[This question paper contains 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1132 **I**

Unique Paper Code : 2172012302

Name of the Paper : DSC: Carbonyls, Carboxylic Acids, Amines, Nitro Compounds, Nitriles, Isonitriles and Diazonium Salts

Name of the Course : **B.Sc. (Hons.) Chemistry**

Semester : III

Duration : 3 Hours Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **SIX** questions out of **EIGHT**.
3. All parts of a question should be attempted together.
4. Each question carries **15** marks.

P.T.O.

1. (a) Write short notes on **any three** of the following Name Reactions.

   (i) Wittig Reaction

   (ii) Aldol Condensation

   (iii) Baeyer-Villiger Oxidation

   (iv) Perkin Reaction

   (b) Write the mechanism involved in acid catalyzed addition of methyl amine to benzaldehyde.

(4,4,4,3)

2. (a) Write final product when nitro benzene undergo reduction with following reagents

   (i) Sn/HCl

   (ii) Zn/NH_4Cl

   (iii) Zn/NaOH

   (b) How will you distinguish primary, secondary and tertiary nitro alkanes on the basis of Victor Meyer's test.

(c) Explain why aldehydes and ketones undergo nucleophilic addition reactions easily but carboxylic acid and their derivatives not.

(d) Why do α-hydrogens in nitroethane show acidic behaviour ? Write the product when nitro ethane reacts with Br_2 in alkaline medium.

(e) Write reactions involved in the catalytic reduction and MPV reduction of benzaldehyde.

(3,3,3,3,3)

3. (a) Suggest the reactions for the synthesis of any two of the followings using diethylmalonate (DEM):

(i) $CH_3CH_2COCH_2COOH$

(ii) $HOOC(CH_2)_4COOH$

(iii) Barbiturate

(b) Suggest a method for the synthesis of any two of the following using ethyl acetoacetate (EAA):

(i) Butane-1,4-dioic acid

(ii) 3-Methylpentan-2-one

(iii) Pent-3-en-2-one

(c) Distinguish between the given acids on the basis of action of heat:

(i) Propane-1,3-dioic acid and Pentane-1,5-dioic acid

(ii) Fumaric acid and maleic acid

(d) Explain why EAA does not give a positive Iodoform test in spite of having a methyl keto group? (4,4,4,3)

4. (a) Explain the following :

(i) *p*-Nitro benzoic acid is more acidic than *m*-nitro benzoic acid?

(ii) Acid anhydrides undergo hydrolysis more readily than acid amides?

(b) Discuss the mechanism of the followings :

(i) Curtius Rearrangement

(ii) Acid catalyzed hydrolysis of an ester.

(c) Give the product formed.

(i) When $CH_3CH(Br)COOEt$ and CH_3CHO react in presence of Zinc catalyst. Name the reaction involved.

(ii) When phthalic acid combines with excess of ammonia. Write the structure of the compound formed when this product is heated at 300°C.

(d) Write a reaction to distinguish between the α-hydroxycarboxylic and β-hydroxycarboxylic acid. (4,4,4,3)

5. (a) Give reasons for the followings with proper justification :

(i) Aromatic amines are much weaker bases than aliphatic amines.

(ii) Benzene diazonium salts are stable whereas alkane diazonium salts are unstable.

(b) By the use of diazotization how will you perform the following conversions **(any two)** :

(i) 2,4,6-Tribromophenol from aniline.

(ii) *p*-Toluic acid from *p*-toluidine (*p*-aminotoluene)

(iii) Nitrobenzene to phenol

(c) *n*-Butylamine when methylated exhaustively with methyl iodide gives compound A. When compound A is treated with silver hydroxide gives compound B. Compound B on β-elimination gives compound C. Write structures of compound A, B, C and name of reaction involved.

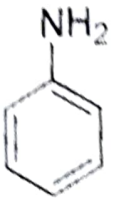
(d) Write all reactions involved in distinguishing primary, secondary and tertiary amines using Hinsberg's method. (4,4,4,3)

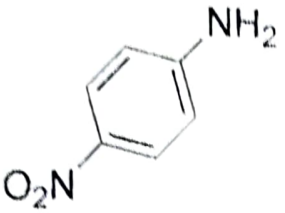
6. (a) Explain the followings :

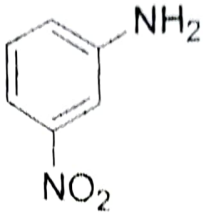
(i) Coupling reactions of arenediazonium salts with phenol is carried out in mild basic conditions.

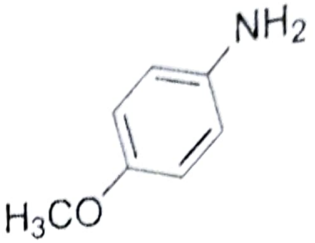
(ii) Tertiary amines with three different groups attached to nitrogen do not show optical activity.

(b) Give increasing order of basicity for followings :









(c) How will you prepare ethylamine from followings:

(i) Acetaldehyde

(ii) Acetyl chloride

(d) What do you understand by diazotization and coupling reactions? (4,4,4,3)

7. (a) Write preparations of alkyl cyanide from followings :

(i) Acid amides

(ii) Acid halides

(b) Explain acidic and alkaline hydrolysis of ethyl cyanide.

