify carbohydrates.

12. (a) Explain the acidic character of phenol and the effect of substituents.

Or

(b) Explain p-benzoquinone mono oxime-p-nitroso phenol tautomerism.

13. (a) Explain benzil-benzilic acid rearrangement with example.

Or

(b) Explain Pinacol-pinacolone rearrangement with example.

14. (a) Elucidate the structure of Coniine.

Or

(b) Elucidate the structure of Citral.

15. (a) Write short notes on chemical shift.

Or

(b) How is IR spectroscopy used to distinguish the types of hydrogen bond?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) (i) How will you convert glucose into fructose?

(ii) How will you convert arabinose into glucose?

Or

[P.T.O.]

(b) (i) Give any four chemical reactions of glucose.

(ii) Explain the hydrolysis reaction of sucrose.

17. (a) (i) Explain Perbin's reaction.

(ii) Explain Benzoin condensation.

Or

(b) Write short notes on

(i) Coumarin

(ii) Vanillin

(iii) Michler's ketone.

18. (a) Explain the following rearrangements :

(i) Bechmann

(ii) Benzidine

Or

(b) Explain the following rearrangements :

(i) Claisen

(ii) Hofmann.

19. (a) (i) Give the synthesis of nicotine.

(ii) Elucidate the structure of dipentene.

Or

(b) Elucidate the structure of piperine.

20. (a) (i) Calculate the λ_{max} for the following compounds :

(ii) What are the reasons for using TMS in NMR spectroscopy?

Or

(b) (i) Explain spin-spin splitting.

(ii) Sketch and explain NMR spectrum of ethyl methyl ketone.

———————

ges)

Reg. No. : .....

ode No. : 30288 E **Sub. Code : SMCH 63**

(CBCS) DEGREE EXAMINATION, APRIL 2022

Sixth Semester

Chemistry — Core

PHYSICAL CHEMISTRY — IV

(For those who joined in July 2017 onwards)

: Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Which of the following will give NMR spectra?

(a) $^{4}_{2}He$ (b) $^{16}_{6}C$

(c) $^{16}_{8}O$ (d) $^{14}_{7}N$

How many number of ESR lines observed for $CH_3^{\bullet}$?

(a) 1 (b) 2

(c) 3 (d) 4

3. $t^{1/2}$ for a zero order reaction is proportional to

(a) a (b) 1/a

(c) $1/a^2$ (d) a^2

4. Unit of first order rate constant is

(a) $mol\,lit^{-1}s^{-1}$ (b) s^{-1}

(c) $lit\,sec^{-1}$ (d) $litmol^{-1}$

5. pH + pOH = ————

(a) 7 (b) 0

(c) 14 (d) 100

6. Which of the following is Lewis acid?

(a) BF_3 (b) NH_3

(c) Cl^{-1} (d) OH^{-1}

7. For one component system the phase rule is ————

(a) F = 3 – P (b) F = 2 – P

(c) F = 1 – P (d) F = 3 + P

The reduced phase rule is

(a) F = C – P + 2 (b) F = C – P – 2

(c) F = C – P + 1 (d) F = C – P – 1

Which of the following is a allotrope of carbon?

(a) C_6H_6 (b) CH_3Cl

(c) fullerene (d) fluorocarbons

———— is a 3D nanostructure.

(a) Nano wire (b) Nanocrystal

(c) Fullerene (d) All the above

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

(a) State and explain mutual exclusion principle.

Or

(b) Write the basic principle of mass spectra.

12. (a) Define and differentiate : Order and molecularity.

Or

(b) Derive the rate constant for first order reaction.

13. (a) What is common ion effect? Give it's applications.

Or

(b) What is buffer solution? Give it's types.

14. (a) Derive the expression of distribution law.

Or

(b) Explain the formation of congruent melting point.

15. (a) Write a note on : Nanocomposites.

Or

(b) Write the sol-gel method for the synthesis of nanoparticles.

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 is chemical shift? (3)

(ii) Explain the factors affecting chemical shift. (5)

Or

(b) Discuss the ESR spectrum of methyl and benzene radicals.

17. (a) Write and explain ARRT.

Or

(b) (i) Explain the effect of temperature on rate constant. (5)

(ii) Define : Rate law. (3)

18. (a) Derive Ostwald's dilution law. Give its experimental verification.

Or

(b) How will you calculate degree of hydrolysis?

19. (a) Define phase rule. Write the thermodynamic derivation of phase rule.

Or

(b) Explain the phase diagram of $FeCl_3$ - water system.

20. (a) Write the synthetic principles of nanoparticles with example.

Or

(b) Explain the following :

(i) Carbon nanotubes

(ii) Metal nanoparticles.

———————

(6 pages)

Reg. No. : .....

Code No. : 20011 E **Sub. Code : SMCH 63**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Sixth 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 :

1. Which of the following will not give NMR spectra?
   (a) $^{1}_{1}H$ (b) $^{12}_{6}C$
   (c) $^{14}_{7}N$ (d) $^{19}_{9}F$

2. ———— is more intensed peak in mass spectra.
   (a) Molecular peak (b) Base peak
   (c) Isotopic peak (d) Hydrogen peak

3. Reaction rates can change with ————
   (a) Temperature
   (b) Catalyst
   (c) Reaction concentration
   (d) All the above

4. The quantity k in a rate law equation
   (a) is dependent of concentration
   (b) is independent of concentration
   (c) is called the arrhenius constant
   (d) is independent of temperature

5. Which of the following is false?
   (a) neutral solution $[H^+] = [OH^-]$
   (b) acidic solution $[H^+] > [OH^-]$
   (c) basic solution $[H^+] < [OH^-]$
   (d) pH scale > 7 for acidic medium

6. ———— is a salt of weak acid strong base.
   (a) NaCl (b) KCl
   (c) CH_3COONa (d) CH_3COONH_4

7. The Gibbs phase rule is ————
   (a) F = C – P + 2 (b) F = C + P + 2
   (c) F = C – P – 2 (d) F = C + P –2

8. A saturated solution of sodium chloride is a ————
   (a) one phase system
   (b) two phase system
   (c) three phase system
   (d) four phase system

9. 10^{-9}m = ----------
   (a) 1 cm (b) 1 nm
   (c) 100 nm (d) 100 cm

10. ———— is called fullerene.
    (a) C – 60 (b) C – 20
    (c) C – 100 (d) C – 12

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 stokes and antistokes lines? Explain.

    Or

    (b) Write an Explain Mc-Lefferty rearrangement.

12. (a) Give the factors affecting rate constant.

    Or

    (b) Compare collision theory with ARRT.

13. (a) What is pH? Explain pH scale.

    Or

    (b) Define the following :
    (i) Common ioneffect. (3)
    (ii) Buffer solution. (2)

14. (a) Explain the phase diagram of water.

    Or

    (b) Write a note on : solvent extraction.

15. (a) What are quantum dots? Give their properties.

    Or

    (b) Explain chemical vapour deposition for the synthesis of nanoparticles.

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 δ and τ scale. (3)

(ii) Write the application of NMR spectra. (5)

Or

(b) (i) Discuss the factors affecting molecular fragmentation. (4)

(ii) Write the differences between IR and Raman spectroscopy. (4)

17. (a) Discuss the characteristics of first and second order reaction with example.

Or

(b) How will you determine order of a reaction?

18. (a) What is K_{sp}? Give its application.

Or

(b) Write a note on :

(i) Lewis concept. (4)

(ii) Ostwald's dilution law. (4)

19. (a) Describe the phase diagram of KI - water system.

Or

(b) Write a note on :

(i) Phase rule. (4)

(ii) Distribution law. (4)

20. (a) Discuss the application of nanoscience and nanotechnology.

Or

(b) Explain the following :

(i) Metal oxide nanoparticles. (4)

(ii) Ceramic nanoparticles. (4)

———————

Pages) **Reg. No. : .....**

Code No. : 30298 E **Sub. Code : SNCH 4 B/ ANCH 42**

B. (CBCS) DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Chemistry

Non Major Elective — APPLIED CHEMISTRY

(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 :

———— salts of higher fatty acids is called soft soaps.

(a) Na (b) K

(c) Ca (d) None of the above

Detergents are

(a) cationic (b) anionic

(c) zwitter ionic (d) all the above

3. ———— helps the early formation of roots, growth and seed formation.

(a) N (b) P

(c) K (d) None of the above

4. The fertilizer that contains maximum percentage of nitrogen is

(a) Ammonium sulphate

(b) KNO_3

(c) Triple super phosphate

(d) None of the above

5. The polymers that can be easily mended by heating is called

(a) Thermo setting polymers

(b) Thermplastics

(c) Elastomers

(d) Fibres

6. Order is obtained from

(a) Polyacrylo nitrile (b) Polythene

(c) PVC (d) Poly styrene

7. Boric acid is used as

(a) Mouthwash (b) Antiacid

(c) Analgesics (d) Antiseptics

Aspirin is a

(a) Antibiotic (b) Analgesics

(c) Laxatines (d) Antispectis

The main constituent of boot polish are

(a) Naptha (b) Wax

(c) Gamarabic (d) All the above

Phenyl is made from

(a) Creosate oil and water

(b) Coconut oil and water

(c) Mineral oil and water

(d) All the above

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

(a) Give the manufacture of toilet soap.

Or

(b) Explain the cleansing action of soap.

(a) Write a note on biofertilizer.

Or

(b) Write a note on mixed fertilizer.

13. (a) Give the differences between thermoplatstic and thermo setting polymer.

Or

(b) Explain the uses of butyl rubber and neoprene.

14. (a) Write a note on tetra cyclines.

Or

(b) What are sedatives and give their uses?

15. (a) Give the preparation and uses of boot polish.

Or

(b) How phenyl and moth balls are prepared?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) What are the advantages of detergents over soaps?

Or

(b) Explain the raw materials used in the manufacture of soap.

17. (a) Explain the role of nitrogen, phosphorus and potassium on plant growth.

Or

(b) How the following are prepared and give their uses. (i) KNO_3 (i) Urea.

18. (a) Write a note on the following (i) Orlon (ii) Nylon 6, 6.

Or

(b) Explain the uses of the following rubber (i) thiocol (ii) poly styrene.

19. (a) Write a note on :

(i) Penicillins

(ii) Laxatines.

Or

(b) Explain about paracetamol and aniacids.

20. (a) How are the following prepared

(i) chalk crayons

(ii) talcum powder.

Or

(b) How are agarbathis and writing inks are prepared?

———————

(6 pages) 13/12/3 A/N

Reg. No. : .....

Code No. : 20021 E **Sub. Code : SNCH 4 B/ ANCH 42**

U.G. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fourth Semester

Chemistry

Non Major Elective: APPLIED CHEMISTRY

(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. The function of a soap is
   (a) Just cleaning the material
   (b) Most effective way to remove the germs
   (c) Just washing and cleaning
   (d) Removing dirt and greese

2. Anionic detergents are
   (a) Cetyl trimethyl ammonium bromide
   (b) Benzalkonium chloride
   (c) Sodium-n-dodecyl benzene sulphonate
   (d) Quaternary ammonium compounds

3. A fertilizer which contains two or more of the elements of nitrogen is called
   (a) Biofertilizers
   (b) Mixed fertilizers
   (c) Urea
   (d) Potassium

4. Which one of the following is used to produce sugar during photosynthesis?
   (a) Nitrogen
   (b) Urea
   (c) Triple super phosphate
   (d) Potash

5. Thermocole is primarily used to manufacture
   (a) Water proof fabric
   (b) Disposable traps
   (c) Non- stick cookware
   (d) Anti friction device

6. Which one of the following is used primarily to coat medical appliances

(a) Rubber

(b) Polyethene

(c) Teflon

(d) Thermocole

7. _____ can helps ease the discomfort of a sore throat

(a) Aluminium hydroxide

(b) Hydrogen peroxide

(c) Diazepam

(d) Epsom salt

8. The substance which neutralising stomach acidity is

(a) Sedatives

(b) Laxatives

(c) Anti acids

(d) Anti septics

9. The product which is used to shine, water proof and appearance

(a) Boot polish

(b) Talcum powder

(c) Tooth paste

(d) Moth balls

10. Which of the following is used to control silver fish and other fisher pests?

(a) Talcum powder

(b) Chalk crayons

(c) Agarbattis

(d) Moth 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 a note on the raw materials used in the manufacture of soap.

Or

(b) Explain advantages of detergent.

12. (a) Describe the role of nitrogen in plant growth.

Or

(b) Explain biofertilizers.

