Government Degree College, Baramulla (Autonomous)

Term End External Examination 4th Semester (Session- July 2024)
Subject: Chemistry
Course No and Title: CHMC1422M/Chemistry-IV
Time: 2.15 hours   Max Marks:100   Min. Marks:40
Section A: Objective Type Questions

**Q1. Choose the appropriate Answer:**   **(8x1.5=12)**

i. One of the assumptions made in the Transition State Theory is

A Equilibrium is maintained between reactants and activated complex

B Equilibrium is maintained between reactants and products

C Equilibrium is maintained between products and activated complex

D Equilibrium is maintained between reactants, activated complex and products

ii. Which of the following is correct for photochemical reaction

A Temperature has the same effect as on thermal reaction

B Temperature has the opposite effect as on thermal reaction

C Temperature has no effect

D Any of the above

iii. The structures of $[Cu(CN)_4]^{2-}$ and $[Cu(NH_3)_4]^{2+}$ are respectively

A square planar and tetrahedral

B tetrahedral and square planar

C both square planar

D both tetrahedral

iv. The IUPAC name of $Na_3[Fe(CN)_5NO]$ is

A Sodium pentacyanonitrosyl iron(II)

B Sodium pentacyanonitrosonium ferrate(I)

C Sodium nitrosoniumpentacyano ferrate(I)

D Sodium nitrosylpentacyano ferrate(II)

v. Which of the following pairs(s) yield aldol product in presence of a base.
I) HCHO and PhCHO   II) PhCHO and CH_3CHO
III) CCl_3CHO and $PhCOCMe_3$ IV) CH_3CHO and C_2H_5CHO

A I and II   **B** I and III
C II and III   **D** II and IV

vi. Alkanes can be obtained from ketones by
I) Perkin condensation   II) Clemmensen Reduction
III) Wolf-Kishner Reduction   IV) Cannizaro's Reaction

A I and II   **B** II and III
C III and IV   **D** All of the above

vii. Hinsberg reagent is

A Benzene sulphonyl chloride

B Benzene sulphonamide

C Benzene sulphonyl urea

D Para-Toluene sulphonic acid

viii. Which of the following amine(s) cannot be acylated with acid chloride

A Ethylamine   **B** Diethylamine
C Triethylamine   **D** None of the above

Section-B: Descriptive Type Questions (Short Type)

Q2: Answer all the Questions   **(8 x 4 =32)**

i. State (a) Grothus-Draper law and (b) Stark-Einstein law.

ii. Show using Arhenius equation, why the activation energy of a reaction cannot be zero or negative.

iii. State important limitations of Valence Bond Theory (VBT).

iv. Which complex among $[Fe(H_2O)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$ will have greater crystal field splitting. State reason for your answer.

v. Identify the alkyl halide and carbonyl compound which you would use to prepare the following alkenes using Witting reaction?

(a) (b)
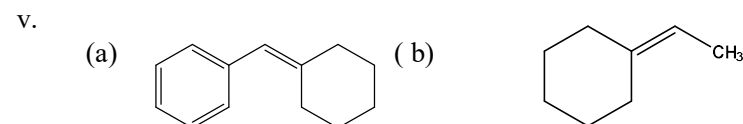
vi. With what starting materials, following compounds can be prepared using a Reformatsky reaction:

(a) (b) (b
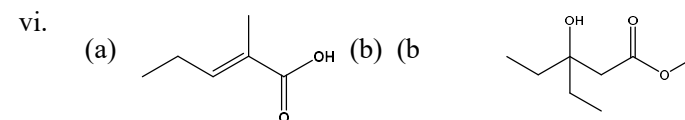
vii. Amines can be prepared by reduction of nitriles with $LiAlH_4$. Suggest probable reaction mechanism.

viii. Starting with nitrobenzene, how can you synthesize 3-chloroaniline?

Section – C: Descriptive Type Questions (Medium Type)

Answer all the questions: (4 x 7=28)

Q 3. What is Order of a reaction. Explain briefly how order of a reaction can be determined by
(a) the use of differential rate expression (b) Half-life method

OR

What is Quantum Yield. Justify why the quantum yield of photochemical formation of $HBr_{(g)}$ from $H_{2(g)}$ and $Br_2(g)$ is very low (~0.01) while as that of $HI_{(g)}$ from $H_{2(g)}$ and $I_{2(g)}$ is very large (~10^5).
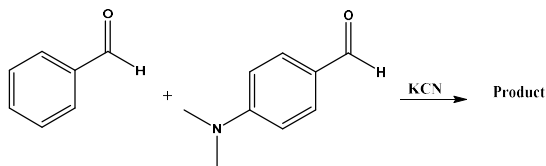
Q 4. Discuss the optical isomerism of $[Cr(en)_2Cl_2]^+$ and $[Cr(ox)_3]^{3-}$ complexes.

OR

What is Jahn-Teller distortion. State with reasons which of the following complexes can undergo Jahn-Teller distortion.
(a) [CuCl6]4-   (b) [Co(CN)6]4-   (c) [Fe(CN)6]4-

Q 5. Predict the product(s) in the following reaction with mechanism. Why is cyanide ion a highly specific catalyst for the benzoin condensation?

OR

How can you prepare aldehydes and ketones each from:
(a) Alkenes   (b) Alkynes   (c) Acid chlorides

Q6. Discuss the mechanism of:
(a) Gabriel-Pthalimide reaction; and
(b) Sulphonation of aninline

OR

Discuss electrophilic substitution reactions of aniline.

Section – D: Descriptive Type Questions (Long Type)

Answer any two of the following: (2 x 14=28)

Q 7.
(a) Label and explain the given photo-physical processes in Jablonski diagram
   I) Fluorescence   II) Phosphorescence
   III) Internal Crossing   IV) Intersystem Crossing

(b) State limitations of collision theory.

Q 8. Discuss Crystal field splitting in week and strong magnetic field. Explain the factors effecting the magnitude of crystal field splitting.

Q 9. Give the preparation and chemical properties of carboxylic acids. Provide a comparative account of nucleophilicity of acyl derivatives

Q 10. What are diazonium salts? Discuss the mechanism of Sandmeyer and Gattermann reaction.

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