BUDHA DAL PUBLIC SCHOOL, PATIALA
Second Term Examination (13 December 2024)

Class XII (Science)
Subject - Chemistry
(Set - A)

Time: 3hrs. **M.M. 70**

General Instructions:

1. There are 33 questions in this question paper with internal choice.
2. Section A consists of 16 multiple-choice questions carrying 1 mark each.
3. Section B consists of 5 short answer questions carrying 2 marks each.
4. Section C consists of 7 short answer questions carrying 3 marks each.
5. Section D consists of 2 case-based questions carrying 4 marks each.
6. Section E consists of 3 long answer questions carrying 5 marks each.
7. All questions are compulsory.
8. Use of log tables and calculators is not allowed.

Section - A

Q1. Which one of the following halides contains C_{SP^2} -X bond?

a) Allyl halide b) Alkyl halide c) Benzyl halide d) Vinyl halide

Q2. The synthesis of alkyl fluoride is best obtained from

a) Free radicals b) Swarts reaction c) Sandmeyer reaction d) Finkelstein reaction

Q3. Major product obtained on reaction of 3-phenylpropene with HBr in presence of organic peroxide is

a) 3-phenyl-1-bromopropane b) 1-phenyl-3-bromopropane

c) 1-phenyl-2-bromopropane d) 3-phenyl-2-bromopropane

Q4. Match the reagents required for the given reactions:

I) Oxidation of primary alcohols to aldehydes	(p) $NaBH_4$
II) Butan-2-one to butan-2-ol	(q) 85% phosphoric acid at 440K
III) Bromination of phenol to 2, 4, 6-tribromophenol	(r) PCC
IV) Dehydration of propan-2-ol to propene	(s) Bromine water

a) I – (r), (II) – (p), III - (s), IV – (q) b) I – (q), (II) – (r), III - (p), IV – (s)

c) I – (s), (II) – (q), III - (p), IV – (r) d) I – (p), (II) – (s), III - (r), IV – (q)

Q5. Which of the following acids reacts with acetic anhybride to form aspirin?

a) Benzoic acid b) Salicylic acid c) Phthalic acid d) Acetic acid

Q6. Rosenmund reduction is used for the preparation of aldehydes. The catalyst used in this reaction is

a) Pd – $BaSO_4$ b) anhydrous $AlCl_3$ c) Iron (III) oxide d) $HgSO_4$

Q7. Iodoform test is not given by

a) ethanol b) ethanal c) pentan-2-one d) pentan-3-one

Q8. The correct name of the given reaction is

$$Ar - N_2^+ X^- \qquad Ar - Br + N_2$$

a) Hoffmann bromamide degradation reaction
b) Gabriel phtanlimide synthsis
c) Carbylamine reaction
d) Catterman reaction

Q9. Aniline on heating with conc. HNO_3 + conc. H_2SO_4 mixture yields

a) O-nitroaniline b) m-nitroaniline c) p-nitroaniline d) all of thee

Q10. In cold conditions, aniline is diazotized and then treated with aniline again to give a coloured product. The structure of the coloured product is

Q11. $\alpha - D(+)$ glucose and $\beta - D(+)$ glucose are

a) Geometrical isomers b) enantiomers c) anomers d) optical isomers

Q12. Peptide linkage is present in

a) carbohydrates b) vitamins c) protein d) rubber

In the following questions, two statements are given – one labeled Assertion (A) and the other labeled Reason (R). Select the correct answer to the questions from the codes (a), (b), (c) and (d) as given below:

a) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is the correct explanation of the Assertion (A).

b) Both Assertion (A) and Reason (R) are correct statements, and Reason (R) is not the correct explanation of the Assertion (A).

c) Assertion (A) is correct, but Reason (R) is incorrect statement.

d) Assertion (A) is incorrect, but Reason (R) is correct statement.

Q13. Assertion (A) : Inversion of configuration is observed in S_N2 reaction.

Reason (R) : The reaction proceeds with the formation of carbocation.