13. (a) List out the applications of fevicol and quick fix.

Or

(b) Discuss the applications of Teflon and thermocole.

14. (a) Write a note on mouth washes.

Or

(b) Discuss on sedatives with an example.

15. (a) List out the applications of tooth powder.

Or

(b) Discuss on the preparation method of writing inks.

PART C — (5 × 8 = 40 marks)

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

16. (a) Discuss on the classification of soaps.

Or

(b) Write a detailed note on the cleansing action of soaps.

17. (a) Describe the role of potassium and phosphorus in plant growth.

Or

(b) Write a note on the following.

(i) Natural fertilizers

(ii) Chemical fertilizers

18. (a) Define rubber and classify with applications.

Or

(b) List out the applications of Bakelite and PVC.

19. (a) Discuss on the following:

(i) Antiseptics

(ii) Antibiotics

Or

(b) Explain:

(i) Laxatives

(ii) Analgesics

20. (a) Explain the preparation method and uses of the following:

(i) Boot polish

(ii) Chalk crayons

Or

(b) Discuss on the preparation method and uses of the following:

(i) Moth Balls

(ii) Agarbattis

———————

Pages)

Reg. No. : .....

ode No. : 30293 E **Sub. Code : SSCH 4 A/ ASCH 41**

Sc. (CBCS) DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Chemistry

kill Based Subject — CHEMISTRY IN MEDICINE

(For those who joined in July 2017 onwards)

ıe : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Which of the following is an antidote for mercury intoxification?

(a) Methadoxine

(b) Maintain the level of hydration

(c) Oxygen therapy

(d) Selenium

Which one of the following is usually detected by measuring glucose level in a blood test?

(a) Asthma (b) Tuberculosis

(c) Diabets (d) Anaemia

Which one of the following is the main causes of hypertension?

(a) Smoking (b) Obesity

(c) Overweight (d) All of the above

Survey is due to the deficiency of

(a) Vitamin C (b) Vitamin E

(c) Vitamin B (d) Vitamin A

Which requires medication to decrease stomach acid production?

(a) bone disease (b) stomach ulcer

(c) skin disease (d) nervous disorder

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

(a) Write a note on first aid kit.

Or

(b) Describe in detail about antidote.

2. Is ice good for poisonous bits?

(a) Yes (b) No

(c) Don't know (d) May be

3. ———— is used as an astringent.

(a) aluminium hydroxide

(b) alum

(c) aluminium

(d) all of the above

4. Iron deficiency anaemia is treated by

(a) ferrous gluconate

(b) aluminium hydroxide

(c) aluminium acetate

(d) sodium hydroxide

5. Quick relief inhalers needed to treat

(a) asthma (b) tuberculosis

(c) nervous disorder (d) typhoid

6. Which causes disfiguring skin sores?

(a) epilepsi (b) reprosy

(c) tuberculosis (d) cholera

12. (a) Explain : Applications of aluminium acetate.

Or

(b) Discuss on biological importance of copper.

13. (a) Explain the treatment for whooping caugh.

Or

(b) Describe the treatment method for peptic ulcer.

14. (a) Explain : determination of glucose in serum.

Or

(b) How will you determine the hemoglobine in blood?

15. (a) Write a note about the sources of vitamins.

Or

(b) Discuss on the treatment for skin diseases.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Describe on various types of common poisons.

Or

(b) Explain the following :

(i) burns

(ii) fainting

(iii) poisonous bits.

17. (a) Write a note on the following :

(i) uses of ferrous fumarate

(ii) biological importance of calcium.

Or

(b) Explain :

(i) Properties and uses of alum

(ii) Biological importance of iodine.

18. (a) Discuss the prevention and treatment of tuberculosis.

Or

(b) Write a detailed note on the prevention and treatment of epilepsy.

19. (a) Explain the following :

(i) Determination of serum cholesterol

(ii) Detection of diabetes.

Or

(b) Discuss on the following :

(i) blood pressure

(ii) hypertension.

20. (a) Write a detailed note on the sources and deficiency diseases of vitamins B2 and B6.

Or

(b) Discuss on the following.

(i) classification of vitamins

(ii) deficiency disease of vitamins.

———————

(6 pages)

Reg. No. : .....

Code No. : 20016 E **Sub. Code : SSCH 4 A/ ASCH 41**

B.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fourth Semester

Chemistry

Skill Based Subject — CHEMISTRY IN MEDICINE

(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 in used to treat bruises?
   (a) ice therapy
   (b) immobilize the bone
   (c) shock treatment
   (d) cast

2. Which one of the following is a kind of treatment for bleeding?
   (a) apply direct pressure on the cut
   (b) make sure for breathing
   (c) immobile the bones
   (d) check pulse frequently

3. An example for an antacids?
   (a) aluminium acetate
   (b) aluminium hydroxide
   (c) ferrous funerate
   (d) aluminium chloride

4. Insect bites will be treated using
   (a) ferrous funerate
   (b) aluminium hydroxide
   (c) aluminium acetate
   (d) aluminium chloride

5. Which of the following is an airborne disease?
   (a) typhoid (b) cholera
   (c) epilepsy (d) diphtheria

6. Killing the H.Pylori bacteria is a treatment for

(a) tuber culosis (b) peptic ulcer

(c) common cold (d) leprosy

7. Which is the rarest blood group?

(a) AB(+) (b) AB(–)

(c) AB (d) A(–)

8. Which one of the following is usually detected measuring hemoglobin?

(a) diabetes (b) anaemia

(c) blood pressure (d) hypertension

9. Which one of the following food mainly contains vitamin B complex?

(a) liver and kidney (b) cod liver oil

(c) dark green (d) spinach

10. What is the deficiency disease of vitamin B complex?

(a) cystic fibrosis (b) anaemia

(c) beriberi (d) premature infants

PART B — (5 × 5 = 25 marks)

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

11. (a) Write a note on the important rules in first aid for accidents.

Or

(b) Explain salicylate poisoning.

12. (a) Explain properties and uses of alum.

Or

(b) Describe biological importance of sodium.

13. (a) Discuss the prevention method for malaria.

Or

(b) Write a note on nervous disorder.

14. (a) Discuss on the composition of blood.

Or

(b) How will you estimate the red blood cells?

15. (a) Write a note on the classifications of vitamins.

Or

(b) Explain treatment for skin diseases.

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 : first air for (i) cuts (ii) bruises (iii) bleeding (iv) fracture.

Or

(b) Explain : alkaloid poisoning and its symptoms.

17. (a) Discuss on the following :

(i) uses of aluminium hydroxide

(ii) uses of dried aluminium hydroxide gel.

Or

(b) Discuss on the following :

(i) Biological importance of potassium

(ii) Uses of ferrous sulphate.

18. (a) Discuss the prevention and treatment of the following :

(i) influenza

(ii) mumps.

Or

(b) Write a note on respiratory disorder.

19. (a) Explain : determination of blood groups and matching.

Or

(b) Discuss on the following :

(i) Estimation of glucose in urine

(ii) Diagnostic test for sugar in urine.

20. (a) Write down the sources and deficiency diseases of vitamins D, E and K.

Or

(b) Discuss the following :

(i) treatment of ulcers

(ii) therapeutic uses.

———————

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Reg. No. : .....

...ode No. : 5365 Sub. Code : PCHM 41

... (CBCS) DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Chemistry — Core

ORGANIC CHEMISTRY — IV

For those who joined in July 2017 onwards)

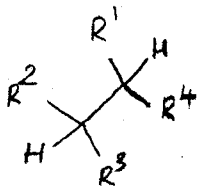
...me : Three hours Maximum : 75 marks

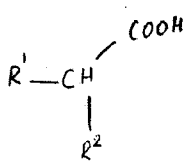
PART A — (10 × 1 = 10 marks)

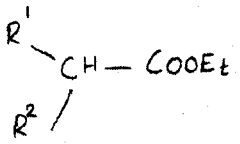
Answer ALL questions.

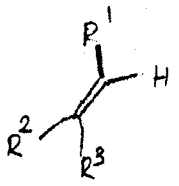
Choose the correct answer :

n Bamford – stevens reaction, the product of the reaction s

(a) 

(b) 

(c) 

(d) 

[n Robinson annulations the following are employed

(a) Aldol condensation

(b) Michael addition

(c) Michael addition and aldol condensation

(d) None of these

Which of the following statements best describes a synthem?

(a) A hypothetical structure that would result in a given reaction if it is existed

(b) A transition state involved in a reaction mechanism

(c) A key intermediate in a reaction sequence

(d) A synthetic reagent used in a reaction

Which one of the following reagent is used in Suzuki coupling?

(a) S_mI_2 (b) P_tO_2

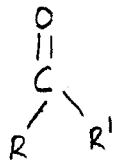
(c) R_uO_2 (d) $Pd(PPh_3)_4$

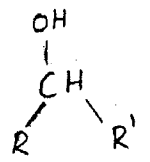
Which one of the following reagent is suitable to convert the mixture of ketone and alkyliodide into tertiary alcohol?

(a) Adam's catalyst (b) Kagan's reagent

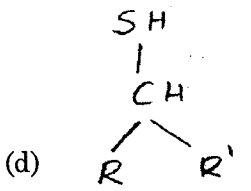
(c) DMSO (d) $Pd(PPh_3)_4$

2. Which among the following compound will give Darzen reaction?

(a) 

(b) 

(c) $R-NH_2$

(d) 

3. 1,2 – dimethyl cyclohexane have several conformations given below which one out this is most stable?

(a) 1, 2 - diaxial

(b) 1, 2 - diequatorial

(c) 1 – axial – 2 – equatorial

(d) 1 – equatorial – 2 - axial

4. Perhydrophenanthrene molecule contains ——— equivalent paris of chiral centres.

(a) 1 (b) 2

(c) 3 (d) 4

9. ——— regulates normal functioning of sex organs in males.

(a) Oestrone (b) Oestriol

(c) Oestradiol (d) Testosterone

10. Which hormone is responsible to control normal ovulation cycle?

(a) Cortisone (b) Progesterone

(c) Testosterone (d) Estrogens

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write a brief account of Shapiro reaction.

Or

(b) Write a short account of McMurray coupling.

12. (a) Briefly explain conformational analysis of decalin.

Or

(b) Explain the conformation of 1, 3 – dimethylcyclohexane.

13. (a) Write briefly on functional group interconversions.

Or

(b) Describe the role of key intermediates in organic synthesis.

14. (a) Discuss any three synthetic applications of Adam's catalyst.

Or

(b) Give an account of still coupling.

15. (a) Describe the conformational structure of coprostane.

Or

(b) Give an account on bile acids.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Write brief notes on :

(i) Acyloin condensation

(ii) Peterson olefination.(4+4)

Or

(b) Explain the following reactions with suitable examples.

(i) Baeyer – villiger oxidation

(ii) Gomberg – pechmann reaction. (4+4)

17. (a) (i) Write briefly on determination of conformational free energy difference.

(ii) Which is the most stable conformation of methylcyclohexane and why?

Or

(b) (i) Discuss the reactions of different conformers of active and meso-2, 3 – dihydroxy butane with acetone.

(ii) Cis-4-t-butylcyclohexanol forms esters more slowly than the trans-isomer. Explain.

18. (a) Applying retrosynthetic analysis, suggest a method of synthesizing the following compounds.

(i) Isonootkatone

(ii) Cis-jasmone.

Or

(b) Describe in detail the uses of activating and blocking groups in organic synthesis.

19. (a) Narrate the uses of osmium tetraoxide and 9-BBN reagents in organic synthesis.

Or

(b) Give an account of synthetic utility of

(i) Alkylborane

(ii) DMSO.

20. (a) How is cholesterol converted into

(i) Progesterone

(ii) 5β – cholanic acid

(iii) Androsterone.

Or

(b) (i) Explain how the position of double bond in cholesterol is determined.

(ii) Outline a method for the conversion of oestrone to oestriol.

———————

(6 pages)

Reg. No. : .....

Code No.: 6057 **Sub. Code: PCHM 41**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022

Fourth Semester

Chemistry – Core

ORGANIC CHEMISTRY – IV

(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. In Shapiro reaction a ———— mechanism is possible.

