BANGLADESH UNIVERSITY OF TEXTILES

B. Sc. in Textile Engineering
Level-1 Term-II, Final Examination-2013
Subject: Chemistry-II (Code: AS 111)

Time: 3 Hrs. **Full Marks: 105**

(Use separate answer script for Part: A and Part: B)
(All parts of question must be answered consecutively)

Part: A

(Answer any three questions)

1. (a) Discuss N-terminal and C-terminal residue of peptide. Show the N-terminal and C-terminal residue for Gly-Phe dipeptide.
   (b) Write some difference between essential and non-essential amino acid.
   (c) Synthesize the following compound,
   (i) Glycollic acid form glycine (ii) 2-amino propanol from alanine.
   [(5+4=9)+3.5+5=17.5]

2. (a) Draw structures for furanose and pyranose forms of D-ribose. Show how you could use periodate oxidation to distinguish between a methyl ribofuranoside and a methyl ribopyranoside.
   (b) Outline chemical tests that will distinguish between members of each of the following pairs:
   (i) D-Glucose and D-fructose. (ii) D-Glucose and D-galactose.
   (c) Describe the cyclic structure of D-(+)-glucose.
   [5+6+6.5=17.5]

3. (a) Define independent and dependent chromophore with example.
   (b) Explain any three types of dyes (Interms of application).
   (c) What is dye intermediate? Give example.
   [5+9+3.5=17.5]

4. (a) Explain the order of basicity of NH_3 and $C_6H_5NH_2$.
   (b) Why direct nitration of aniline is difficult and produce 3- nitro aniline,? How can you produce ortho and para nitro aniline?
   (c) Distinguish 1°, 2° and 3° amines.
   [4+8.5+5=17.5]

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Part: B

(Answer any three questions)

5. (a) Explain the isomerism exhibited by following pairs of compound:
   (i) Methylpropyl ether & Diethyl ether. (ii) Diethyl ether & butyl alcohol.
   (iii) Crotonic acid & Isocrotonic acid.
   (b) What is TEL? Discuss the function of TEL as antiknock.
   [12+5.5=17.5]

6. (a) Arrange these compounds in order of increasing boiling point and explain increasing order.
   (i) CH_3OH, CH_3CH_2OH and H_2O. (ii) 1°, 2° and 3° alcohol.
   (b) Provide the reagents necessary for the following synthesis:
   Phenol to (i) p-hydroxybenzoic acid (ii) Picric acid
   (c) Write structural formulas for the products formed when primary alcohol reacts with each of the following reagents:
   (i) Cl_2 / NaOH (ii) C_6H_5NCO (iii) C_2H_2 / Hg^{2+} (iv) Cu at 300°C
   (d) Describe the acidic nature of phenol.
   [6+4+4+3.5=17.5]

7. (a) Show how benzaldehyde could be synthesized form each of the following:
   (i) Benzene (ii) Benzenediazonium chloride
   (b) Compunds A and D do not give positive Tollen's tests; however, compound C does. Give structures for A, B, C and D.

$$\text{4-Bromobutanal} \xrightarrow[HA]{OHCH_2CH_2OH} A(C_6H_{11}O_2Br) \xrightarrow{Mg.\ Et_2O} B(C_6H_{11}MgO_2Br)$$

$$\xrightarrow[H_3O^+,\ H_2O]{CH_3CHO} C(C_6H_{12}O_2) \xrightarrow[HA]{CH_3OH} D(C_7H_{14}O_2)$$

   (c) Give two methods for synthesize benzophenone from benzene.
   (d) Write any two reactions common to aldehydes and ketones.
   [4+6+3.5+4=17.5]

8. (a) Use Grignard reagent to prepare the following products:
   (i) Methanol (ii) Acetone (iii) Ethyl acetate
   (b) Write the limitations of Grignard-reagent.
   (c) What products would you expect to obtain when acid amide reacts with followings:
   (i) HNO_2 (ii) P_2O_5
   (d) Write the reactions for synthesis of Propanoic acid from ethanoic acid.
   [6+3.5+4+4=17.5]

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BANGLADESH UNIVERSITY OF TEXTILES

