ROLL NUMBER				

SET	A

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
CHEMISTRY(043)

CLASS : XII
DATE: 11-09-2022

TIME ALLOTED : 3 HRS.
MAXIMUM MARKS:70

GENERAL INSTRUCTIONS:

a) All questions are compulsory.

b) There is no overall choice. However, there are internal choices in two 1 mark questions, two 2 marks questions, two 3 marks questions and in one 5 marks question. You have to attempt only one of the choices in such questions.

SECTION A

Read the passage given below and answer the following questions:

1. A biomolecule or biological molecule is a loosely used term for molecules and ions present in organisms that are essential to one or more typically biological processes, such as cell division, morphogenesis, or development. Biomolecules include large macromolecules or polyanions such as proteins, carbohydrates, lipids, and nucleic acids, as well as small molecules such as primary metabolites, secondary metabolites and natural products. A more general name for this class of material is biological materials. Biomolecules are usually endogenous, produced within the organism but organisms usually need exogenous biomolecules, for example certain nutrients, to survive. Most biomolecules are organic compounds, and just four elements-oxygen, carbon, hydrogen, and nitrogen-make up 96% of the human body's mass. But many other elements, such as the various biometals, are present in small amounts. 1x5=5

a) Give one example each for essential and non-essential amino acids?

b) Write one functional difference between DNA and RNA.

c) Give an example of a peptide hormone.

d) Name the vitamins in each case whose deficiency causes:

(i)Night blindness (ii) Rickets

e) Draw the pyranose structure of α- D-Glucose

Questions 2 to 11 are multiple choice questions

2. Which of the following solution in water possesses the highest value of elevation in Boiling point? 1

(a) 0.1 M NaCl (b) 0. 1M$BaCl_2$ (c) 0.1 M KCI (d)0.1M urea

3. The concentration in gms per litre of a solution of cane sugar (M = 342) which is isotonic with a solution containing 6 gms of urea (M = 60u) per litre is: 1

(a) 3.42 (b) 34.2 (c) 5.7 (d) 19

4. The conversion PhCN to $PhCOCH_3$, can be achieved most conveniently by reaction with: 1

(a) CH_3MgBr followed by hydrolysis

(b) I_2 – NaOH

(c) $(CH_3)_2Cd$

(d) CH_3COCl in presence of anhydrous $AlCl_3$.

5. The value of Henry's constant K_H is __ 1

(a) greater for gases with higher solubility.

(b) greater for gases with lower solubility.

(c) constant for all gases.

(d) not related to the solubility of gases

6. An organic compound A (C_4H_9Cl) on reaction with Na / ether gives a hydrocarbon which on monochlorination gives only one chloro derivative, then A is: 1

(a) tert-butyl chloride (b) sec-butyl chloride (c) isobutyl chloride (d) n-butyl chloride

7. Which of the following isomer has the highest melting point? 1

(a) 1,2-Dicholorbenzene

(b) 1,3 -Dichlorobenzene

(c) 1,4-Dicholorbenzene

(d) All isomers have same melting points

8. When tertiary butyl alcohol is passed over heated |copper, the reaction taking place is: 1

(a) Oxidation (b)reduction (c) dehydration (d) substitution

9. The ether which undergoes electrophilic substitution reaction is: 1

(a) CH_3OCH_3, (b)$C_6H_5OCH_3$, (c)$CH_3OC_2H_5$, (d)$C_2H_5OC_2H_5$

10. Isopropyl alcohol on oxidation forms: 1

(a) Acetaldehyde (b) Ethylene (c)ether (d)Acetone

11. In aqueous solution, an amino acid exists as: 1

(a) cation (b) anion (c) dianion (d) zwitter ion

Questions 12 to 16 are fill in the blanks

12. The mole fraction of the solute in one molal aqueous solution is _____ 1

13. Identify X and Y in the following reaction: 1

$$CH_3\text{-}CH{=}CH_2 + HBr \longrightarrow X \xrightarrow{AgNO_2} Y$$

14. Complete the following 1

$CH_3CH_2CH(CH_3)\text{-}O\text{-}CH_2CH_3 + HI \longrightarrow$

15. $A \xrightarrow[(ii)H_2O]{(i)DIBAL-H} CH_3-CH=CHCH_2CH_2CHO$ 1

Identify A.