   (a) carbene (b) anion

   (c) radical (d) ylide

2. In silyl carbanion, negative charge is stabilized by empty ———— orbital of silicon.

   (a) 's' (b) 'd'

   (c) 'f' (d) 'p'

3. The cis isomer of of 1,4 dimethyl cyclo hexanes exists in two ———— conformations.

   (a) e, a (b) a, e

   (c) e e, a a (d) both (a) and (b)

4. Cyclohexane 1, 3 diol has been shown to have the diaxial rather than diequatorial orientation due to ————.

   (a) Intermolecular hydrogen bonding

   (b) Intramolecular hydrogen bonding

   (c) Covalent bonding

   (d) Ionic bonding

5. The synthetic equivalent of synthon $PhCH_2$ ——

   (a) $PhCH_2Cl$ (b) $PhCH_3$

   (c) $PhCH_2MgCl$ (d) PhMgBr

6. Tetra hydro pyranyl is a protecting group for ————.

   (a) amine (b) carbonyl

   (c) alcohol (d) acids

7. DDQ is a powerful ———— agent.

   (a) reducing (b) nitrating

   (c) oxidising (d) Decarboxylating

8. Stille reaction is coupling of two organic groups in the presence of palladium with ————.

   (a) organolithium (b) organosilane

   (c) organomagnesium (d) organostannanes

9. When concentrated sulphuric acid is added to a solution of cholesterol in chloroform a ———— colour is produced in chloroform layer.

   (a) green (b) blue

   (c) red (d) yellow

10. Catalytic hydrogenation of ergosterol produces ————.

    (a) Calciferol (b) Cholesterol

    (c) Stigmasterol (d) Ergostano

PART B — (5 × 5 = 25 marks)

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

11. (a) Explain the mechanism of Stobe reaction.

    Or

    (b) Suggest the mechanism for Wittig reaction and discuss its uses.

12. (a) Outline the conformational analysis of Cis –1, 2, –dimethyl cyclohexane.

    Or

    (b) Axial cyctohexanol is oxidized faster than equatorial cyclohyexanol. Justify your answer.

13. (a) Give an overview of protecting groups used to protect amine compounds.

    Or

    (b) How is Robinson annulation reaction useful in organic synthesis?

14. (a) Summarize the synthetic applications of organosilanes.

    Or

    (b) Explain the preparation and applications of DDQ.

[P.T.O.]

15. (a) How is oestrone converted to oestriol.

Or

(b) Suggest a method to prepare 5α-cholanic acid from cholesterol.

PART C — (5 × 8 = 40 marks)

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

16. (a) Discuss the mechanism of Julia olefination and acyloin condensation.

Or

(b) Suggest the mechanism for Mc Murray coupling and Pschorr reactions.

17. (a) Establish the conformational analysis of decalin.

Or

(b) Discuss Curtin Hammett principle.

18. (a) Compose the retrosynthetic analysis of Cis-Jasmone and designed synthesis.

Or

(b) Discuss functional group inter conversion with suitable examples.

19. (a) Compile the synthetic applications of samarium in organic synthesis.

Or

(b) Describe the preparation and synthetic applications of Adams catalyst.

20. (a) How do you establish the following in the structure of cholesterol?

(i) position of the side chain

(ii) position of the angular methyl group

Or

(b) Elaborate on the general study of bile acids.

———————

ıges) **Reg. No. :** .....

ode No. : 5366 **Sub. Code : PCHM 42**

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2022.

Fourth Semester

Chemistry – Core

INORGANIC CHEMISTRY – IV

(For those who joined in July 2017 onwards)

ıe : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

A γ-ray having 14.4 keV energy is moving towards a sample at 30° angle with Doppler velocity 2 cms^{-1}. What is the Doppler energy?

(a) 3.1×10^{-6} eV

(b) 4.2×10^{-7} eV

(c) 9.6×10^{-7} eV

(d) 1.4×10^{-8} eV

2. If Mossbauer spectrum of $Fe(CO)_5$ is recorded in the presence of a magnetic field, the original spectrum with two lines changes into the one with:

(a) Three Lines (b) Four Lines

(c) Five Lines (d) Six Lines

3. If the molecular ion produced by photo-ejection process predissociates, what is the consequence in the photoelectron spectrum?

(a) Photoelectron spectrum will have double or triple maxima

(b) Part of the vibrational fine structure of the spectrum will be lost

(c) Photoelectron spectrum will have appreciable vibrational fine structure

(d) None of the above

4. In the PES of Argon gas two closely spaced lines are obtained in a roughly 2:1 ratio. Why?

(a) Two transitions are possible from the ground to excited states

(b) The degeneracy of the $^2P_{3/2}$ state is four and for the $^2P_{1/2}$ state is two

(c) Spin-orbit coupling

(d) All of the above

The metallobiomolecules contain generally metals ›f first transition series. Why?

a) The other transition metals metal ions are too large and cannot fit into the hole in the ring system and sits above the ring.

b) The sizes of first row transition metals are exactly right to fit in the holes of metallophorphyrin ring systems

c) The metal-Nitrogen bond length is around 200 pm

d) All of the above

The binding of one oxygen molecule influences the ›inding of successive molecules in hemoglobin, is 'eferred to as a ————.

a) Homotropic allosteric interaction

b) Heterotropic allosteric interaction

c) Root effect

d) Haldane effect

Which of the following is used in reversible ›inding of dioxygen?

a) Hemocyanin

b) Hemerythrin

c) Hemoglobin

d) All of these

8. Wilson's disease involves a hereditary dysfunction of the primary copper storage capability of the body, in the protein ————.

(a) laccase

(b) ascorbate oxidase

(c) ceruloplasmin

(d) none of these

9. Which of the following methods is used to prepare optical fibers?

(a) Hydrothermal method

(b) Sol-gel method

(c) High temperature ceramic method

(d) Epitaxy method

10. In the preparation of TaS_2 by chemical vapour transport method (CVT), the CVT agent used is

(a) S^{2-} (b) I_2

(c) NO_3^- (d) Cl_2

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) How is Mossbauer spectroscopy used in the structural elucidation of $[FeCl_2(H_2O)_4]Cl.2H_2O$ and $Fe(H_2O)_6]SO_4.H_2O$.

Or

(b) Describe the applications of Mossbauer spectroscopy in any two bioinorganic systems

12. (a) Explain chemical shift in XPS with example. Mention different factors affecting it.

Or

(b) Describe the applications of NQR spectroscopy in determining the ionic character of a bond.

13. (a) Discuss the Bohr effect and cooperativity for the oxygenation of hemoglobin.

Or

(b) What is meant by iron-sulphur proteins? Discuss briefly on ferridoxins and rubredoxins.

14. (a) Discuss the mode of action of carboxypeptidase A in the hydrolysis of an amide linkage in a polypeptide.

Or

(b) How are the following chelating agents can be used therapeutically?

(i) D-penicillamine and

(ii) cis-diamminedichloroplatinum (II).

15. (a) What are zeolites? Explain the structure and properties of zeolites.

Or

(b) Write a note on pillared clays.

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 applications of Mossbauer spectroscopy in determination of (i) spin state crossover (SCO) and (ii) cis-Trans isomers.

Or

(b) Explain the following with reference to Mossbauer spectroscopy:

(i) Isomer shift

(ii) Quadrupole splitting and

(iii) Magnetic splitting.

17. (a) What is Koopmans's Theorem? What are its drawbacks? Explain with an example.

Or

(b) Discuss the XPS of the following molecules:

(i) N(ls) XPS of $[Co(en)_2(NO)_2]NO_3$

(ii) C(ls) XPS of CCl_3CH_3

(iii) C(ls) XPS of $C_2H_5COOCF_3$ and

(iv) N(ls) XPS of NaN_3.

18. (a) What are nitrogenases? Explain the structural features of the active site in nitrogenase.

Or

(b) What are metalloporphyrins? Explain the structure and functions of hemoglobin and myoglobin.

19. (a) (i) Describe the inhibition and poisoning of enzyme with suitable examples.

(ii) What are biological effects of copper deficiency and copper accumulation in the body?

Or

(b) Discuss the structure and role of superoxide dismutase.

20. (a) Discuss the intercalation compounds of graphite and transition metal disulphides.

Or

(b) Explain the chemical precipitation. solution. sol-gel and hydrothermal methods for the synthesis of inorganic materials with suitable examples.

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(6 pages) Reg. No. : _____

Code No. : 6058 **Sub. Code : PCHM 42**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022

Fourth Semester

Chemistry – Core

INORGANIC CHEMISTRY – IV

(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. _____ is the shift on atomic spectral lines and gamma spectral lines, which occurs as a consequence of replacement of one nuclear isomer by another.
   (a) Chemical shift
   (b) Red shift
   (c) Blue shift
   (d) Isomer shift

2. Mossbauer spectroscopy arises due to the transition of _____
   (a) Vibrational (b) Nuclear spin
   (c) Rotational (d) Electronic spin

3. Which of the following is also known as X-ray photoelectron spectroscopy?
   (a) Electron spectroscopy for chemical analysis
   (b) Auger electron spectroscopy
   (c) Both (a) and (b)
   (d) Electron impact spectroscopy

4. _____ spectroscopy is a branch of magnetic resonance spectroscopy and is concerned with the absorption of radio waves by matter in zero magnetic field.
   (a) NMR (b) EPR
   (c) NQR (d) Raman

5. Ferritin and transferrin are _____.
   (a) hydrolyses
   (b) metal storage and structural proteins
   (c) electron carriers
   (d) metal sensors

6. The function of myoglobin is _____.
   (a) Storage of CO_2 (b) Storage of CO
   (c) Storage of O_2 (d) Storage of NO

7. In oxygen transport element which is important?
   (a) Fe and Cu (b) Fe and CO
   (c) Fe and Mg (d) Fe and Mn

8. _____ is an enzyme that helps break down potentially harmful oxygen molecules in cells.
   (a) Superoxide dismutase
   (b) Carboxypeptidase
   (c) Carbonic anhydrase
   (d) Xanthine oxidase

9. Zirconia is a hard brittle _____.
   (a) Metal (b) Non-metal
   (c) Ceramics (d) Composite

10. How many tubes of graphite do single-walled nanotubes consist of?
    (a) Two (b) One
    (c) Three (d) Multi

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 quadrupole effect of magnetic field on Mossbauer spectra.

    Or

    (b) How will you determine the absolute configuration of complexes?

12. (a) Write the principle and applications of Auger Electron spectroscopy.

    Or

    (b) Write the Koopman's theorem. Explain with an example.

13. (a) Explain the structure and function of chlorophyll.

    Or

    (b) Write the role of metal ions in biological systems.

14. (a) Write a brief note on superoxide dismutase.

    Or

    (b) Describe the role of the Carbonic anhydrase in biological systems.

15. (a) What are zeolites? Give is structure and properties.

Or

(b) Write a comprehensive note on graphite compounds.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) What do you meant by isomer shift? Discuss the Mossbauer spectra of iron (Sn) compounds.

Or

(b) Discuss the hyperfine splitting in Mossbauer spectra.

17. (a) Write a note on adiabatic and vertical ionisation.

Or

(b) Discuss the basic principles and applications of nuclear quadrupole resonance spectroscopy (NQR).

18. (a) Write a note on Perutz mechanism.

Or

(b) Write a comprehensive note on Ferredoxins and rubredoxins.

19. (a) Give a brief account on copper proteins.

Or

(b) Discuss the role of metallothioneins in bioinorganic chemistry.

20. (a) Brief about the fullerenes in supramolecular chemistry.

Or

(b) How will you synthesis Nanoparticles using sol-gel method and hydrothermal methods?

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Reg. No. : .....

...de No.: 5367 Sub. Code: PCHM 43

M.Sc. (CBCS) DEGREE EXAMINATION, APRIL 2022

Fourth Semester

Chemistry – Core

PHYSICAL CHEMISTRY IV

For those who joined in July 2017 onwards)

Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

...hoose the correct answer :

...What is the relation between restoring force, f to ...he displacement q in Hooke's law?

...a) $f = -kq$ (b) $f = kq$

...c) $f = -kq^2$ (d) $f = kq^2$

...Which of the following molecule have infrared ...ctive vibrations?

...a) NO (b) CH_4

...c) H_2 (d) All

...hosgene is

...a) $COCl_2$ (b) PH_3

...c) H_3PO_3 (d) H_3PO_4

...dsorption of acetic acid on charcoal is an example ...or

...a) Absorption (b) Physisorption

...c) Chemisorption (d) Both (b) and (c)

...urface area can be determined by

...a) Gibb's adsorption equation

...b) BET equation

...c) Freundlich adsorption equation

...d) Temkin equation

PART B — (5 × 5 = 25 marks)

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

...a) What are hot bands? Why are they called so?

Or

...b) Explain the effect of an harmonicity on the vibrational spectra of diatomic molecules.