Q14. Assertion (A) : The C – O – H bond angle in alcohols is slightly less than the tetrahedral angle.

Reason (R) : This is due to the repulsive interaction between the two lone electron pairs on oxygen.

Q15. Assertion (A) : Oxidation of ketones is easier than aldehydes.

Reason (R) : C – C bond of ketones is stronger than C – H bond of aldehydes.

Q16. Assertion (A) : Enzymes are very specific for a particular reaction and for a particular substrate.

Reason (R) : Enzymes are biocatalysts.

Section - B

Q17. Haloalkanes react with KCN to form alkyl cyanides as main product while AgCN forms isocyanides as the chief product. Explain.

Q18. Write the mechanism of hydration of alkene to form alcohol.

OR

Predict the major product of acid catalysed dehydration of

a) 1-methylcyclohexanol b) butan-1-ol

Q19. Arrange the following compounds in increasing order of their property as indicated:

a) Acetaldehyde, Acetone, Di-tert-butyl ketone, Methyl tert-butyl ketone (reactivity towards HCN)

b) Benzoic acid, 4-nitrobenzoic acid, 3, 4-dinitrobenzoic acid, 4-methoxy benzoic acid (acid strength)

Q20. Write short notes on

a) Carbylamine reaction b) Hoffmann's bromamide reaction

Q21. What are the expected products of hydrolysis of lactose?

Section – C

Q22. Complete the following

a) $(CH_3)_3\,CBr + KOH$

b) $C_6H_5ONa + C_2H_5Cl$

c) $CH_3\,CH\,(Br)CH_2CH_3 + NaOH$

Q23. How are following conversions carried out?

a) Propene Propane – 2 – ol

b) Ethyl magnesium chloride Propane – 1 – ol

c) Phenol Salicyladehyde

Q24. Give reasons:

a) Propanol has higher boiling point than that of butane.

b) Ortho – nitrophenol is more acidic than orthomethyoxyphenol

c) Alcohols are comparatively more soluble in water than hydrocarbons of comparable molecular masses.

Q28. Give simple chemical tests to distinguish between the following pairs of compounds:

a) Propanal and Propanone b) Ethanal and Propanal c) Phenol and Benzoic acid

Q26. Write IUPAC names

a) $CH_3\,CO\,(CH_2)_4\,CH_3$ b) Ph – CH = CH – CHO c) $(CH_3)_3\,C\,CH_2\,COOH$

Q27. Arrange the following in increasing order of basic strength

a) $C_2H_5NH_2$, $(C_2H_5)_2NH$, NH_3, $(C_2H_5)_3N$ (in gaseous phase)

b) $(CH_3)_3N$, $(CH_3)_2\,NH$, $CH_3\,NH_2$, NH_3 (in aqueous phase)

c) NH_3, $C_6H_5NH_2$, $C_6H_5CH_2NH_2$, $(C_2H_5)_2\,NH$

OR

Give reasons :

b) Aniline does not undergo Friedal-Crafts reaction.

c) Gabriel phthalimide synthesis is preferred for synthesizing primary amine.

d) pKb of aniline is more than that of methylamine.

Q28. What happens when D-glucose is treated with the following reagents?

b) HI b) Bromine water c) HNO_3

Section – D

Q29. Read the passage given below and answer the following questions:

Nucleophilic substitution reaction of haloalkane can be conducted according to both S_N1 and S_N2 mechanisms. S_N1 is a two step reaction while S_N2 is a single step reaction. For any haloalkane which mechanism is followed depends on factors such as structure of haloalkane, properties of leaving group, nucleophilic reagent and solvent.