B. Sc. in Textile Engineering
Level-1 Term-II Final Examination-2014
Subject: Chemistry-II (Code: AS 111)

Time: 3 Hrs. **Full Marks: 105**

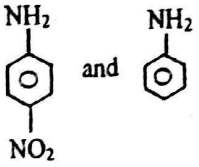
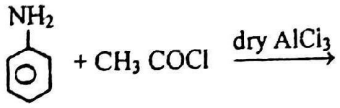
(Use separate answer script for Part: A and Part: B)
(All parts of question must be answered consecutively)

Part: A

(Answer any three questions)

1. (a) Classify amino acid with example according to the number of amino and carboxyl groups in the molecule.
   (b) How will you prepare amino acid from α- halo acid and potassium phthalimide?
   (c) Give any one reaction involving both the carboxyl and amino group of amino acid.
   (d) What is Zwitter ion? **[6+5+4+2.5=17.5]**

2. (a) What are carbohydrates? Discuss their classifications.
   (b) Describe about mutarotation of glucose.
   (c) Starting from glucose, prepare the following compounds.
   i) glucose phenylhydrazone ii) glucaric acid iii) glucitol **[5+6+6.5=17.5]**

3. (a) Discuss any two preparation methods of amine.
   (b) Compare basicity of  and
   (c) Write down the major product for the given reaction –
   (i) 
   (ii) 
   (iii) $CH_3NH_2 + CH_3CHO \longrightarrow$ **[6+4+7.5=17.5]**

4. (a) Naphthacene is coloured but naphthalene is colourless, explain it.
   (b) Discuss nitro dye and azo dye with example.
   (c) Write some non-textile uses of dyes.
   (d) Mention the function of electrolyte during dyeing processes. **[4+7+4+2.5=17.5]**

Part: B

(Answer any three questions)

5. (a) Describe two general methods for preparation of aromatic ketones.
   (b) Explain the reactivity of the following compounds
   i) C_2H_5-CO-CH_3 ii) CH_3-CO-CH_3 iii) H-CHO
   (c) Write down the products formed when benzaldehyde reacts with each of the following reagents.
   i) NaOH ii) $C_6H_5NH_2$ iii) Cl_2 **[6+5.5+6=17.5]**

6. (a) What are diastereoisomers? Give an example.
   (b) Explain the isomerism exhibited by the following molecular formula:
   i) $C_6H_6Cl_2$ ii) $Pt(NH_3)_2Cl_2$
   (c) Draw and explain the energy diagram for different conformations of 1, 2-dichloroethane. **[3.5+7+7=17.5]**

7. (a) Write a method for distinguishing 1°, 2° and 3° alcohols.
   (b) Explain "*0*-nitrophenol is more stable than *p*-nitrophenol".
   (c) Provide the necessary reagents for the following synthesis –
   Propanol to i) propyl acetate ii) 1-chloropropane iii) Propane **[7.5+4+6=17.5]**

8. (a) Distinguish configuration and conformation.
   (b) Indicate about the structural difference between benzaldehyde and phenyl acetaldehyde.
   (c) Write short note on any two
   i) Organo-Zinc compound ii) Metamerism iii) Importants of Grignad reagent. **[5.5+5+3.5×2=17.5]**

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BANGLADESH UNIVERSITY OF TEXTILES

B. Sc. in Textile Engineering
Level-1 Term-II, Final Examination-2015

Subject: Chemistry-II (Code: AS 111)

Time: 3.00 Hrs. **Full Marks: 105**

(Use separate answer script for Part: A and Part: B)
(All parts of a question must be answered consecutively)

Part: A
(Answer any three questions)

1. (a) What are amino acids? Describe zwitterionic nature of amino acids.
   (b) Write the reactions of amino acids with the following reagents:
   (i) $Ba(OH)_2$ (ii) NH_3 (iii) HCl
   (c) Show the formation of possible dipeptides from 'Glycine and Alanine' amino acid pair.

[5+6+6.5=17.5]

2. (a) How can you determine the cyclic structure of glucose?
   (b) Draw a chair conformation for the form of a disaccharide in which one unit of D-glucopyranose is joined with β-D-fructofuranose by a β-1,2-glycosidic bond.
   (c) Synthesize the following products from D-Glucose
   (i) Gluconic acid (ii) Glucuronic acid (iii) Glucaric acid

[6+4+7.5=17.5]

3. (a) Define diazonium salt. Synthesize a colored azo compound from diazonium salt.
   (b) How chromophore plays a vital rule in conjugated system?
   (c) Write short note on: (i) Pigment (ii) Direct dye

[6+5.5+6=17.5]

4. (a) Write down three general methods for synthesis of carboxylic acid.
   (b) Arrange the following compounds in order to decreasing boiling point with reason CH_3COOH, CH_3CONH_2 and CH_3COOCH_3
   (c) Compare the acidity between O_2N-C_6H_4-COOH and H_2N-C_6H_4-COOH.