3. In Raman spectroscopy, energy of change comes from

(a) Photon (b) Electron

(c) Ion (d) Molecule

4. Which of these properties must change for a mode to be Raman active?

(a) Volume (b) Polarisibility

(c) Momentum (d) Dipole moment

5. The factor introduced to make collision theory a more generalized one is called

(a) Steric Factor (b) Hammett Factor

(c) Collision Factor (d) Arrhenius Factor

6. According to Collision theory, particles must

(a) Collide every where

(b) Collide with correct orientation

(c) Have low energy

(d) Low collision Frequency

7. Effect of ionic strength is

(a) Ionic effect (b) Electrophoretic effect

(c) Salt effect (d) Solvent effect

12. (a) Explain the mutual exclusion principle with example.

Or

(b) What are the advantages of Raman spectroscopy over IR?

13. (a) Discuss Pulse radiolysis method to study Fast reactions.

Or

(b) How will you study fast reaction by temperature jump method?

14. (a) Discuss the Influence of ionic strength on the rates of ionic reactions.

Or

(b) Account for the first and second explosion limits in H_2-O_2 reaction.

15. (a) Write the differences between Physical adsorption and chemical adsorption.

Or

(b) Write a brief notes on heterogeneous catalysis.

PART C — (5 × 8 = 40 marks)

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

16. (a) Explain Harmonic oscillator method of vibrational spectroscopy.

Or

(b) How many normal modes of vibrations are possible for the following molecules?

(i) HBr

(ii) O_2

(iii) OCS (linear)

(iv) SO_2 (bent)

17. (a) Explain the quantum theory of Raman spectroscopy.

Or

(b) Discuss the classical theory and applications of Raman spectroscopy.

18. (a) Discuss Flow methods used to study the Fast reactions.

Or

(b) State the limitations of Langmuir theory of unimolecular reaction and discuss Hinshelwood theory of unimolecular reaction.

19. (a) Discuss the influence of solvents on ion-ion reaction.

Or

(b) Using the Rice-Herzfeld mechanism for the formation of HBr in the reaction $H_2 + Br_2 \rightarrow 2HBr$, and steady state treatment for [H] and [Br], derive the rate law and expression for the formation of HBr.

20. (a) Discuss Gibb's adsorption isotherm.

Or

(b) Discuss Michaelis-Menton Kineics.

———————

(7 pages) Reg. No. : .....

Code No. : 6059 **Sub. Code : PCHM 43**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Fourth Semester

Chemistry – Core

PHYSICAL CHEMISTRY – IV

(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. On which factors the vibrational stretching frequency of diatomic molecule depend?

(a) Force constant (b) Atomic Population

(c) Temperature (d) Magnetic Field

2. Which of the following molecules will not exhibit an infrared spectrum?

(a) CO_2 (b) N_2

(c) Benzene (d) $H-C\equiv C-H$

3. In Raman spectrum, if λ is the wavelength of incident radiation, then the Anti-Stoke's lines will have wavelength equal to

(a) λ (b) $\lambda + \Delta\lambda$

(c) $\lambda - \Delta\lambda$ (d) λ^2

4. Which of these properties must change for a mode to be Raman active?

(a) Volume (b) Polaisibility

(c) Momentum (d) Dipole moment

5. Flash photolysis can be used to study free radicals with concentration

(a) 10^{-1}M (b) 10^{-2}M

(c) 10^{-3}M (d) 10^{-6}M

6. The minimum additional energy, above the internal energy, which the reacting molecule must possess so that their collision results in a reaction is known as

(a) Threshold energy

(b) Average Potential Energy

(c) Average Kinetic Energy

(d) Activation Energy

7. Explosive reactions are the type of

(a) Fast reactions (b) Chain reactions

(c) Slow reactions (d) Surface reactions

8. Effect of ionic strength is

(a) Ionic effect (b) Electrophoretic effect

(c) Salt effect (d) Solvent effect

9. The magnitude of chemisorptions increases with ———— temperature

(a) Rise in (b) Decrease in

(c) Constant (d) Low

10. The transition of ions to micelle is

(a) Reversible (b) Irreversible

(c) Both (a) and (b) (d) Neither (a) nor (b)

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Homonuclear diatomic molecules do not show vibrational spectra. Explain why?

Or

(b) Explain Born-Oppenheimer approximation.

12. (a) State selection rules for Raman spectra. Consider the molecular vibrations of carbon dioxide and determine Raman active vibrational modes.

Or

(b) Why are the anti-stokes lines less intense than stokes lines in Raman spectrum? Explain how the laser source of exciting radiation helped in Raman spectroscopy.

13. (a) Discuss the simple collision theory.

Or

(b) Explain briefly the salient features of RRKM theory of unimolecular reactions.

14. (a) Give the significance of volume of activation.

Or

(b) Write notes on Hammett equation. Mention it's significance.

15. (a) Derive Langmuir isotherm equation.

Or

(b) How is the surface area of a catalyst determined by employing B.E.T. adsorption equation?

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 terms :
(i) Overtones
(ii) Combination of bands
(iii) Selection rules for IR spectra
(iv) Born-Oppenheimer approximation.

Or

(b) How many normal modes of vibration are possible for the following molecules?
(i) BCl_3
(ii) $HC \equiv CH$
(iii) CH_3I
(iv) C_6H_6.

17. (a) Explain :
(i) Q-switching
(ii) Types of Lasers.

Or

(b) Discuss the applications of IR and Raman spectroscopy.

18. (a) Discuss the salient features of ARR theory and write it's thermodynamic formulation.

Or

(b) How will you explain Nuclear Magnetic Resonance method for the study of Fast reactions?

19. (a) Explain the factors influencing reaction rates in solution.

Or

(b) Discuss the influence of pressure on explosion in the reaction between H_2 and O_2.

20. (a) Derive B.E.T. adsorption isotherm.

Or

(b) (i) Explain Bronsted catalysis law.
(ii) Explain the kinetics and mechanism of acid-base catalysis reaction.

(7 pages) Reg. No. : .....

Code No. : 6398 **Sub. Code : ZCHE 11**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Green chemistry is also called as _____.

   (a) Life chemistry

   (b) Environmental chemistry

   (c) Organic chemistry

   (d) Sustainable chemistry

2. 'E' Factor is _____

   (a) Mass ratio of waste to desired product

   (b) Ratio of molecular weight of desired product and molecular weights of all substances produced in the stoichiometric equation

   (c) Percentage of all the materials used in the preparation

   (d) Total mass used in a process divided by the mass of product

3. "Zeolite" is the broad term used to describe a family of minerals called _____

   (a) Tri silicates (b) Tectosilicates

   (c) Tetrasilicates (d) Pentasilicates

4. Greener catalysis means

   (a) Moving away from stoichiometric processes to homogenous and heterogeneous catalytic reactions using organic, organometallic, inorganic and biological catalysts

   (b) Developing chemicals that are recyclable

   (c) Design chemical products and processes that work most efficiently

   (d) Reduced costs associated with waste treatment and disposal

5. An ideal solvent facilitates the _____

(a) Mass transfer (b) Dissolving property

(c) Combustion (d) Titration

6. Which of the following is the greenest solvent?

(a) Formaldehyde (b) Benzene

(c) Ethanol (d) Water

7. Microwave assisted reaction operates at a frequency of _____

(a) 3 GHz (b) 2.45 GHz

(c) 2 MHz (d) 3 MHz

8. In microwave Assisted Hofmann Elimination quaternary ammonium salts are heated at

(a) High temperature and the yield of the Hofmann elimination product is low

(b) Low temperature and the yield of the Hofmann elimination product is high

(c) High temperature and the yield of the Hofmann elimination product is high

(d) Low temperature and the yield of the Hofmann elimination product is low

9. A Solar cell is an electrical device that converts the energy of light directly into electricity by the

(a) Photovoltaic effect

(b) Chemical effect

(c) Atmospheric effect

(d) Physical effect

10. The main composition of biogas is _____

(a) Nitrogen (b) Carbon dioxide

(c) Methane (d) Hydrogen

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) (i) Explain atom economy.

(ii) Write a brief notes on waste minimisation.

Or

(b) (i) What is reaction mass efficiency?

(ii) Define Mass intensity.

12. (a) (i) Which catalyst is used in green chemistry?

(ii) What are the three types of catalyst? Give example for each type.

Or

(b) Write notes on alternate energy sources to conventional energy sources.

13. (a) (i) What is super cooled water?

(ii) Write and explain a green reaction done with super cooled water.

Or

(b) Write notes on tunable and switchable solvent systems

14. (a) Write Photochemical ring closure of dienes and explain mechanism.

Or

(b) Explain the merits and demerits of microwave techniques.

15. (a) What are the top five sources of renewable energy?

Or

(b) Discuss the applications and limitations of geothermal Power.

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 Principles of Green Chemistry.

Or

(b) Discuss the steps for reduction of non-renewable raw materials usage.

17. (a) Discuss Bio-catalysis.

Or

(b) Write notes on Phase-transfer catalysis and its advantage.

18. (a) Discuss any Four chemical reactions done with green solvents.

Or

(b) Discuss the applications of ionic liquids as catalysts and solvents.

19. (a) (i) Write notes on Microwave assisted Hoffman elimination and Heck reactions.

(ii) Explain Microwave solvent free deacetylation and saponification of ester reactions.

Or

(b) (i) What do you mean by sonochemistiy?

(ii) Discuss the Principle of sonochemistry.

(iii) Write notes on ultra sound assisted Simmons-Smith reaction.

20. (a) Explain the Principle, types and applications of solar cells.

Or

(b) Write note on

(i) Hydroelectic Power

(ii) Biomass

(iii) Wind Power and

(iv) Geothermal Power

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Reg. No. : .....

le No. : 5694 **Sub. Code : ZCHE 21**

c. (CBCS) DEGREE EXAMINATION, APRIL 2022

Second Semester

Chemistry

Elective — NANOSCIENCE AND NANOTECHNOLOGY

(For those who joined in July 2021 onwards)

: Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Who coined the word nanotechology?

(a) Richard Smally (b) Sumio Tijima

(c) Eric Drexler (d) Richard Feymann

What type of nanomaterials has antioxidant properties?

a) Nanowires (b) Fullerenes

c) Nanotubes (d) Buckyballs

Carbon nanotubes are also called as ————

a) Bulky tubes (b) Bucky tubes

) Bulk tubes (d) Bulk balls

ne of the main interests for the research of anobots in ————

) Medicine

) Astronomy

Marine engineering

) Coastal studies

ano sized polymers built from branched units are led ————

Dendrimers

Composites

Carbon-based materials

Metal-based materials

2. A material with two of three-dimension are in nano range and third dimension is large is known as ————

(a) Quantum wire (b) Micro material

(c) Quantum well (d) Macro material

3. Which gas serves as buffer gas in Laser ablation?

(a) Nitrogen (b) Oxygen

(c) Helium (d) Neon

4. Which of the following is an example of Bottom-Up approach?

(a) Attrition (b) Etching

(c) Miling (d) Colloidal disperson

5. Which of the following does not combine with fiber to give composites?

(a) Metals (b) Ceramics

(c) Non-metals (d) Polymers

6. Novel bio-nanocomposites containing a ————

(a) Metal

(b) Non-metal

(c) Biodegradable polymer

(d) Alloys

PART B — (5 × 5 = 25 marks)

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

11. (a) Describe the one-dimensional type of nanocrystals.

Or

(b) Give a comprehensive note on Nanowires.

12. (a) Give the synthesize of nanomaterials using laser ablation method.

Or

(b) Describe the nucleation process.

13. (a) Give the classification of nanocomposites.

Or

(b) Write a comprehensive note on polymer-based nanocomposites.

14. (a) What are carbon nanotubes?

Or

(b) How will you synthesize graphene by chemical varpour deposition method?

15. (a) Write comprehensive note on nanomedicines.

Or

(b) What is tissue engineering? Explain.

PART C — (5 × 8 = 40 marks)

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

16. (a) Discuss the Three-Dimensional type of nanocrystals.

Or

(b) Explain the surface energy and surface tension in nano-materials.

17. (a) Discuss the bottom-up and top-down approaches in nanoparticle systhesis.

Or

(b) Give the synthesis of nanoparticles by physical vapour deposition (PVD) method.

18. (a) Discuss the polymer-based nanocomposites.

Or

(b) Discuss the polybutylene terephthalate (PBT) based nanocomposites.

19. (a) Discuss the structure of carbon nanotubes (CNT).