Influences of solvent polarity: In S_N1 reaction, the polarity of the system increases from the reactant to the transition state, because a polar solvent has a greater effect on the transition state than the reactant, thereby reducing activation energy and accelerating the reaction, In S_N2 reaction, the polarity of the system generally does not change from the reactant to the transition state and only charge dispersion occurs. At this time, polar solvent has a great stabilizing effect on Nu than the transition state, thereby increasing the activation energy and slow down the reaction rate. For example, the decomposition rate (S_N1) of tertiary chlorobutane at 25°C in water (dielectric constant 79) is 300000 times faster than in ethanol (dielectric constant 24). The reaction rate (S_N2) of 2-Bromopropane and NaOH in ethanol containing 40% water is twice slower than in absolute ethanol. Hence, the level of solvent polarity has influence on both S_N1 and S_N2 reaction, but with different results. Generally speaking weak polar solvent is favourable for S_N2 reaction, while strong polar solvent is favourable for S_N1. Generally speaking the substitution reaction of tertiary haloalkane is based on SN1 mechanism in solvents with a strong polarity (for example ethanol containing water).

a) Why racemisation occurs in S_N1?
b) Why is ethanol less polar than water?
c) Which one of the following in each pair is more reactive towards S_N2 reaction?

OR

c) Arrange the following in the increasing order of their reactivity towards S_N1 reactions.
i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane
ii) 1-Bromo-3-methylbutane, 2-Bromo-2 –methylbutane, 2-Bromo-3-methylbutane

Q30 Read the following passage and answer the questions that follow:

Amines can be considered as derivatives of ammonia and are usually formed from nitriles, nitro, halides, amides, etc. They show hydrogen bonding which influences their physical properties. In aromatic amines, electron releasing and withdrawing groups respectively increase and decrease their basic character.

Hinsberg test is used for the identification and distinction between primary, secondary and tertiary amines.

1. Ethyl amine can be prepared by the action of $LiAlH_4$ on
   a) CH_3NO_2 b) $CH_3 - CN$ c) $CH_3 - NC$ d) $CH_3 - CH_2 - CONH_2$
2. Which of the following reagents is used for the Hinsberg test of amines?
   a) C_6H_5COCI b) CH_3COCI c) $C_6H_5 - SO_3H$ d) $C_6H_5 - SO_2CI$
3. Out of the following, the strongest base in aqueous solution is
   a) $(CH_3)_2NH$ b) $(CH_3)_3N$ c) $CH_3 - NH_2$ d) $C_6H_5 - NH_2$
4. The reaction of ammonia with a large excess of $CH_3 - Cl$ will give mainly
   a) C_2H_6 b) $(CH_3)_2NH$ c) $(CH_3)_4N^+CI^-$ d) $CH_3 - NH_2$

OR

4. Among the following amines, which one is expected to have the lowest boiling point?
   a) $C_2H_5 - NH_2$ b) $(C_2H_5)_3N$ c) $(CH_3)_4N^+CI^-$ d) $CH_3 - NH_2$

Section - E

Q31. a) Give major products that are formed by heating the following ethers with HI

i) $CH_3 - CH_2 - CH - CH_2 - O - CH_2 - CH_3$

ii) $CH_3 - CH_2 - CH_2 - O - C - CH_2 - CH_3$

iii)

b) While separating a mixture of ortho and para nitrophenols by steam distillation, name the isomer which will be steam votalite and why?

Q32. An organic compound (A) (molecular formula $C_8H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give a carboxylic acid (B) and an alcohol (C). Oxidation of (C) with chromic acid produced (B). (C) on dehydration gives but – 1 – ene. Write equations for the reactions involved.

OR

Q32. a) Write chemical reactions to affect following transformation :

i) Butan – 1 – ol to Butanoic acid

ii) Butanal to Butanoic acid

iii) 4 – Methylacetophenone to benzene 1,4 – dicarboxyllic acid

b) Give reasons

i) Cyclohexanone forms cyanohydrin in good yield but 2, 2, 6 trimethylcyclohexanone does not

ii) During preparation of ester from carboxylic acid and alcohol in the presence of acid catalyst, the water or ester should be removed as soon as it is formed.

Q33. a) What are essential and non-essential amino acids? Give one example of each type.

b) What is the difference between nucleotide and nucleoside?

OR

Q33. (a) How are vitamins classified? Give examples of each type. Name the vitamin responsible for coagulation of blood.

(b) Differentiate between Amylose and Amylopectin