(c) Explain Thorpe nitrile condensation.

P.T.O.

(d) How will you prepare acetaldehyde by hydrogen cyanide. (4,4,4,3)

8. (a) Explain mechanism of reaction when primary amine reacts with chloroform in presence of KOH.

(b) Write reactions given by nitriles and isonitriles.

(c) Write the name and structure of product when

(i) Methyl isocyanide is reduced with platinum in presence of $H_2(g)$.

(ii) Hydrolysis of methaneisonitrile undergoes in presence of acid

(d) Write at least four important physical properties of isocyanide. Write significance of ambident ion. (4,4,4,3)

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Your Roll No.....

Sr. No. of Question Paper : 1075 **I**

Unique Paper Code : 2172012301

Name of the Paper : DSC 7: Chemistry of d and f Block Elements & Quantitative Inorganic Analysis (NEP-UGCF-2022)

Name of the Course : **B.Sc. (Hons.) Chemistry**

Semester : III

Duration : 2 Hours Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **four** questions in all.
3. **All** questions carry equal marks.

P.T.O.

1. Explain :

(a) (i) The factors responsible for formation of a large number of complexes by transition metals.

(ii) Actinides have a greater tendency to form complexes than lanthanides. (5)

(b) Electronic spectra of Ln^{3+} complexes are similar irrespective of change of ligand. (5)

(c) The coordination numbers of the elements of second and third transition series tend to be greater than for the first transition series. (5)

2. Explain why :

(a) (i) Fewer number of oxidation states are available at each end of the first transition series than in the middle?

(ii) Transition metals in high oxidation states are generally available as fluorides or oxides? (5)

(b) Lanthanides predominantly exhibit a +3 oxidation state while actinides exhibit other than +3 oxidation states. (5)

(c) (i) Transition elements and their compounds act as good catalysts.

(ii) Absorption spectra of transition metal ions are broad. (5)

3. (a) (i) Write the number of unpaired electrons in Ce^{4+}(At. No.=58) and Eu^{3+}(At. No.=63).

(ii) Why aqueous solutions of Eu^{3+} is pale pink while Ce^{4+} is orange red? (5)

(b) Calculate the magnetic moment of Europium (III) (L=3). Explain the discrepancy between observed (3.4-3.6 BM) and calculated value. (5)

(c) Explain **(any one)** :

(i) Micas are harder than clay.

(ii) Structure of cyclic phosphazene (trimer).

(2.5)

(d) Advantages and disadvantages of digestion in gravimetric analysis. (2.5)

4. (a) Given below are the Latimer diagrams of Mn (Reduction potential, E° in Volt) in acidic medium and basic medium :

Acidic medium:

$$MnO_4^- \xrightarrow{+0.56} MnO_4^{2-} \xrightarrow{+2.27} MnO_2 \xrightarrow{+0.95} Mn^{3+} \xrightarrow{+1.51} Mn^{2+} \xrightarrow{-1.18} Mn$$

Basic medium:

$$MnO_4^- \xrightarrow{+0.58} MnO_4^{2-} \xrightarrow{+0.6} MnO_2 \xrightarrow{+0.15} Mn^{3+} \xrightarrow{-0.25} Mn(OH)_2 \xrightarrow{-1.56} Mn$$

Answer the following questions with the help of above diagrams :

(i) Write the balanced half reaction for the reduction of MnO_4^- to Mn^{2+} in acidic medium. Find the standard reduction potential for the reaction.

(ii) In which of the medium, acidic or basic Mn(III) is more stable? Justify your answer.

(iii) Using the given Latimer diagram for manganese in acidic medium, construct the Frost diagram to determine the most stable oxidation state of manganese. Explain your reasoning based on the diagram.

(2+1.5+4=7.5)

(b) (i) Explain the reason for the validity of spin only expression to calculate the magnetic moment for ions of first transition series.

(ii) A M^{2+} ion of first transition series has been observed to have four unpaired electrons. Calculate its magnetic moment using spin only formula,

(iii) What is the effect of curie temperature in ferromagnetism? (2.5×3=7.5)

5. (a) (i) Write a short note on borates.

(ii) Discuss the primary differences in the general properties of inorganic and organic polymers (any three). (2.5×2)

(b) (i) What is the structural difference between pyroxines and amphiboles?

(ii) Draw the structures of following ions :

$Si_2O_7^{2-}$, $Si_3O_9^{6-}$ (2+3)

(c) (i) Mention the criteria while selecting a wash solution in the gravimetric analysis.

(ii) Which is more effective for washing a precipitate in the gravimetric analysis: using two portions of 50 mL or ten portions of 10 mL of each? Justify your answer. (2+3)

6. (a) (i) What are silicones? What are the chain building and chain stopping units in silicones?

(ii) Identify the industries from the following which use silicones:

Rubber, Glass, Oil, Cement (5)

(b) Match the uses with the polymers

Gemstones	montmorillonites
Textiles	orthosilicates
Fertilizers	polyphosphazenes
Paints	phosphates
Corrosion protection	Borates (5)

(c) Write short note on any two of the following : 10

(i) Ion exchange method for separation of lanthanides

(ii) Lanthanide contraction and its consequences

(5)