[7.5+5+5=17.5]

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Part: B
(Answer any three questions)

5. (a) Draw the structure of R and S configuration for lactic acid.
   (b) Show and describe the geometric (cis-trans) isomer of following compound
   (i) Pt $(NH_3)_2Cl_2$ (ii) Dichloro benzene
   (c) Racemic mixture and meso compound is not optically active-explain with example.

[5.5+6+6=17.5]

6. (a) Show how acetaldehyde and acetone could be synthesized from each of the following: (i) $CH_3CH=C(CH_3)_2$ (ii) CH_3COCl
   (b) Write down the products formed when propanal reacts with each of the following:
   (i) C_2H_5MgX (ii) $C_6H_5NH.NH_2$ (iii) Tollens' reagent
   (c) Give two methods for synthesis of benzophenone.
   (d) Distinguish between aldehydes and ketones by suitable chemical reactions.

[4+6+3.5+4=17.5]

7. (a) Compare the solubility of 1°, 2°, 3° alcohol with description.
   (b) Distinguish between phenol and ethanol.
   (c) Prepare following compounds from phenol
   (i) P-hydroxy toluene (ii) Anisol (iii) Aniline

[5+5+7.5=17.5]

8. (a) Prepare the following products by using Grignard reaction.
   (i) $C_2H_5COO\ C_2H_5$ (ii) $C_2H_5COCH_3$ (iii) 2-pentanol
   (b) Write the limitations of Grignard-reagents.
   (c) Synthesis the following compounds by using organo-zinc compounds.
   (i) 2,2 dimethyl propane (ii) β-hydroxy-ester
   (d) Explain why TEL is not environmentally friendly.

[6+3.5+4+4=17.5]

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BANGLADESH UNIVERSITY OF TEXTILES

B. Sc. in Textile Engineering

Level-1 Term-II, Final Examination-2016

Subject: Chemistry-II (Code: CHEM 103)

Time: 3.00 Hrs. **Full Marks: 72**

(Use separate answer for Part A and Part : B)

(All parts of a question must be answered consecutively)

Part: A

(Answer any three questions)

1. (a) Discuss the properties and uses of following dyes
   (i) Disperse dye (ii) Direct dye
   (b) Which one show higher absorption between ethylene and naphthalene? Explain.
   (c) Write some non textile uses of dye.

[5+4+3=12]

2. (a) What is N-terminal and C-terminal residue of a polypeptide chain? Write the Sanger's method for analysis of N-terminal amino acid of a polypeptide chain.
   (b) How can you get the following from glycine?
   (i) methyl amine (ii) glycolic acid (iii) DNP-glycine
   (c) What is the difference between essential and non essential amino acid?

[5+4.5+2.5=12]

3. (a) Show that carbon chain of Glucose can be shortening through chemical reaction.
   (b) Although Cellulose contains hydroxyl groups but not soluble in water- Explain.
   (c) A disacharide "A" (which formed by α, β-1, 2-glycosidic bond between two different monosaccharide) gives methylation reaction in alkali media and produce a product "B". Again further hydrolysis of "B" gives two monosaccharide's "C" and "D". Complete the following sequence with appropriate reaction.

$$A \longrightarrow B \longrightarrow C + D$$

[4+3+5=12]

4. (a) Graphically show the ΔH shift for the effect of substituent groups on acid strength of benzoic acid.
   (b) Compare the reaction of phenol and salicylic acid towards $NaHCO_3$.
   (c) An aromatic compound "X" (contains two-COOH groups in benzene ring) reacts with methanol in presence of catalyst to produce "Y". "Y" further reacts with ethylene glycol by a polymerization reaction and produces a polymer "Z". Complete the following sequence with appropriate reaction.

$$X \longrightarrow Y \longrightarrow Z$$

[4+3+5=12]

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Part: B

(Answer any three questions)

5. (a) Write the reaction mechanism for following reaction
   $(CH_3)_3CCl + NaOH \longrightarrow (CH_3)_3COH + Cl^-$
   (b) Discuss the reactive of 1°, 2° and 3° RX towards E1 reaction.
   (c) Compare basicity CH_3NH_2 and aniline in terms of inductive and mesomeric effect.