Or

(b) Give a brief account on fullerenes.

20. (a) Brief in detail about the nanorobots.

Or

(b) Discuss the nanorobots in cancer treatment and in gene therapy.

———————

(6 pages)

Reg. No. : .....

Code No. : 6404 **Sub. Code : ZCHE 21**

M.Sc.(CBCS) DEGREE EXAMINATION, NOVEMBER 2022

Second Semester

Chemistry

Elective– NANO SCIENCE AND NANOTECHNOLOGY

(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 property of nanoparticles provides a driving force the diffusion?
   (a) Optical Properties
   (b) High surface area to volume ratio
   (c) Sintering
   (d) There is no such property

2. Quantum dots can be used in ————————.
   (a) Crystallography (b) Optoelectronics
   (c) Mechanics (d) Quantum physics

3. What are the approaches used in making nanosystems?
   (a) Top-down (b) Bottom-up
   (c) Neither (a) nor (b) (d) Both (a) and (b)

4. The art and science of etching, writing or printing at the microscopic level in the order of nanometer is ————————
   (a) NEMS (b) Nanofabrication
   (c) Nanopaltcinins (d) Nanolithography

5. Expand PNCS.
   (a) Poly Nanocomposites
   (b) Polymer Nanocomposites
   (c) Polymer Nanocompounds
   (d) Polymer Nylon compounds

6. What are the advantages of nano-composite packages?
   (a) Lighter and biodegradable
   (b) Enhanced thermal stability, conductivity and mechanical strength
   (c) Gas barrier properties
   (d) All of the above

7. A water-cooled surface is used in the process to collect ————————.

(a) Nanoparticles (b) Nanotubes

(c) Nanospheres (d) Nanosheets

8. Fullerences are soluble in ————————.

(a) Water (b) Aromatics

(c) Carbon disulfide (d) Both (b) and (c)

9. 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

10. Branched polymers are ————————.

(a) SPIONS

(b) Liposomes

(c) Dendrimers

(d) Block copolymers in the next unmanned mission to Mars.

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 definitions of nanoparticles.

Or

(b) Write a comprehensive note on Nanowire.

12. (a) Give the synthesis of nanoparticles by physical vapour deposition (PVD) method.

Or

(b) Explain the bottom-up and top-down approaches in nanoparticle synthesis.

13. (a) Give the classification of Nanocomposites.

Or

(b) Write a comprehensive note on polymer-based nanocomposites.

14. (a) Write note on the reduction of graphere oxide.

Or

(b) Write a brief note on Graphene nanoribbon (GNRs).

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

Or

(b) Substantiate nanomedicine in diagnosis of diseases.

PART C — (5 × 8 = 40 marks)

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

16. (a) Narrate the size of building blocks of nanostructures.

Or

(b) Explain the surface ratio in nano-materials.

17. (a) Give the synthesize of nanomaterials using Laser Ablation and Chemical Vapour Deposition Methods.

Or

(b) Write note on the synthesis of nanoparticles by biological methods.

18. (a) Give a brief account on Nanocomposites.

Or

(b) Discuss the Polymer based Nanocomposites.

19. (a) Give a brief account on Functionalized graphene polymer nanocomposites (FPNs).

Or

(b) Give a brief account on fullerenes.

20. (a) Highlight the recent developments in modern cancer chemotherapy?

Or

(b) Discuss the materials used in tissue engineering.

———————

(6 pages) **Reg. No. :** .....

Code No. : 6395 **Sub. Code : ZCHM 11**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022

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 :

1. The IUPAC name of  is

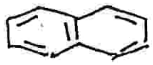
   (a) Bicyclo [0.1.2] pentane

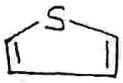
   (b) Bicyclo [1.0.2] pentane

   (c) Bicyclo [1.0.1] pentane

   (d) Bicyclo [2.1.0] pentane

2. Which of the following compounds is not aromatic?

   (a)  (b) 

   (c)  (d) 

3. What should be the free energy so that reaction is spontaneous?

   (a) Positive

   (b) Negative

   (c) Neutral

   (d) none of the mentioned

4. In Hammett constituent constant σ_p is negative for substituted benzoic acid is ——— then benzoic acid itself.

   (a) more acidic (b) neutral

   (c) more basic (d) less acidic

5. Carbenes are trapped as

   (a) Cyclopropane derivative

   (b) Oxidative product

   (c) Diels Alder reaction

   (d) Hydroxylamine derivative

6. By which of the following techniques, free radicals can be detected

(a) UV (b) NMR

(c) IR (d) ESR

7. In the E1 mechanism, the leaving group leaves first to generate a ———

(a) Free radical (b) Carbene

(c) Carbocation (d) Carbanion

8. E1cB elimination reaction occurs under ——— conditions.

(a) Neutral (b) Basic

(c) Less acidic (d) More acidic

9. The best medium for Mannich reaction is ———

(a) Acidic (b) Aqueous

(c) Basic (d) Organic

10. Why is sodium borohydride an important reagent in reducing a ketone?

(a) It is good for hydrolysis type reactions

(b) It is a good source of the hydride ion (H^-)

(c) It can act as a base

(d) It can act as a free radical initiator

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Narrate the aromaticity of annulenes.

Or

(b) Discuss the homo and anti-aromaticity in 2π and 8π electron systems.

12. (a) Write a brief account on Yukawa – Tsuno equation.

Or

(b) Write a note on Grunwald – Winstein equation.

13. (a) What are singlet and triplet carbenes? How do react with alkenes?

Or

(b) Discuss the formation and stability of free radicals.

14. (a) Explain the role of neighbouring group participation with examples.

Or

(b) How does nucleophilic substitution take place at vinylic carbon? Illustrate with examples.

15. (a) How is benzyne intermediate generated? Write two of its important properties.

Or

(b) Write briefly on Michael addition.

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 structure and synthesis of congressane.

Or

(b) (i) Explain the structure of azulene.

(ii) How can adamantane be synthesized?

(iii) How are sydnones synthesized?

17. (a) (i) State and explain the principle of microscopic reversibility.

(ii) How are cross-over experiments useful in determining reaction mechanism?

Or

(b) (i) With an example show how isotopic labelling can be used to ascertain the mechanism.

(ii) Why is Hammett equation a linear free energy relationship?

18. (a) (i) What is Hofmann-Loffler reaction? Discuss its mechanism.

(ii) Narrate the stability of carbenes.

Or

(b) Give in detail the methods of generations and reactions of nitrene.

19. (a) Explain the mechanism and stereo chemistry of E2 reaction.

Or

(b) (i) What are Saytzeff and Hoffmann orientations? Explain with examples.

(ii) Write a note on ambident nucleophile.

20. (a) Discuss in detail the mechanism of ortho-lithiation reaction and its applications.

Or

(b) Briefly discuss the following :

(i) Brich reduction

(ii) Wittig reaction.

———————

(7 pages)

Reg. No. : .....

Code No. : 6396 **Sub. Code : ZCHM 12**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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 :

1. Dipole – dipole forces are stronger than ———— and weaker than ———— interactions
   (a) Ion – ion, London
   (b) London, ion - ion
   (c) Ion – ion, dispersion
   (d) Dipole – induced dipole, London

2. Due to the repulsive forces the potential energy of the system is ————
   (a) increased
   (b) decreased
   (c) increased and decreased
   (d) none of these

3. Carbon monoxide has ten bonding electrons and four antibonding electrons. Therefore it has a bond order of ————
   (a) 2 (b) 3
   (c) 7 (d) 1

4. Which one of the following is not paramagnetic?
   (a) O_2^- (b) CO
   (c) N_2^+ (d) NO

5. Which of the following compound is most acidic?
   (a) B_2O_3 (b) SO_3
   (c) P_4O_{10} (d) Cl_2O_7

6. Which of the following is non-aqueous solvent?
   (a) CCl_4 (b) Ether
   (c) Benzene (d) All of these

7. In which of the following process are neutrons emitted?

(a) Nuclear fusion (b) Nuclear fission

(c) Spontaneous fission (d) Inverse beta decay

8. A compound containing some amount of radio isotope is ————————

(a) Radio active compound

(b) Tracer

(c) Non-radioactive

(d) Linear active compound

9. Which of the following compound exists in liquid state?

(a) Borane (b) Decaborane

(c) Pentaborane (d) Diborane

10. Which element exhibits the highest catenation property?

(a) Bismuth (b) Antimony

(c) Phosphorus (d) Nitrogen

PART B — (5 × 5 = 25 marks)

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

11. (a) Give a concise account on the applications of Slater rules.

Or

(b) Give a brief account on the factors affecting redox potential.

12. (a) Draw the molecular orbital energy level diagram for BeH_2 molecule.

Or

(b) What advantages does the VSEPR model of chemical bonding have compared with Lewis formulas?

13. (a) Write short note on symbiosis.

Or

(b) Give an account of the general characteristics of solvents.

14. (a) Describe the atomic power project in India.

Or

(b) Write notes on heavy ion reactions.

15. (a) What are inorganic metal clusters? Explain the bonding in dinuclear clusters.

Or

(b) (i) Define Wade's rule.

(ii) What are isopoly and heteropoly acids?

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) Anomalous ionization potential

(ii) Instantaneous dipole – induced dipole interactions.

Or

(b) (i) Write briefly on the factors affecting electron affinity.

(ii) Narrate the hydrogen bonding and its types.

17. (a) (i) Write an account of Born-Haber cycle with an appropriate example.

(ii) What do you understand by apicophilicity?

Or

(b) (i) List the rule for the linear combination of atomic orbitals method.

(ii) Explain the stereochemistry of hybrid orbitals.

18. (a) (i) Narrate the classification of protic and aprotic solvents.

(ii) What do you understand by solvation effects?

(iii) State HSAB principle.

Or

(b) Give an account of the following reactions in liquid NH_3.

(i) Ammonation reactions

(ii) Ammonolytic reactions

(iii) Metatheses reactions.

19. (a) Define the term nuclear cross section. What are the unit? How is the nuclear cross section for a particular reaction determined?

Or

(b) (i) Discuss the applications of radioactive isotopes in neutron absorptionmetry.

(ii) What do you mean by threshold energy?

20. (a) (i) Describe the structure and bonding in boranes.

(ii) Give the types of catenation with examples.

Or

(b) (i) Discuss the structure of 12-heteropoly anion, $[P\,(Mo_3O_{10})_4]^{3-}$.

(ii) Explain the structure phosphazenes.

(6 pages) **Reg. No. :** .....

Code No. : 6397 **Sub. Code : ZCHM 13**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Schrodinger equation is a ————————.

   (a) 1st order differential equation

   (b) Second order differential equation

   (c) Both (a) and (b)

   (d) None of these

2. Hamiltonian is given by

   (a) sum of K.E. and P.E.

   (b) Difference of K.E. and P.E.

   (c) Product of K.E. and P.E.

   (d) Square root of K.E. and P.E.

3. In one dimensional problem the energy levels of a bound state system are

   (a) Discrete

   (b) Degenerate

   (c) Non degenerate

   (d) Discrete and non degenerate

4. Who discovered the one-dimensional wave function?

   (a) Isaac Newton (b) Robert Boyle

   (c) Joseph Fourier (d) Jean d'Alembert

5. For what number of zeros, the approximation is poor?

   (a) 1 (b) 2

   (c) 3 (d) 4

6. Variational parameters are adjusted until the energy of the ———— wave function is minimized.

(a) Atomic (b) Molecular

(c) Ionic (d) Trial

7. Which of the following molecule shows rotational spectra?

(a) N_2 (b) H_2

(c) CO_2 (d) Co

8. Which of the following is called heat radiation?

(a) Infrared radiation

(b) Microwave

(c) Gamma rays

(d) X-rays

9. Overtones are mainly observed in ————.

(a) Far IR (b) Mid IR

(c) Near IR (d) Not in the IR region

10. In Raman spectroscopy, the radiation lies in the ————.

(a) UV Region (b) X-ray region

(c) Visible region (d) microwave region

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Write a note on Hermitian operator.

Or

(b) Comment on quantum mechanical treatment of angular momentum.

12. (a) The ground state wave function of a harmonic oscillator is $\psi = \exp(-\alpha x^2)$ where $\alpha = \frac{4\pi^2 mE}{h^2}$ and $-\infty \leq x \leq \infty$. Find the most probable value of x.

Or

(b) Explain the an harmonicity force constant and its significance.

13. (a) Write a note on the approximations used in the HMO method.

Or

(b) Give an account of Heitler – London treatment.