16. If one strand of DNA has the sequence ATGCTTGA, the sequence in the complimentary strand would be_____ 1

In the following questions (Q. No. 17 - 21) a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

(a) Assertion and reason both are correct and reason is the correct explanation for assertion.

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17. Assertion: Azeotropic mixtures are formed only by non-ideal solutions and they may have boiling points either greater or lesser than both the components. 1

Reason : The composition of the vapour phase is same as that of the liquid phase of an azeotropic mixture.

18. Assertion: The boiling point of 1-Chloropropane is greater than that of Isopropyl chloride. 1

Reason: As the molecular mass increases magnitude of van der Waal forces increases.

19. Assertion: In case of phenol, bromination takes place even in absence of Lewis acid whereas bromination of benzene takes place in presence of Lewis acid like $FeBr_3$. 1

Reason : – OH group attached to benzene ring is highly deactivating.

20. Assertion: At isoelectric point, the amino acid does not migrate under the influence of electric field. 1

Reason: At isoelectric point, amino acid exists as a zwitterion.

21. Assertion: Oxidation of toluene to benzaldehyde using CrO_3 is carried out in presence of acetic anhydride. 1

Reason: Acetic anhydride stops the oxidation of benzaldehyde to benzoic acid.

Q.No 22 – 26 are very short answer questions and carry 1 mark each.

22. Define reverse osmosis. 1

OR

What do you mean by Vant Hoff factor?

23. What are freons? 1

OR

What happens when chloroform is exposed to sunlight?

24. Draw the structure of 3-Chloromethyl-2-isopropylpentan-1-ol. 1

25. Write the IUPAC name of $CH_3CH_2COCH(C_2H_5)\ CH_2CH_2Cl$. 1

26. The two strands in DNA are not identical but complementary. Explain 1

SECTION B

Q.No 27 -33 are Short Answer Type I carrying 2 marks each.

27. State Henry's law and mention two of its applications. 2

28. How many grams of KCl should be added to 1 kg of water to lower its freezing point to – 8.0°C? (K_f = 1.86 K kg/mol, RAM K=39u,Cl=35.5 u) 2

29. Write the structure of the product: 2

(a) When chlorobenzene is treated with chloromethane in presence of sodium metal and dry ether.

(b) Dehydrohalogenation of 1-Bromo- 1-methylcyclohexane with alcoholic KOH.

OR

Explain why

(a) Grignard reagent is prepared and stored in anhydrous conditions

(b) Primary benzylic and allylic halides follow S_N1 mechanism

30. Convert 2

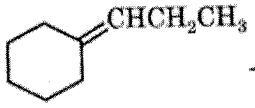
(a) Benzene to benzaldehyde

(b) Propene to Propanone

OR

Complete the following

(a) $CH_3 - C \equiv CH \xrightarrow[H_2SO_4/H_2O]{HgSO_4}$

(b) 

$\xrightarrow[2.Zn/H_2O]{1.O_3}$ (A) + (B)

31. (a) Arrange the following compounds in increasing order of their acid strength: 2
Propan-1-ol, 2, 4, 6-trinitrophenol, 3-nitrophenol, 3, 5-dinitrophenol, phenol, 4-methylphenol

(b) Write the names of reagents and equations for the preparation of Ethoxybenzene by Williamson's synthesis.

32. Suggest a mechanism for the dehydration of ethanol using conc.H_2SO_4 at 443 K. 2

33. Write Short note on: 2

(a) Glycosidic linkage (b) Amylopectin

SECTION C

Q.No 34 -40 are Short Answers Type II carrying 3 marks each.