[4+4+4=12]

6. (a) Can you differentiate aldehyde and ketone by acidic $KMnO_4$? Explain your answer with related reactions.
   (b) How can you get following compounds from aldehyde?
   (i) alkene (ii) alkane (iii) cyanohydrine
   (c) Write two preparative methods for both aldehyde and ketone.

7. (a) Compare the boiling point of acetic acid and ethanol.
   (b) Why is phenol acidic whereas ethanol is neutral? Explain.
   (c) Write the reaction of ethanol with following reagents.
   (i) PCl_5 (ii) CH_3COOH (iii) HX

[3.5+4.5+4=12]

8. (a) Starting with CH_3MgBr prepare the following compounds.
   (i) methane (ii) ethanoic acid (iii) ethanol
   (b) Write a short note on 'Cannizaro reaction'.
   (c) Write the condensation of benzaldehyde with following reagents:
   (i) 1° amine (ii) alkyl hydrazine

[3+4+5=12]

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[6+3+3=12]

Part : B
(Answer any three questions)

5. (a) Why p-Methylphenol is less acidic than phenol but p-Nitrophenol is more acidic than phenol?

(b) How stability of carbocations control the percentages of products of the following reaction:

$CH_3CH = CH_2 + HBr \longrightarrow A\ (90\%) + B(10\%)$

(c) Compare between S_N1 and S_N2 reactions mechanism pathways.

[4+3+5=12]

6. (a) Ketones give negative test with Fehling and Tollen reagents but alpha-hydroxy ketones give positive test-Explain.

(b) Name and draw the structures of the organic products obtained by the following reactions.

(i) Propanone with $NaBH_4$

(ii) Propanone with HCN

(iii) Propanone with Ethanal in presence of dilute NaOH

(c) Compare between Wolf-Kishner and Cleamenson reduction.

[3+6+3=12]

7. (a) Synthesize Cyclopropane using Simmons-Smith reaction.

(b) Why following reaction is surface area dependable?

$R\text{-}X + Mg \xrightarrow{\text{Dry Ether}} RMgX$

(c) When preparation of a Grignard reagent will fail?

(d) How you will prepare Carboxylic acids and Tertiary alcohols from $CH_3\text{-}CH_2MgBr$?

[2+3+4+3=12]

8. (a) Arrange the following compounds according to their boiling point and justify

$CH_3\text{-}CHO$, $CH_3\text{-}CH_2\text{-}OH$, $CH_3\text{-}CH_3$, $CH_3\text{-}CH_2\text{-}NH_3^+Cl^-$

(b) Illustrate Friedel Craft and Williamson reaction of phenol.

(c) Write down the following conversions:

(i) Propanol $\longrightarrow$ Ethanol

(ii) Ethanol $\longrightarrow$ Propanol

[4+4+4=12]

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BANGLADESH UNIVERSITY OF TEXTILES

B. Sc. in Textile Engineering

Level-1 Term-II, Final Examination-2017

Subject: Chemistry-II (Code: CHEM 103)

Time: 3.0 Hrs. **Full Marks: 72**

(Use separate answer script for Part: A and Part: B)

(All parts of a question must be answered consecutively)

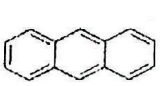
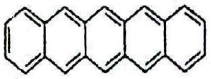
Part : A

(Answer any three questions)

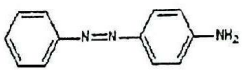
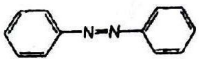
1. (a) Write an identification test of amino acid.
   (b) Why non-essential amino acids are so called? Write the name of two non-essential amino acid.
   (c) How can you get lactic acid from alanine?
   (d) Isoelectric point of alanine is 6.01, whereas that of arginine is 10.75. – Explain.

[3+4+2+3=12]

2. (a) Explain the following facts:

i)  is colorless, whereas  is a blue colored compound.

(anthracene) (Pentacene)

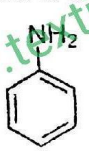
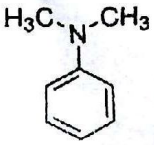
ii)  is more colorful than 

(p-amino azobenzene) (azobenzene)

   (b) Write the differences between dye and pigment.
   (c) Why reactive dyes are so called? Write the working mechanism of reactive dye.