14. (a) Write briefly on Boltzmann distribution.

Or

(b) Give an account of rotational spectra of symmetric top polyatomic molecules.

15. (a) Discuss the vibrations in linear molecules and symmetric top molecules.

Or

(b) (i) Comment on absorption frequencies of any three functional groups for organic compounds.

(ii) What is meant by Rayleigh scattering?

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Write a note on postulates of quantum mechanics.

Or

(b) Discuss in detail the time-dependent and time-independent Schrodinger wave equations.

17. (a) Explain briefly the quantum mechanical treatment of simple harmonic oscillator.

Or

(b) (i) Narrate the radial distribution functions.

(ii) For a particle in a one-dimensional box of length 'L', find the probability in the region $0 \leq X \leq L/4$ for $n = 1$.

18. (a) Discuss briefly the linear variation method.

Or

(b) Write an account on Pauli exclusion principle and slater determinant for He atom.

19. (a) Write notes on the following

(i) Collision broadening

(ii) Doppler broadening.

Or

(b) (i) Comment on transition moment integral.

(ii) What are the characteristics of an electromagnetic radiation?

20. (a) (i) Stokes lines are more intense than anti-stokes lines. Explain why?

(ii) State and explain Born – Oppenheimer approximation.

Or

(b) Describe the theory and principle of vibrational – rotational Raman spectroscopy.

(8 pages) Reg. No. : .....

Code No. : 6401 **Sub. Code : ZCHM 21**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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)

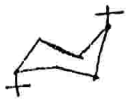
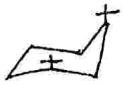
Answer ALL questions.

Choose the correct answer.

1. Compounds that are mirror images of each other are called ————————.
   (a) stereoisomers
   (b) diastereomers
   (c) enantiomers
   (d) conformers

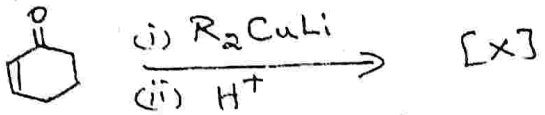
2. Which of the following is an example of regio-selective reaction?
   (a) Addition of HI to propylene
   (b) Debromination of mesodibromobutane
   (c) 2-Bromo octane with sodium hydroxide
   (d) Debromination of 2,3-dibromobutane

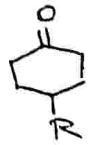
3. The diequatorial form of trans-1,2-dimethyl cyclo hexane has ———————— gauche-butane interaction.
   (a) 1 (b) 2
   (c) 3 (d) 4

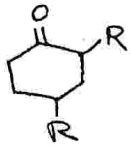
4. Which one of the following conformations is the highly stable?
   (a)  (b) 
   (c)  (d) 

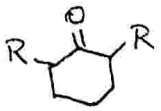
5. Oxidation of acetaldehyde with selenium dioxide produces ————————.
   (a) Ethanoic acid (b) Oxalic acid
   (c) Methanoic acid (d) Glyoxal

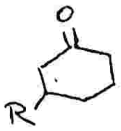
6. In the reaction sequence



(a) 

(b) 

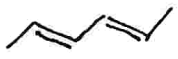
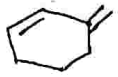
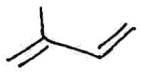
(c) 

(d) 

7. Which type of electronic transition can be seen in saturated aldehydes and ketones?
   (a) $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$
   (b) $n \rightarrow \sigma^*$
   (c) only $\pi \rightarrow \pi^*$
   (d) $\sigma - \sigma^*$

8. Photochemical reactions involving fission of α-carbon and carboxylic carbon followed by elimination is known as ————.
   (a) Norrish type-II process
   (b) Norrish type-I process
   (c) Norrish type-III process
   (d) None of these

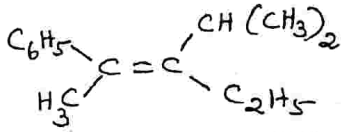
9. On heating Cis-3,4-dimethylcyclobutene is converted back to ————.
   (a) (Z, Z)-penta-2,4-diene
   (b) (E, Z)-Hexa-2,4-diene
   (c) (Z, Z)-Hexa-2,4-diene
   (d) (E, E)-Hexa-2,4-diene

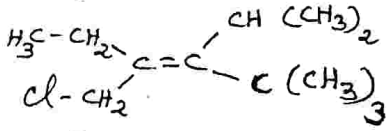
10. Which of the following dienes cannot undergo Diels-Alder reactions?
   (a) 
   (b) 
   (c) 
   (d) 

PART B — (5 × 5 = 25 marks)

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

11. (a) (i) What is Prelog's rule? Explain its use.
   (ii) Assign E or Z notation for the following :

(1) 

(2) 

Or

(b) Explain asymmetric synthesis.

12. (a) Discuss the conformations and stability of decalins.

Or

(b) (i) Point out the difference between configuration and conformation of a molecule.

(ii) Predict the most stable chair conformation of isomeric cis and trans 1,2-dimethylcyclohexanes.

13. (a) Indicate the applications of the following reagents in organic synthesis

(i) Luche reagent

(ii) Fetizon's reagent.

Or

(b) Discuss the uses of the following reagents :

(i) 1,3-Dithane

(ii) Vaskas catalyst.

14. (a) (i) Write a brief note on Photosensitization.

(ii) Outline the mechanism of Photoreduction.

Or

(b) Give an account of cis-trans isomerization of olefins brought about photochemically. How does it differ from the thermal isomerization?

15. (a) How does the stereochemistry of the products formed in electrocyclic reactions are affected HOMO? Explain.

Or

(b) Construct an orbital correlation diagram for conrotatory interconversions of 1,3-butadiene and cyclobutene.

PART C — (5 × 8 = 40 marks)

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

16. (a) (i) With suitable examples explain enantiotopic and diastereotopic hydrogens.

(ii) Discuss the stereochemistry of a compound having two dissimilar asymmetric carbon centres.

Or

(b) (i) What are stereospceific and stereoselective reactions? Explain with suitable examples.

(ii) Define a prochiral centre and give an example of a molecule that contain this centre.

17. (a) (i) Draw the conformation of cis-syn-cis perhydrophenanthrene.

(ii) Give an account of conformations and reactivity of cyclohexanones.

Or

(b) (i) Draw the conformations of cis and trans 4-t-butylcyclohexane tosylates. In a solvolysis reaction which one will solvolyze faster. Rationalize your answer.

(ii) Discuss the reactions of the two different conformers of cis-2-aminocyclohexanol with HNO_2.

18. (a) Discuss any five synthetic uses of LDA.

Or

(b) Give the synthetic applications of the following reagents :

(i) DCC

(ii) PCC

(iii) DMDO

(iv) Von Rudloff reagent.

19. (a) (i) Distinguish between :

(1) Singlet and triplet excited states

(2) Fluorescence and Phosphorescence.

(ii) Describe Norrish type II reactions with examples.

Or

(b) Write briefly on :

(i) Paterno-Buchi reaction

(ii) Di-π methane rearrangement.

20. (a) (i) Construct the correlation diagram for [2+2] cycloaddition and state the conditions under which the addition occurs.

(ii) What is aza-cope rearrangement?

Or

(b) (i) Give a typical example of Cope rearrangement. Explain on the basis of frontier molecular orbital theory how it is thermally allowed.

(ii) Explain electrocyclic ring closure reaction of allylic carbanion.

Pages)

Reg. No. : .....

ode No. : 5692 **Sub. Code : ZCHM 22**

Sc. (CBCS) DEGREE EXAMINATION, APRIL 2022

Second Semester

Chemistry — Core

)ORDINATION COMPOUNDS AND SOLID STATE CHEMISTRY

(For those who joined in July 2021 onwards)

ıe : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Which of the following complexes shows zero crystal field stabilization energy?

(a) $[Co(H_2O)_6]^{3+}$ (b) $[Fe(H_2O)_6]^{3+}$

(c) $[Co(H_2O)_6]^{2+}$ (d) $[Mn(H_2O)_6]^{3+}$

2. The correct increasing order of splitting power of ligands according to spectrochemical series is

(a) $Cl^- < OH^- < CN^-$

(b) $Cl^- < CN^- < OH^-$

(c) $OH^- < Cl^- < CN^-$

(d) $OH^- < CN^- < Cl^-$

3. Three of the following ions are kinetically inert, one is labile, which ion is labile?

(a) Rh^{3+} (b) Ti^{3+}

(c) Ru^{2+} (d) Cr^{3+}

4. In an inner-sphere electron transfer reaction, which of the following ligands could not act as a bridging ligand?

(a) 1, 10-phenanthroline

(b) 4, 4'-bipyridine

(c) pyrazine

(d) bis(4-pyridyl) methane

Regarding the magnetic properties of lanthanides and actinides, the correct statement is ————

(a) Lanthanides are weakly paramagnetic while actinides are strongly paramagnetic

(b) Quenching of orbital contribution is greater in lanthanides than in actinides

(c) 5f electrons in actinides are too diffuse and are less effectively shielded which results in considerable quenching of orbital contribution, and hence the magnetic movements of actinides are significantly less than theoretically predicted values

(d) Because of diffused f electrons, there is no quenching of orbital contribution towards the magnetic movement

Which of the following elements have a negative value of magnetic susceptibility?

(a) Iron (b) Oxygen

(c) Aluminium (d) Nitrogen

What type of stoichiometric defect is shown by ZnS?

(a) Schottky defect

(b) Frenkel defect

(c) Both Frenkel and Schottky defects

(d) Non-stoichiometric defect

8. In which pair most efficient packing is present?

(a) hcp and bcc

(b) hcp and ccp

(c) bcc and ccp

(d) bcc and simple cubic cell

9. What happens to the free electrons when an electric field is applied?

(a) They move randomly and collide with each other

(b) The move in the direction of the field

(c) They remain stable

(d) The move in the direction opposite to that of the field

10. If the number of valence electrons in an atom is 4, what is the substance called?

(a) a conductor (b) a semiconductor

(c) neutral (d) a bad conductor

PART B — (5 × 5 = 25 marks)

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

11. (a) Write the basic concept of Crystal Field Theory (CFT).

Or

(b) What factors determine the sequence of ligands in the spectrochemical series?

12. (a) Write a note on labile and inert complexes.

Or

(b) Write a note on stability constant.

13. (a) What is magnetic susceptibility? Give the types of magnetic behaviours.

Or

(b) Give the magnetic properties of Lanthanides and actinides.

14. (a) Describe the structure rutile.

Or

(b) Explain the line defects.

15. (a) Describe the band theory.

Or

(b) What are superconductors? Explain.

PART C — (5 × 8 = 40 marks)

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

16. (a) Describe the crystal filed stabilization energy in octahedral complexes.

Or

(b) Discuss the ligand field theory.

17. (a) What is trans effect? Which theory of trans effect satisfactorily explain the order of trans effect of inert ligands?

Or

(b) Explain the complementary and non-complementary reactions.

18. (a) Discuss the magnetic properties of complexes with T ground terms.

Or

(b) Explain the spin-state cross over phenomenon.

19. (a) Discuss about the point defects.

Or

(b) How will you determine the crystal structure by rotating crystal method?

20. (a) Discuss about the semiconductors.

Or

(b) Illustrate the types of solids.

———————

(7 pages) Reg. No. : .....

Code No. : 6402 **Sub. Code : ZCHM 22**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022

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. Crystal field theory focuses on the nonbonding electrons on the ———— in coordination complexes not on the ————

(a) Central metal ion, metal-ligand bonds

(b) Metal-ligand bonds, central metal ion

(c) Ligand, Central metal

(d) None of these above

2. Crystal field theory assumes that the attraction between the ———— and in a complex is essentially electrostatic

(a) Metal ion, metal ion

(b) Ligands, ligands

(c) Metal ion, ligands

(d) None of these above

3. For charged ligands ———— the charge and ————the size the more stable in the complex formed

(a) Lower, larger (b) higher, larger

(c) Lower, smaller (d) higher, larger

4. Chelate complexes are ———— stable than the corresponding complexes containing indentate ligands.

(a) more (b) less

(c) least (d) none of these above

5. For a diamagnetic material, which of the following statement is correct?

(a) Magnetic susceptibility < 0

(b) Magnetic susceptibility > 0

(c) Magnetic susceptibility = 1

(d) Magnetic susceptibility = 0

6. With an increase in temperature, magnetic susceptibility of a ferromagnetic material _____

(a) First increases and then decreases

(b) Remains constant

(c) Decreases

(d) Increases

7. Frenkel defect is not found in the halides of alkali metals because alkali metals have

(a) High electropositivity

(b) High ionic radii

(c) Ability to occupy interstitial sites

(d) High reactivity

8. A compound that can show both, Frenkel as well as schottky defects is _____

(a) *ZnS* (b) *Nacl*

(c) *AgBr* (d) *AgI*

9. A semiconductor has _____temperature coefficient of resistance

(a) Zero (b) Positive

(c) Negative (d) None of the above

10. What is the property of insulating materials?

(a) Prevents the unwanted flow of current

(b) Decreases the unwanted flow of current

(c) Increases the unwanted flow of current

(d) Allow the unwanted flow of current

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 various factors influencing the magnitude of crystal field splitting.