34. 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0°C .Calculate the Van't Hoff factor and degree of dissociation. (K_f=1.86 $KKgmol^{-1}$ RAM C=12,H=1,O=16 F=19u) 3

35. An alkyl halide X of molecular formula $C_6H_{13}Cl$ on treatment with potassium tert-butoxide gives two isomeric alkene Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2,3-dimethylbutane. Predict the structures of X, Y and Z. Write all the reactions. 3

OR

(a) Give a chemical test to distinguish between chlorobenzene and benzyl chloride.

(b) Which of the following is more reactive towards S_N1 mechanism and why?
CH_3-CH_2-CH_2Br or CH_2=CH-CH_2Br

(c) What are ambident nucleophiles?

36. Give reason for the following observations: 3

(a) Ethyl iodide undergoes S_N2 reaction faster than ethyl bromide.

(b) Sulphuric acid not used during the reaction of alcohols with KI.

(c) Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides.

37. Give equations for the reactions of phenol with: 3

(a) Dil. HNO_3 (b) Zn dust (c) NaOH and CO_2

38. Name the reagent used in the following reactions: 3

(a) Benzyl alcohol to benzaldehyde

(b) Anisole to 4-methoxyacetophenone

(c) Acetophenone to 2-phenylbutan-2-ol

39. Explain the following reactions giving one example of each : 3

(a) Rosenmund reduction reaction

(b) Stephen reaction

(c) Etard reaction

40. What happens when D-Glucose is treated with the following reagents? Explain with equations. 3

(a) HI

(b) Bromine water

(c) Hydroxylamine

OR

Differentiate between the following :

(a) Nucleoside and Nucleotide

(b) Native protein and denatured protein

(c) Fibrous and globular proteins

SECTION D

SECTION D

Q.No 41 is a long answer question carrying 5 marks

41. (a) The vapour pressure of ethanol and methanol are 44.5 mm and 88.7 mm of Hg respectively. A solution is prepared by mixing 60 g of ethanol and 40 g of methanol. Assuming the solution to be ideal, calculate the vapour pressure of the solution. 5

(b) Henry's law constant for the solubility of methane in benzene at 298 K is 4.27×10^5 mm Hg. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg.

(c) Define the term cryoscopic constant.

OR

(a) Calculate the freezing point of an aqueous solution of a non-electrolyte having an osmotic pressure of 2 atm at 300K. (K_f=1.86KKgmol^{-1}, R=0.0821 Latm K^{-1}mol^{-1})

(b) What type of deviation is shown by acetone and CS_2 mixture and why?

(c) What is meant by abnormal molar mass?

******END OF THE QUESTION PAPER******

ROLL NUMBER				

SET	B

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
CHEMISTRY(043)

CLASS : XII
DATE: 11-09-2022

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(a) Give one example each for essential and non-essential amino acids?

(b) Write one functional difference between DNA and RNA.

(c) Give an example of a peptide hormone.

(d) Name the disease caused by the deficiency of:

(i) Vitamin D (ii)Vitamin C

(e) Draw the pyranose structure of β- D-Glucose.

Questions 2 to 11 are multiple choice questions

2. The conversion PhCN to $PhCOCH_3$, can be achieved most conveniently by reaction with: 1

(a) CH_3MgBr followed by hydrolysis

(b) I_2 – NaOH

(c) $(CH_3)_2Cd$

(d) CH_3COCl in presence of anhydrous $AlCl_3$.

3. The value of Henry's constant K_H is __ 1

(a) greater for gases with higher solubility.

(b) greater for gases with lower solubility.

(c) constant for all gases.