[5+3+4=12]

3. (a) Apply Hinsberg test to distinguish the following compounds:

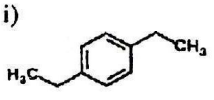
 $(CH_3CH_2)_2NH$ and 

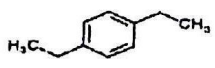
   (b) Complete the following reactions with explanation:

 $+ CH_3COCl \longrightarrow$?

 $+ CH_3COCl \xrightarrow{AlCl_3}$?

   (c) Complete the following reactions:

i)  $\xrightarrow{K_2Cr_2O_7,\ H^+}$

ii)  $\xrightarrow{KMnO_4,\ heat}$

[3+5+4=12]

4. (a) "Glucose shows mutarotation but sucrose does not"- Give your opinion in terms of this statement.
   (b) Convert Fisher Projection formula of D-Glucose to Hawarth formula.
   (c) Complete the following sequence, where A is a ketohexose and E is an aldohexose;

$$A \xrightarrow[Na\text{-}Hg\ /\ H_2O]{[H]} B \xrightarrow[Br_2\ /\ H_2O]{[O]} C \xrightarrow{Heat} D \xrightarrow[Na\text{-}Hg\ /dil.\ Acid]{[H]} E$$

[4+3+5=12]

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Part: B

(Answer any three questions)

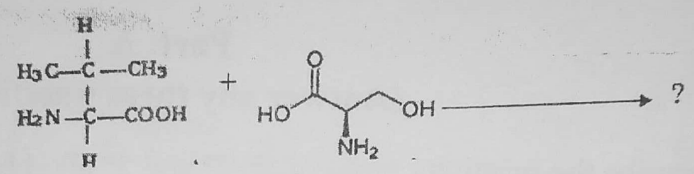
5. (a) Write Gabriel method for synthesis of α-amino acid.
   (b) Complete the following reactions (any three):

i) $H_2N\text{-}CH_2\text{-}COOH \longrightarrow HO\text{-}CH_2\text{-}COOH$

ii) $R\text{-}CH(NH_2)\text{-}COOH + R'\text{-}OH \longrightarrow ?$

iii) $H_2N\text{-}CH(CH_3)\text{-}COOH \xrightarrow{?} H_2N\text{-}CH_2\text{-}CH_3$

iv)



   (c) Write the chemical structure and name of three neutral amino acids.

[4+4+4=12]

6. (a) Show the formation of N-Glycosides during formation of β-N glycosidic bond.
   (b) Synthesize the following textile fibers from cellulose:
   (i) Rayon (ii) Acetate Rayon
   (c) Discuss the digestive system of cellulose.
   (d) Write the methylation reaction sucrose.

[3+3+2+4=12]

7. (a) Why vat dye are so called? Write the working mechanism of vat dye.
   (b) Synthesize Butter yellow dye (figure: a) from nitrobenzene through dye intermediate.

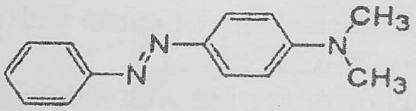
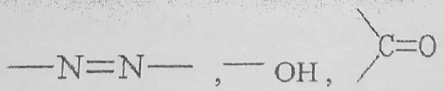


Fig: Butter yellow dye

   (c) Indicate followings as chromophore/ auxochrome (with explanation):



   (d) Write the classification of dye based on chromophore present.

[4+3+3+2=12]

8. (a) Write the mechanism for the following reaction:

$$R\text{-}C{\equiv}N \xrightarrow[\text{Heat}]{H_2O,\ H^+} R\text{-}CO_2H$$

   (b) Benzoic acid reacts with $NaHCO_3$ but phenol doesn't-Justify the statement.
   (c) Compare the reactivity among RCOCI, $RCONH_2$ and RCOOR.
   (d) Write the synthesis of polyethyleneterephthalate (PET).