Or

(b) Narrate the application of molecular orbital theory to explain spectrochemical series.

12. (a) Define, 'stepwise stability constant and overall stability constant'. How are they related?

Or

(b) Discuss the π-bonding theory of Trans effect.

13. (a) Write briefly on orbital quenching.

Or

(b) Narrate the types of magnetic behaviours.

14. (a) Give the conditions for the formation of Frenkel and Schottky defects.

Or

(b) (i) Write briefly on limiting radius ratio.

(ii) Define packing efficiency of a molecule.

15. (a) Write a note on free electron theory.

Or

(b) Write an explanatory note in Meissener effect.

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 effect of Jahn Teller distortion in electronic spectra.

(ii) What are the limitations of crystal field theory?

Or

(b) Explain the crystal field stabilization energy in octahedral and tetrahedral complexes.

17. (a) (i) List out the factors which affect the stability of a metal complex.

(ii) Illustrate a dissociative substitution reaction.

Or

(b) (i) Discuss the spectroscopic method of determination of stability constant of a metal complex.

(ii) What are complementary and non complementary electron transfer reactions?

18. (a) Describe the Gory method of determination of the magnetic susceptibility of a substance.

Or

(b) Explain the magnetic properties of lanthanides and actinides.

19. (a) (i) Explain the powder method of determining crystal structure.

(ii) Give any four example of compounds which have rutile structure.

Or

(b) Explain briefly the structures of the following crystals

(i) Zinc blende

(ii) Fluorite

(iii) Cscl

20. (a) (i) What is Hall effect? How is it used to explain conductivity?

(ii) What is the difference between insulator and semiconductor?

Or

(b) (i) What is photovoltaic effect? Explain with suitable examples.

(ii) What are the two types of semiconductors.

'ages)

Reg. No. : .....

de No. : 5693 **Sub. Code : ZCHM 23**

Sc. (CBCS) DEGREE EXAMINATION, APRIL 2022

Second Semester

Chemistry — Core

ECTROCHEMISTRY AND SPECTROSCOPY — II

(For those who joined in July 2021 onwards)

: Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

Differences in transport number arise from differences in ————

(a) Electrical density

(b) Electrical mobility

(c) Electrical current

(d) None of these

An octahedral complex may have allowed vibrations where the molecule is ————

(a) Asymmetric (b) Symmetric

(c) Planar (d) Linear

Which of the following electromagnetic radiation is used in ESR?

(a) X-radiation (b) Radiowaves

(c) IR-Radiation (d) Microwaves

The approximate chemical shift value of methylproton in NMR is ————

a) 0.9 (b) 1.3

c) 1.5 (d) 2.5

NQR is applicable only to ———— and not ————

a) Liquids, solids (b) Solids, liquids

c) Gases, solids (d) Liquids, gases

In which state of matter mass spectroscopy in being performed?

a) Plasma (b) Gaseous

c) Liquid (d) Solid

2. The movement of sol particles under an applied electric potential is called ————

(a) Electro filtration (b) Electro-osmosis

(c) Electro phoresis (d) None of these

3. Which of the following can be used as fuel in a fuel cell?

(a) Helium (b) Hydrogen

(c) Argon (d) Nitrogen

4. The diffusion current in the polarography depends on all of the following, except

(a) Charge of the electrolyte

(b) Temperature

(c) Lifetime of mercury drop

(d) Capillary diameter

5. The Franck – Condon principle is based on the ————

(a) Born approximation

(b) Oppenheimer approximation

(c) Born-oppenheimer approximation

(d) None of these

PART B — (5 × 5 = 25 marks)

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

11. (a) Write briefly upon Bjerrum equation.

Or

(b) Write an account on ion-ion and ion-solvent interactions.

12. (a) What are fuel cells? Explain the working of any one fuel cell.

Or

(b) Write an account on colorimetric methods.

13. (a) State and explain Franck – Condon principle.

Or

(b) Discuss the types of electronic transitions.

14. (a) Discuss the multiplet formation or spin-spin splitting/coupling.

Or

(b) Narrate the principle and theory of ESR spectroscopy.

15. (a) Write a note on isomer shift in mass bauer spectroscopy.

Or

(b) Write a brief note on electro spray ionization.

PART C — (5 × 8 = 40 marks)

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

16. (a) Write notes on :

(i) Electro - osmosis

(ii) Electrophoresis.

Or

(b) (i) Explain the reasons for the deviation from Debye – Huckel Onsager equation.

(ii) Define the term Zeta potential.

17. (a) (i) Give Bulter – Volmer equation and examine it for high and low overvoltage.

(ii) What do you understand by the term electrogravimetry?

Or

(b) Write an account on :

(i) Stripping voltammetry

(ii) Concentration cells

18. (a) Explain the principle and technique of photoelectron spectroscopy.

Or

(b) Describe the fate of electronically excited molecules.

19. (a) Discuss the spin – spin and spin – lattice relaxation times and mechanism.

Or

(b) (i) Explain the factors influencing geminal and vicinal coupling.

(ii) What are the shielding and deshielding of magnetic nucleus?

20. (a) (i) Explain the relationship between electric field gradient and molecular structure.

(ii) Mossbauer spectrum of $FeSO_4.7H_2O$ shows no quadrupole splitting Why?

Or

(b) (i) Discuss in detail about McLaffety rearrangement.

(ii) What is recoil energy?

(7 pages)

Reg. No. : .....

Code No. : 6403 **Sub. Code : ZCHM 23**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Second Semester

Chemistry - Core

ELECTRO CHEMISTRY 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 questions.

Choose the correct answer :

1. Medium under the influence of applied potential is known as
   (a) Electrophoresis
   (b) Electro-osmosis
   (c) Osmosis
   (d) None of these

2. Calculate the EMF of the half-cell given below. *Pt*, H_2/Hcl at 1 – atmosphere pressure and *0.1 M* given $E°_{(op)} = 2$ V
   (a) 4 V (b) 5.6 V
   (c) 3.4 V (d) 5.4 V

3. Which of the following is used as an electrolyte in an H_2–O_2 fuel cell?
   (a) KOH (b) $Cu(OH)_2$
   (c) $Fe(OH)_2$ (d) NH_4OH

4. The auxillary electrode in polarography is
   (a) Rotating platinum electrode
   (b) Graphite electrode
   (c) Mercury pool
   (d) Dropping mercury

5. The Franck – London principle has
   (a) classical application only
   (b) quantum application only
   (c) Both classical and quantum applications
   (d) None of these

6. Vibronic coupling in a molecule involves the interaction between _____ and _____

(a) Electronic, molecular motion

(b) Electronic, nuclear vibrational motion

(c) Molecular, nuclear vibrational motion

(d) Electronic, atomic motion

7. Which of the following will not show electron spin resonance?

(a) Free radicals

(b) Transition metals

(c) Paramagnetic materials

(d) Diamagnetic materials

8. Rotation of electrons about the protons generates a secondary magnetic field which opposes the applied magnetic field. The proton is said to be

(a) Shifted (b) Deshielded

(c) H-Bonded (d) Shielded

9. NQR spectroscopy is referred to as

(a) High field NMR (b) Low field NMR

(c) Zero field NMR (d) None of the above

10. Which species of the following is used to bombard with the sample for which mass spectroscopy has been performed

(a) Protons (b) Electrons

(c) Neutrons (d) Alpha particles

PART B — (5 × 5 = 25 marks)

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

11. (a) Write briefly upon Stark Einstein equation.

Or

(b) Write short notes on transport numbers.

12. (a) Discuss the theories of hydrogen over voltage.

Or

(b) Explain the theory of corrosion. How is corrosion prevented?

13. (a) Give a critical account on intensity of electronic transition.

Or

(b) Narrate the nature of stimulated emission.

14. (a) Discuss the theory of FT – NMR spectroscopy.

Or

(b) How ESR spectra is represented? Explain why? Give an account of lime width in ESR.

15. (a) Explain the basic principle of Massbaver spectroscopy.

Or

(b) Write a brief account of quadrupole splitting.

PART C — (5 × 8 = 40 marks)

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

16. (a) (i) Give Debye – Huckel Onsager equation. How is it verified?

(ii) What do you understand by the term mean ion activity?

Or

(b) Write an account on:

(i) Zeta potential

(ii) Electrophoresis

17. (a) (i) Discuss the application of EMF measurements for the determination of (1) solubility product (2) Equilibrium constant.

(ii) Define liquid junction potential. How will you eliminate the same?

Or

(b) Derive Butler-Volmer equation for an electrode process involving one electron transfer and deduce Tafel equation.

18. (a) Discuss the breakdown of Born-oppenheimer approximation or interaction of rotations and vibrations.

Or

(b) Explain the principle and technique of ultra violet photoelectron spectroscopy.

19. (a) (i) Discuss the fine structure in EPR or zero field splitting.

(ii) "Chemical shift is field dependent while coupling constant is not" Explain why?

Or

(b) Define chemical shift. How it is expressed? What are the factors affecting it?

20. (a) (i) Describe the effect of magnetic field on the NQR spectra.

(ii) What is doppler shift?

Or

(b) (i) Write a note on molecular ion peak.

(ii) For $S_nX_4(X = F, cl, Br, I)$ how isomer shift varies with electro negativity of substituents?

(7 pages)

Reg. No. : .....

Code No. : 6408 **Sub. Code : ZCHM 32**

M.Sc.(CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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 :

1. The energy of He(I) is ————————

(a) 21.21 eV (b) 21.21 MeV

(c) 40.2 eV (d) 1457 eV

2. ESCA gives sufficient chemical information up to a depth about ————————Armstrong in metals.

(a) 5-20 (b) 15-40

(c) 40-100 (d) 100-200

3. Which of the following complex has a highest oxidation state of metal?

(a) $(\eta^6 - C_6H_6)_2Cr$

(b) $Mn(CO)_5Cl$

(c) $Na_2[Fe(CO)_4]$

(d) $K[Mn(CO)_5]$

4. Which of the following is the neutral complex which follows the 18- electron rule?

(a) $(\eta^5 - C_5H_5)Fe(CO)_2$

(b) $(\mu^5 - C_5H_5)2MO(CO)_3$

(c) $(\eta^5 - C_5H_5)_2CO$

(d) $(\eta^5 - C_5H_5)2\,Re(\eta^6 - C_6H_6)$

5. Which metal centre does not obey the 18-electron rule?

(a) Fe in $Fe(\eta^5 - C_5H_4COMe)_2$

(b) CO in $CO_2(CO)_8$

(c) Ru in $[Ru(\eta_6 - C_6Me_6)_2]^{2+}$

(d) V in $V(CO)_6$

6. Which statement about ferrocene is incorrect?

(a) I_2 oxidizes ferrocene to give a diamagnetic cation

(b) The ligands in ferrocene undergo electrophilic substitution with RCOCl in the presence of a Lewis acid

(c) The Fe centre in ferrocene can be protonated by treatment with concentrated H_2SO_4

(d) In the gas phase, the C_5H_5 rings in ferrocene are eclipsed

7. What is meant by hydroformylation reaction?

(a) Reaction of olefins

(b) Reaction of Azos

(c) Reaction of aromatics

(d) All of the mentioned

8. In which process hydroformylation of olefin to an aldehyde occurs?

(a) Azo process

(b) Alkyl process

(c) Oxo process

(d) None of the mentioned

9. In thermogravimetric analysis, the result obtained appear as a ————————

(a) Continuous chart

(b) Continuous parabola

(c) Continuous circular positions

(d) Discontinuous chart

10. The purpose of secondary filter in fluorescence spectroscopy is

(a) Allows only excitation radiation

(b) Allows only emission radiation

(c) Allows both excitation and emission radiations

(d) Allows transmitted radiation

PART B — (5 × 5 = 25 marks)

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

11. (a) Write a note on absolute configuration of chelate complexes from ORD.