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4. Which of the following solution in water possesses the highest value of elevation in Boiling point? 1

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5. The concentration in gms per litre of a solution of cane sugar (M = 342) which is isotonic with a solution containing 6 gms of urea (M = 60) per litre is: 1

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6. An organic compound A (C_4H_9Cl) on reaction with Na/diethyl ether gives a hydrocarbon which on monochlorination gives only one chloro derivative, then A is: 1

(a) tert-butyl chloride (b) sec-butyl chloride (c) isobutyl chloride (d) n-butyl chloride

7. In order to convert aniline into chlorobenzene the reagents used are: 1

(a) Cu_2Cl_2

(b) $NaNO_2$ /HCl and Cu_2Cl_2

(c) Cl_2 /CCl_4

(d) Cl_2 /$AlCl_3$

8. When tertiary butyl alcohol is passed over heated copper, the reaction taking place is: 1

(a) Oxidation (b)reduction (c) dehydration (d) substitution

9. The ether which undergoes electrophilic substitution reaction is: 1

(a) CH_3OCH_3, (b)$C_6H_5OCH_3$, (c)$CH_3OC_2H_5$, (d)$C_2H_5OC_2H_5$

10. Isopropyl alcohol on oxidation forms: 1

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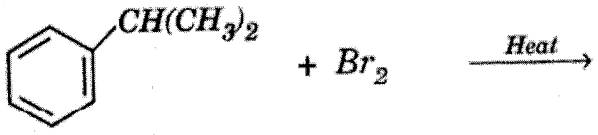
12. The mole fraction of the solute in one molal aqueous solution is _____. 1

13. Complete the following 1



14. Complete the following 1

C_6H_5-O-CH_2CH_3 + HI ⟶

15. A $\xrightarrow[(ii)H_2O]{(i)DIBAL-H}$ $CH_3-CH=CHCH_2CH_2CHO$ 1

Identify A.

16. If one strand of DNA has the sequence ATGCTTGA, the sequence in the complimentary strand would be_____. 1

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Reason : At isoelectric point, amino acid exists as a zwitterion.

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Reason: The composition of the vapour phase is same as that of the liquid phase of an azeotropic mixture.

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Reason : – OH group attached to benzene ring is highly deactivating.

21. Assertion: Oxidation of toluene to benzaldehyde using CrO_3 is carried out in presence of acetic anhydride. 1

Reason: Acetic anhydride stops the oxidation of benzaldehyde to benzoic acid.

Q.No 22 – 26 are very short answer questions and carry 1 mark each.

22. Write the IUPAC name of $CH_3CH_2COCH(C_2H_5)\ CH_2CH_2Cl$. 1

23. Define reverse osmosis. 1

OR

What do you mean by Vant Hoff factor?

24. What are freons? 1

OR

What happens when chloroform is exposed to sunlight?

25. Draw the structure of 3-Chloromethyl-2-isopropylpentan-1-ol. 1

26. What are anomers? 1

SECTION B

Q.No 27 -33 are Short Answer Type I carrying 2 marks each.

27. (a) Arrange the following compounds in increasing order of their acid strength: 2

Propan-1-ol, 2, 4, 6-trinitrophenol, 3-nitrophenol, 3, 5-dinitrophenol, phenol, 4 -methyl phenol

(b) Write the names of reagents and equations for the preparation of Ethoxybenzene by Williamson's synthesis.

28. State Henry's law and mention two of its applications. 2

29. How many grams of KCl should be added to 1 kg of water to lower its freezing point to – 8.0°C ? (K_f = 1.86 K kg/mol, RAM K=39,Cl=35.5 u) 2

30. Write the structure of the products: 2

(a) When chlorobenzene is treated with chloromethane in presence of sodium metal and dry ether.

(b) Dehydrohalogenation of 1-Bromo- 1-methylcyclohexane with alcoholic KOH.

OR

Explain why:

(a) Grignard reagent is prepared and stored in anhydrous conditions

(b) Primary benzylic and allylic halides follow S_N1 mechanism

31. Convert: 2

(a) Benzene to benzaldehyde

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Complete the following:

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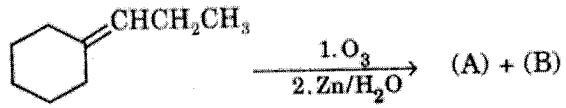
(b) 

32. Suggest a mechanism for the acid catalyzed hydration of ethene. 2

33. Write Short note on: 2

(a) Native protein (b) Invert sugar

SECTION C

Q.No 34 -40are Short Answer Type II questions carrying 3 marks each.