[4+3+3+2=12]

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B. Sc. in Textile Engineering

Level-1 Term-II, Final Examination-2018

Subject: Chemistry-II (Code: CHEM 103)

Time: 3.0 Hrs. **Full Marks: 72**

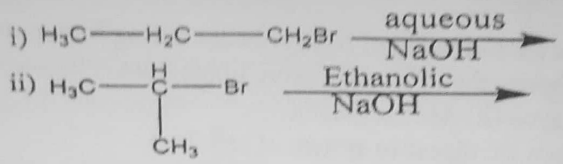
(Use separate answer script for Part: A and Part: B)

(All parts of a question must be answered consecutively)

Part: A

(Answer any three questions)

1. (a) Describe the reactivity order of 1°, 2° and 3° alkyl halides towards S_N1 and S_N2 reactions.
   (b) Complete following reactions. Write E1 mechanism for the reaction which follows elimination pathway



   (c) Differentiate between (i) Inductive effect and electromeric effect. (ii) Electrophilic addition and nucleophilic addition reaction.

[4+4+4=12]

2. (a) What is keto-enol tautomerism? Which of the following compounds will participate in Canizzaro reaction and why? Explain with mechanism.
   (i) H-CHO (ii) CH_3CHO.
   (b) Write the reaction of acetone with following reagents:
   (i) Hydroxylamine. (ii) Zn(Hg)/HCl. (iii) Water. (iv) NH_2-NH_2/KOH.
   (c) Write two preparative methods of ketone.

[5+4+3=12]

3. (a) Apply the effect of substituent's on following to determine the higher basicity of compound

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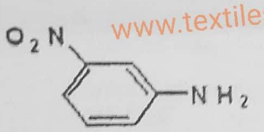
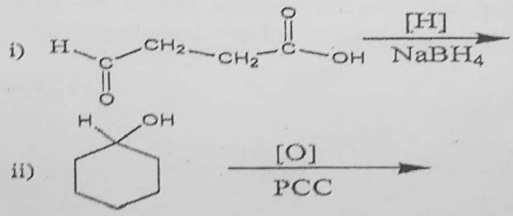


3-Nitroaniline

4-Nitroaniline

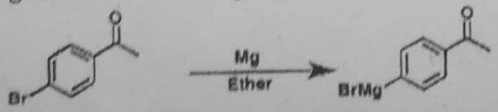
   (b) Complete following reactions:



   (c) Bromination of aniline yields 2,4,6-tri bromo derivative. How p-bromo aniline can be obtained as major product?
   (d) Illustrate esterification reaction of alcohol with inorganic acid.

[3+3+3+3=12]

4. (a) Mention the limitations of Grignard reagent.
   (b) The following product preparation is not possible in following reaction. Show the necessary steps to generate the desired product.



This is not the product of this reaction.

   (c) Synthesize organozinc halides using:
   (i) Highly reactive zinc (Zn*) (ii) Transmetallation reaction.
   (d) How does lead (Pb) improve the octane rating?

[2+3+4+3=12]

BANGLADESH UNIVERSITY OF TEXTILES

B. Sc. in Textile Engineering

Level-1 Term-II, Final Examination-2020

Subject: Chemistry-II (Code: CHEM 103/AS 111)

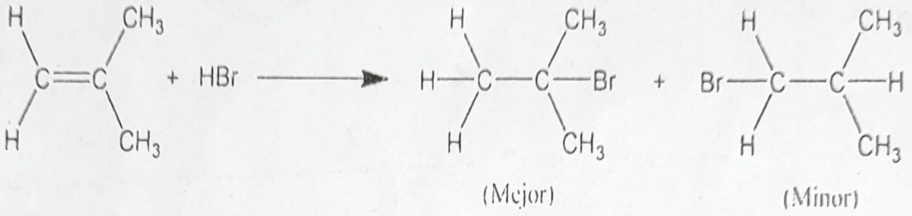
Time: 3.0 Hrs. **Full Marks: 72**

(Use separate answer script for Part A and Part B)
(All parts of a question must be answered consecutively)

Part: A

(Answer any three questions)

1. (a) Discuss the factors that restrict the preparation of Grignard reagents.
   (b) How stability of carbocations control percentages of products of the following reaction? Explain with mechanism.



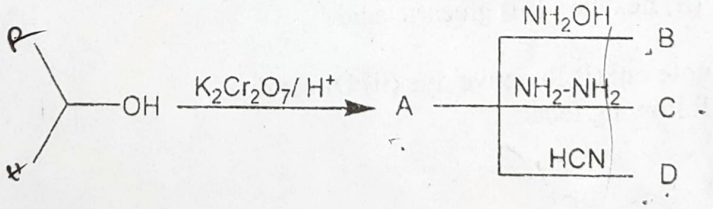
   (c) Use Organo-zinc compound to prepare the following products: (any two)
   (i) Propan-2-ol (ii) β-hydroxy ester (iii) 2-methylpropan-2-ol.