Or

(b) Explain the effect of solvent polarity in CT spectra.

[P.T.O.]

12. (a) Write briefly about PE spectra of oxygen molecule.

Or

(b) Write a note on types of PES.

13. (a) Write briefly about synthesis of metal complexes with allyl systems.

Or

(b) Write a note on synthesis and reactions of ferrocene.

14. (a) Write briefly about Cluster compounds in catalysis.

Or

(b) Write briefly about water gas shift reactions.

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) Write a note on Hunds rules and selection rules.

Or

(b) Discuss the construction of orgel diagram of octahedral d^2-ion.

17. (a) Discuss the UV Photoelectron spectra of Nitrogen molecule.

Or

(b) Discuss the principle applications of Auger electron spectroscopy.

18. (a) Explain ionic versus covalent bonding in metallocenes.

Or

(b) Discuss the structure features of metal complexes with alkene and alkyne systems.

19. (a) Explain Tolman catalytic loop and Fischer Tropsch process.

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. : 6409 **Sub. Code : ZCHM 33**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Which of the following does not contain a C_3 axis?
   (a) $POCl_3$ (b) $[NH_4]^+$
   (c) $[H_3O]^+$ (d) ClF_3

2. Which molecule or ion has D_{3h} symmetry?
   (a) $[H_3O]^+$ (b) $CHCl_3$
   (c) $[CO_3]^{2-}$ (d) NF_3

3. Which of the following gives the correct description of the stretching modes of SO_3, and how many absorptions do these vibrational modes give rise to in the IR spectrum of SO_3?
   (a) Symmetric stretch, asymmetric stretch (doubly degenerate); one absorption
   (b) Symmetric stretch, asymmetric stretch (doubly degenerate); two absorptions
   (c) Symmetric stretch; asymmetric stretch; two absorptions
   (d) Symmetric stretch; asymmetric stretch; one absorption

4. The symmetric stretching mode for PCl_3 is of A_1 symmetry. In the C_{3v} character table, there are z and $(x^2 + y^2, z^2)$ entries in the A1 row, this tells you that the symmetric stretching mode is _____
   (a) IR active and Raman inactive
   (b) IR active and Raman active
   (c) IR inactive and Raman active
   (d) IR inactive and Raman inactive

5. Helmholtz free energy (A) is defined as
   (a) A = H - TS (b) A = E - TS
   (c) A = H + TS (d) None of these

6. For a spontaneous process, free energy
   (a) Is zero
   (b) Increase
   (c) Decreases whereas the entropy increases
   (d) And entropy both decrease

7. The Maxwell-Boltzmann law is given by the expression _____
   (a) $1/e^{(E\varepsilon T)}$ (b) $1/e^{(1+E\varepsilon T)}$
   (c) $1/e^{(\alpha+E\varepsilon T)}$ (d) $1/e^{(\alpha+nE\varepsilon T)}$

8. Maxwell-Boltzmann statistics cannot be applied to _____
   (a) Atoms (b) Molecules
   (c) Photons (d) Lattice

9. Which of the following is correct for the net entropy change in an irreversible process?
   (a) It is positive (b) It is negative
   (c) It is zero (d) All of the above

10. Unfolding of regular secondary protein structure causes _____
    (a) Large decrease in the entropy of the protein
    (b) Little increase in the entropy of protein
    (c) No change in the entropy of the protein
    (d) Large increase in the entropy of the protein

PART B — (5 × 5 = 25 marks)

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

11. (a) Construct a multiplication table for C_{3v} point group.

Or

(b) Write briefly about classes of symmetry operations.

12. (a) Explain briefly about symmetry selection rule for Raman and infrared spectra.

Or

(b) Write a note on determination of hybridization of atomic orbitals in methane.

13. (a) Write briefly about partial molar quantities and their determination.

Or

(b) Write a note on excess thermodynamic functions.

14. (a) Write briefly about partition functions.

Or

(b) Write briefly about negative Kelvin temperature.

15. (a) Write briefly about the Phenomenological laws and their applications in chemistry.

Or

(b) Write briefly about application of irreversible thermodynamics to biological system.

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 constructing character table for C_{4v} using the great orthogonality theorem.

Or

(b) Give a detailed account on the great orthogonality theorem.

17. (a) Give a detailed account on determination of hybridization of atomic orbitals in non-linear molecule methane and PF_5.

Or

(b) Write a note on electronic spectra of ethylene and formaldehyde.

18. (a) Discuss the significance of free energy concepts.

Or

(b) Write a note on chemical potential and derive Gibbs - Duhem equation.

19. (a) Give the derivation of Maxwell - Boltzman statistics.

Or

(b) Give the derivation of Maxwell - Boltzmann statistics.

20. (a) Discuss onsager reciprocal relations and application of irreversible thermodynamics to biological system.

Or

(b) Discuss the entropy changes due to coupling of chemical reaction.

———————

(6 pages)

Reg. No. : .....

Code No. : 6410 **Sub. Code : ZCHM 34**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

Third Semester

Chemistry — Core

SCIENTIFIC RESEARCH METHODOLOGY

(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 main aim of interdisciplinary research?
   (a) To over simplify the problem of research
   (b) To bring out the holistic approach to research
   (c) To create a new trend in research methodology
   (d) To reduce the emphasis on a single subject in the research domain

2. The main aim of the scientific method in the research field is to ————
   (a) Improve data interpretation
   (b) Confirm triangulation
   (c) Introduce new variables
   (d) Eliminate spurious relations

3. Literature is a
   (a) Written record (b) Published record
   (c) Unpublished record (d) All of these

4. World of learning is a what source of information
   (a) Primary source (b) Documentary source
   (c) Secondary source (d) Tertiary source

5. The first page of the research report is
   (a) appendix (b) bibliography
   (c) index (d) title page

6. The last page of the research report is
   (a) appendix (b) bibliography
   (c) index (d) title page

7. The act of presenting someone else's work or idea as own is considered as

(a) Plagiarism

(b) Academic dishonesty

(c) Wrongful appropriation

(d) All of these

8. Plagiarism where the writer changes a few words in the original text of another is known as

(a) Direct copying (b) Word switch

(c) Paraphrasing (d) None of these

9. The X-ray region stands between ultraviolet and ——— ray regions.

(a) Gamma (b) Alpha

(c) Beta (d) UV

10. The AFM tip is typically made of ———

(a) silicon or silicon nitride

(b) diamond

(c) silver

(d) graphite

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 objectives of a research?

Or

(b) What are the criteria of a good research?

12. (a) Write abbreviations of some journals.

Or

(b) Write notes on chemical abstracts.

13. (a) Explain the types of references.

Or

(b) What are the ways of communicating research papers?

14. (a) What is plagiarism?

Or

(b) What is intellectual property right?

15. (a) Explain the principle, instrumentation and applications of AFM.

Or

(b) Elucidate the principle, instrumentation and applications of scanning electron microcopy.

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 problems encountered by researchers in India.

Or

(b) Explain funding agencies in India to carryout research.

17. (a) Elucidate literature survey as sources of information.

Or

(b) Explain the significance of SCOPUS.

18. (a) Explicate format of a research report.

Or

(b) Discuss the structure of a research paper.

19. (a) Explain IPR and LICENSING.

Or

(b) Elucidate techniques used to avoid plagiarism.

20. (a) Explain the principle, instrumentation and applications of X-ray photoelectron spectroscopy.

Or

(b) Enlighten the principle, instrumentation and applications of transmission electron microscopy.

———————

(7 pages) Reg. No. : .....

Code No. : 6407 **Sub. Code : ZCHM 31**

M.Sc. (CBCS) DEGREE EXAMINATION, NOVEMBER 2022.

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. Which of the following statements about infrared spectroscopy is correct?
   (a) When the frequency of infrared light matches the frequency of bond vibration in a molecule, a peak appears on the spectrum
   (b) Infrared spectroscopy can be used to determine the size and shape of a compound's carbon skeleton
   (c) An IR spectrometer illuminates a compound with infrared light and records the positions where the light is blocked by the compound This results in the peaks of the spectrum
   (d) The fingerprint region of the spectrum can be used to identify functional groups

2. In an infrared (IR) spectrum, which of the following functional groups has the highest frequency?
   (a) Ketone (b) Aldehyde
   (c) Ester (d) Alcohol

3. The proton NMR spectrum of $CH_3OCHClCH_2Cl$ will exhibit ————
   (a) A three proton doublet. One proton singlet and a two proton doublet
   (b) A three proton singlet. One proton singlet and a two proton doublet
   (c) A three proton singlet. One proton triplet and a two proton doublet
   (d) A three proton triplet. One proton triplet and a two proton triplet

4. The distance between the centers of the peaks of doublet is called as?
   (a) Coupling constant
   (b) Spin constant
   (c) Spin-spin coupling
   (d) Chemical shift

5. In which state of matter mass spectroscopy is being performed?
   (a) solid (b) liquid
   (c) gaseous (d) plasma

6. What are the main criteria on which mass spectrometer is reliable on?
   (a) Composition in sample
   (b) Relative mass of atoms
   (c) Concentration of elements in the sample
   (d) Properties of sample

7. The region of electromagnetic spectrum for nuclear magnetic resonance is
   (a) Microwave (b) UV-rays
   (c) Infrared (d) Radio frequency

8. The first two-dimensional experiment, COSY, was proposed by ————.
   (a) Jean Jeener
   (b) Madam Curie
   (c) Newton
   (d) Christy Catherene Mary

9. Which types of isomers are formed in rearrangement reactions?
   (a) Structural isomers
   (b) Geometrical isomers
   (c) Optical isomer
   (d) Conformational isomers

10. Which was the first molecular rearrangement identified as such by early chemists?
    (a) Wolff's rearrangement
    (b) Pinacol rearrangement
    (c) Favorskii rearrangement
    (d) Hofmann rearrangement

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 various electronic transitions involved in uv-visible absorption spectroscopy.

Or

(b) Explain the role of Fermi Resonance in infrared spectroscopy.

12. (a) Explain the principle of NMR spectroscopy.

Or

(b) Explain spin-spin coupling constant

13. (a) Explain the principle of mass spectroscopy.

Or

(b) Explain :

(i) Molecular ion peak

(ii) Meta stable peak in MS

14. (a) Explain 1H-13C COSY with one example.

Or

(b) What is the difference between 1D and 2D NMR?

15. (a) Explain memory effect in molecular rearrangement with one example.

Or

(b) What is Pinacol-Pinacolone rearrangement? Explain its mechanism.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Compare ORD and CD.

Or

(b) State and explain how Woodward-Fieser Rules are used to calculate maximum absorption values of α,β-unsaturated ketones in uv-visible absorption spectroscopy.

17. (a) Explain spin decoupling with example.

Or

(b) Discuss ^{13}C NMR spectra of carbonyl compounds and olefinic compounds.

18. (a) Elucidate Fragmentation pattern of

(i) alkanes

(ii) aldehyde

(iii) ketones

(iv) acids in MS

Or

(b) What is the principle behind the MALDI-TOF MS?

19. (a) A compound with molecular weight 120 gave a negative iodoform test. It absorbs at 292 $m\mu$, ε max 16 in the ultraviolet spectrum. In its infra-red spectrum, the values bands are (i) 3042 (m), 2941 (w), 2862 (w), 1722 (s), 1605, 1575 (m) and 1462 cm^{-1} (m).

In the NMR spectrum, three signals are present (i) multiplet, 2.73 τ (26.5 squares), (ii) doublet 7.2 τ (10.3 squares) and 0.22 τ (5.2 squares). The mass spectrum shows M^+ peak at $\frac{m}{I}$120 and base peak at $\frac{m}{z}$ 91. Give the structure of the compound.

Or

(b) An organic compound with molecular formula C_8H_7Br yields a primary alcohol on hydroboration. The spectral data of the compound is given below.

(i) UV: λ_{max} 282 $m\mu\varepsilon_{max}$ 450.

(ii) IR: 3033 (m), 1646 (m), 1602 (m), 1562 (v), 820 (s) and 710 cm^{-1} (m).

(iii) NMR : 2.62-2.74 τ (asymmetrical pattern, 18.9 squares), 4.30 τ (double doublet, 4.7 squares), 3.30 τ (double doublet, 4.9 squares) and 4.86 τ (double doublet, 5.0 squares).

Determine the structure of the compound.

20. (a) What is Dakin rearrangement? Explain its mechanism.

Or

(b) What is Neber rearrangement? Explain its mechanism.