34. 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0□C. Calculate the Van't Hoff factor and degree of dissociation of fluoroacetic acid. (K_f=1.86 KKgmol^{-1} , RAM C=12,H=1,O=16, F=19 u) 3

35. An alkyl halide X of molecular formula $C_6H_{13}Cl$ on treatment with potassium tert-butoxide gives two isomeric alkene Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2,3-dimethylbutane. Predict the structures of X, Y and Z. Write all the reactions. 3

OR

(a) Give a chemical test to distinguish between chlorobenzene and benzyl chloride.

(b) Which of the following is more reactive towards S_N1 mechanism and why?

CH_3-CH_2-CH_2Br or CH_2=CH-CH_2Br

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36. Give reason for the following observations 3

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(c) Hydroxylamine

OR

Differentiate between the following :

(a) Nucleoside and Nucleotide

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SECTION D

Q.No 41 is a long answer question carrying 5 marks.

41. (a) The vapour pressure of ethanol and methanol are 44.5 mm and 88.7 mm Hg respectively. A solution is prepared by mixing 60 g of ethanol and 40 g of methanol. Assuming the solution to be ideal, calculate the vapour pressure of the solution. 5

(b) Henry's law constant for the solubility of methane in benzene at 298 K is 4.27×10^5 mm Hg. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg

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OR

(a) Calculate the freezing point of an aqueous solution of a non-electrolyte having an osmotic pressure of 2 atm at 300K. (K_f=1.86 $KKgmol^{-1}$, R=0.0821Latm $K^{-1}mol^{-1}$)

(b) What type of deviation is shown by acetone and CS_2 mixture and why?

(c) What is meant by abnormal molar mass?

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9/129

ROLL NUMBER				

SET	C

INDIAN SCHOOL MUSCAT
HALF YEARLY EXAMINATION 2022
CHEMISTRY(043)

CLASS : XII
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e) Draw the structure of α-D(-)fructofuranose.

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Questions 12 to 16 are fill in the blanks

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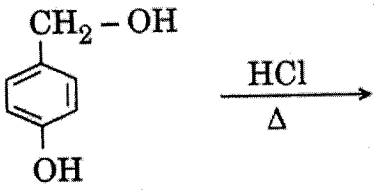
14. Predict the major product : 1



15. Complete the following 1

$(CH_3)_3C$ -O-CH_2CH_3 + HI ⟶

16. $A \xrightarrow[(ii)H_2O]{(i)DIBAL-H} CH_3-CH=CHCH_2CH_2CHO$ 1

Identify A.

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Reason: Acetic anhydride stops the oxidation of benzaldehyde to benzoic acid.

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Reason: As the molecular mass increases magnitude of van der Waal forces increases.

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21. Assertion: At isoelectric point, the amino acid does not migrate under the influence of electric field. 1

Reason: At isoelectric point, amino acid exists as a zwitterion.

Q.No 22 – 26 are very short answer questions and carry 1 mark each.

22. Define reverse osmosis. 1

OR

What do you mean by Vant Hoff factor?

23. Draw the structure of 3-Chloromethyl-2-isopropylpentan-1-ol. 1

24. Write the IUPAC name of $CH_3CH_2COCH(C_2H_5)\ CH_2CH_2Cl$. 1

25. What are anomers? 1

26. What are freons? 1

OR

What happens when chloroform is exposed to sunlight?

SECTION B

Q.No 27 -33 are Short Answer Type I carrying 2 marks each.

27. State Henry's law and mention two of its applications. 2

28. How many grams of KCl should be added to 1 kg of water to lower its freezing point to – 8.0°C ? (K_f = 1.86 K kg/mol,RAM K=39,Cl=35.5 u) 2

29. Write the structure of the product: 2

(a) When chlorobenzene is treated with chloromethane in presence of sodium metal and dry ether.

(b) Dehydrohalogenation of 1-Bromo- 1-methylcyclohexane with alcoholic KOH.