[4+4+4=12]

2. (a) Synthesize 1°, 2° and 3° alcohol using Grignard Reagent.
   (b) Prepare the following compounds from phenol (i) Toluene (ii) Salicylaldehyde.
   (c) How can you explain phenol is acidic whereas ethanol is neutral?

[4+4+4=12]

3. (a) Arrange the following compounds according to their increasing boiling point and justify.
   CH_3-CH_2-CH_2-CH_3, CH_3-CH_2-CH_2-OH, CH_3-CO-CH_3.
   (b) Compound A give positive Tollen's test. Write the structures for A, B, C, D.



   (c) Describe two general methods for preparation of aromatic ketones.

[4+4+4=12]

4. (a) Define diazonium salt. Distinguish 1°, 2° and 3° amines by Hinsberg test.
   (b) Bromination of aniline yields 2, 4, 6-tri bromo derivative. How *p*-bromo aniline can be obtained as major product?
   (c) Which of the following compound is more basic and why?
   (i) Methylamine and (ii) Aniline.

[4+4+4=12]

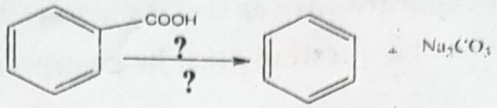
Part: B

(Answer any three questions)

5. (a) Write the respective structure of alanine in a solution having pH 3, 6 and 8. (pl value of alanine is 6.11).
   (b) Why glycine is optically inactive?
   (c) Write general structure of a polypeptide chain and indicate its N-terminal and C-terminal.

[4+4+4=12]

6. (a) How can you get carboxylic acid from followings:
(i) Alkene (ii) Amide (iii) Acyl chloride.
(b) Nucleophilic substitution reaction of carboxylic acid favors acidic media rather basic- explain with mechanism.
(c) Complete following reactions:
i)



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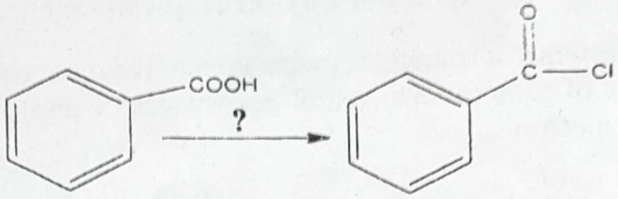

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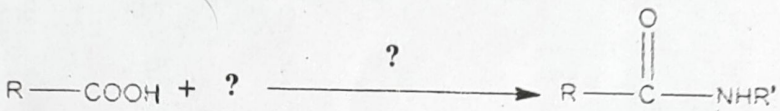

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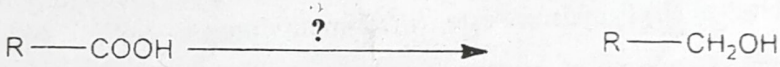


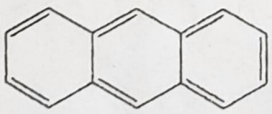
NaHBr

[3+5+4=12]

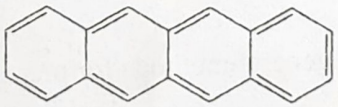
7. (a) Which one of the following monosaccharides will act as a reducing sugar? Explain with reaction.
(i) Glucose (ii) Fructose.
(b) Write the reaction for synthesis of sucrose from its monomer. (Write Haworth projection for each structure).
(c) Prepare the following compounds from glucose (any two)
(i) sorbitol (ii) hexane (iii) glucaric acid

[4+5+3=12]

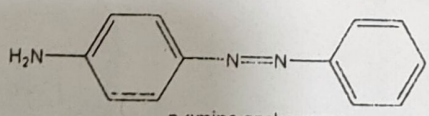
8. (a) Write short note on: (i) Reactive dye (ii) Direct dye.
(b) Explain the following facts:
i)


anthracene

is colorless, where

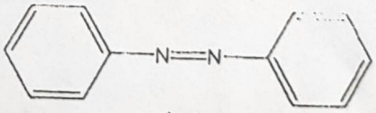

naphthacene

is a yellow-colored compound.
ii)



p-amino azobenzene

is more colorful than



azobenzene

(c) Write the differences between dye and pigment.

[4+5+3=12]

** ** **