OR

Explain why :

(a) Grignard reagent is prepared and stored in anhydrous conditions
(b) Primary benzylic and allylic halides follow S_N1 mechanism

30. Convert: 2

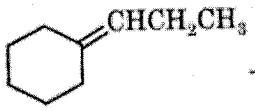
(a) Benzene to benzaldehyde

(b) Propene to Propanal

OR

Complete the following

(a) $CH_3 - C \equiv CH \xrightarrow[H_2SO_4/H_2O]{HgSO_4}$

(b) 

$\xrightarrow[2.\,Zn/H_2O]{1.\,O_3}$ (A) + (B)

31. (a) Arrange the following compounds in increasing order of their acid strength: 2
Propan-1-ol, 2, 4, 6-trinitrophenol, 3-nitrophenol, 3, 5-dinitrophenol, phenol, 4-methylphenol

(b) Write the names of reagents and equations for the preparation of Ethoxybenzene by Williamson's synthesis.

32. Suggest a mechanism for the dehydration of ethanol using conc.H_2SO_4 at 413K. 2

33. Write Short note on: 2

(a) Glycosidic linkage (b) Amylopectin

SECTION C

Q.No 34 -40are Short Answer Type II carrying 3 mark each.

34. What happens when D-Glucose is treated with the following reagents? Explain with equations. 3

(a) HI

(b) Bromine water

(c) HCN

OR

Differentiate between the following :

(a) Nucleoside and Nucleotide

(b) Native protein and denatured protein

(c) fibrous and globular proteins

35. 19.5 g of CH_2FCOOH is dissolved in 500 g of water. The depression in the freezing point of water observed is 1.0□C. Calculate the van't Hoff factor and degree of dissociation of fluoro acetic acid. (K_f=1.86 KKgmol^{-1} , RAM C=12,H=1,O=16 F=19u)) 3

36. An alkyl halide X of molecular formula $C_6H_{13}Cl$ on treatment with potassium tert-butoxide gives two isomeric alkene Y and Z (C_6H_{12}). Both alkenes on hydrogenation give 2,3-dimethylbutane. Predict the structures of X, Y and Z. Write all the reactions. 3

OR

(a) Give a chemical test to distinguish between chlorobenzene and benzyl chloride.

(b) Which of the following is more reactive towards S_N1 mechanism and why?

CH_3-CH_2-CH_2Br or CH_2=CH-CH_2Br

(c) What are ambident nucleophiles?

37. Give reason for the following observations: 3

(a) Ethyl iodide undergoes S_N2 reaction faster than ethyl bromide.

(b) Sulphuric acid not used during the reaction of alcohols with KI.

(c) Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides.

38. Give equations for the reactions of phenol with: 3

(a) Con HNO_3 (b) Zn dust (c) NaOH and CO_2

39. Name the reagent used in the following reactions: 3

(a) Benzyl alcohol to benzaldehyde

(b) Anisole to 4-methoxyacetophenone

(c) Acetophenone to 2-phenylbutan-2-ol

40. Explain the following reactions giving one example of each : 3

(a) Rosenmund reduction reaction

(b) Stephen reaction

(c) Etard reaction

SECTION D

Q.No 41 is a long answer question carrying 5 marks

41. (a) The vapour pressure of ethanol and methanol are 44.5 mm and 88.7 mm Hg respectively. A solution is prepared by mixing 60 g of ethanol and 40 g of methanol. Assuming the solution to be ideal, calculate the vapour pressure of the solution. 5

(b) Henry's law constant for the solubility of methane in benzene at 298 K is 4.27×10^5 mm Hg. Calculate the solubility of methane in benzene at 298 K under 760 mm Hg

(c) Define the term ebullioscopic constant.

OR

(a) Calculate the freezing point of an aqueous solution of a non-electrolyte having an osmotic pressure of 2 atm at 300K. (K_f=1.86 $KKgmol^{-1}$,R=0.0821 Latm $K^{-1}mol^{-1}$)

(b) What type of deviation is shown by acetone and CS_2 mixture and why?

(c) What is meant by abnormal molecular mass?

******END OF THE QUESTION PAPER******