Indian School Al Wadi Al Kabir

Assessment I (2024-2025)

Class: XII | Sub: Chemistry (043) | Max. Marks: 70

Date: 26/09/2024 | Set - I | Time: 3 hours

General instructions:

(a) There are 33 questions in this question paper with internal choice.
(b) SECTION A consists of 16 multiple -choice questions carrying 1 mark each.
(c) SECTION B consists of 5 short answer questions carrying 2 marks each.
(d) SECTION C consists of 7 short answer questions carrying 3 marks each.
(e) SECTION D consists of 2 case - based questions carrying 4 marks each.
(f) SECTION E consists of 3 long answer questions carrying 5 marks each.
(g) All questions are compulsory.
(h) Use of log tables and calculators is not allowed

SECTION A

The following questions are multiple-choice questions with one correct answer. Each question carries 1 mark. There is no internal choice in this section.

1. Alcohols undergo dehydration (removal of a molecule of water) to form alkenes on treating with a protic acid. The relative ease of dehydration of alcohols follows the following order:
   (a) primary < secondary < tertiary
   (b) secondary < primary < tertiary
   (c) primary < tertiary < secondary
   (d) tertiary < primary < secondary

2. The boiling points of three compounds X, Y and Z are listed below. X, Y and Z are of almost similar molecular masses. Choose the correct combination based on boiling points.

Compound	Boiling points/K
X	390.3
Y	350.8
Z	300.8

   (a) X- alcohol, Y-alkane, Z-amine
   (b) X- alcohol, Y- amine, Z- alkane
   (c) X- amine, Y-alkane, Z-alcohol
   (d) X- alkane, Y-alcohol, Z-amine

3. Phenol on reaction with con. HNO_3 forms _____
   (a) a mixture of o-Nitrophenol and p-Nitrophenol.
   (b) p-Nitrophenol as the major product.
   (c) a mixture of o, p and m-Nitrophenols.
   (d) 2,4,6-Trinitrophenol.

4. The _____ of protein refers to the shape in which a long polypeptide chain can exist.
   (a) primary structure
   (b) secondary structure
   (c) tertiary structure
   (d) quaternary structure

5. The IUPAC name of the compound formed when CH_3COCl is hydrogenated over $Pd/BaSO_4$:
   (a) Ethanal
   (b) Acetaldehyde
   (c) Ethanol
   (d) Acetone

6. Among the compounds listed below, which has the highest pK_b value?

$C_6H_5NHCH_3$	$C_2H_5NH_2$	$(C_2H_5)_2NH$	$C_6H_5NH_2$
(I)	(II)	(III)	(IV)

   (a) (I)
   (b) (II)
   (c) (III)
   (d) (IV)

7. Which among the following bases is not present in RNA?
   (a) Adenine
   (b) Guanine
   (c) Cytosine
   (d) Thymine

8. Benzene sulphonyl chloride is known as
   (a) Baeyer's reagent.
   (b) Hinsberg's reagent.
   (c) Jones reagent.
   (d) Lucas reagent.

9. Glucose gets oxidised to gluconic acid on reaction with a mild oxidising agent like bromine water. This indicates
   (a) that the six carbon atoms in glucose are linked in a straight chain.
   (b) the presence of five –OH groups.
   (c) that the carbonyl group is present as an aldehydic group.
   (d) the presence of a primary alcoholic group in glucose.

10. Maltose on hydrolysis gives _____
   (a) α- D-Glucose and β-D-Fructose.
   (b) β-D-Glucose and β-D-Galactose.
   (c) β-D-Glucose and β-D-Glucose.
   (d) α- D-Glucose and α- D-Glucose.

11. When benzene diazonium chloride reacts with phenol, it forms a dye. This reaction is called
    (a) Diazotisation reaction.
    (b) Condensation reaction.
    (c) Coupling reaction.
    (d) Acetylation reaction.

12. Complete the following analogy.
    o-Nitrophenol: P :: o-Cresol: Q
    (a) P: more acidic than phenol Q: less acidic than phenol
    (b) P: less acidic than phenol Q: more acidic than phenol
    (c) P: more acidic than phenol Q: more acidic than phenol
    (d) P: less acidic than phenol Q: less acidic than phenol

13. Given below are two statements labelled as Assertion (A) and Reason (R).
    Assertion (A): OH^- is an ambident nucleophile.
    Reason (R): The nucleophiles which have two different electron donor atoms and can attack through two different sites are called ambident nucleophiles.
    Select the most appropriate answer from the options given below:
    (a) Both A and R are true and R is the correct explanation of A.
    (b) Both A and R are true but R is not the correct explanation of A.
    (c) A is true but R is false.
    (d) A is false but R is true.

14. Given below are two statements labelled as Assertion (A) and Reason (R).
    Assertion (A): Sucrose is a non-reducing sugar.
    Reason (R): Sucrose is dextrorotatory but after hydrolysis gives dextrorotatory glucose and laevorotatory fructose.
    Select the most appropriate answer from the options given below:
    (a) Both A and R are true and R is the correct explanation of A.
    (b) Both A and R are true but R is not the correct explanation of A.
    (c) A is true but R is false.
    (d) A is false but R is true.

15. Given below are two statements labelled as Assertion (A) and Reason (R).
    Assertion (A): Aniline on reaction with concentrated sulphuric acid followed by heating forms p-amino benzene sulphonic acid as major product.
    Reason (R): The sulphonic acid group is an electron donating group.
    Select the most appropriate answer from the options given below:
    (a) Both A and R are true and R is the correct explanation of A.
    (b) Both A and R are true but R is not the correct explanation of A.
    (c) A is true but R is false.
    (d) A is false but R is true.

16. Given below are two statements labelled as Assertion (A) and Reason (R).
    Assertion (A): The carboxylic carbon is less electrophilic than carbonyl carbon.
    Reason (R): The lone pairs on oxygen atom attached to hydrogen atom in the -COOH group are involved in resonance.

Select the most appropriate answer from the options given below:
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

SECTION B

This section contains 5 questions with internal choice in one question. The following questions are very short answer type and carry 2 marks each.

17. Give reasons for the following statements.
    (a) Chloroethane is insoluble in water.
    (b) Thionyl chloride method is preferred for preparing alkyl chlorides from alcohols.

18. (a) A and B are two functional isomers of the compound C_3H_6O. On heating with NaOH and I_2, isomer B forms yellow precipitate of iodoform whereas isomer A does not form any precipitate. Write the formula of A and B.
    (b) Write a chemical test to distinguish between phenol and benzoic acid.

19. (a) How is a nucleoside different from a nucleotide?
    (b) Name the linkage present in nucleic acids.

OR

    (a) Give an example each of a globular protein and a fibrous protein.
    (b) Glycogen is also known as animal starch. Give a reason.

20. (a) What is the other name of vitamin C?
    (b) Name the vitamin whose deficiency causes increased clotting time.

21. Arrange the following in:
    (a) Decreasing reactivity towards nucleophilic addition reaction.
    Propanal, acetone, benzaldehyde
    (b) Increasing order of boiling point:
    Propane, Ethanol, Dimethylether, Propanal

SECTION C

This section contains 7 questions with internal choice in one question. The following questions are short answer type and carry 3 marks each.

22. Give chemical equations for the following.
    (a) Sandmeyer's reaction
    (b) Fittig reaction
    (c) Swarts reaction

23. (a) Write the IUPAC name of the following.
    $CH_3CH=C(CH_3)CH_2Br$

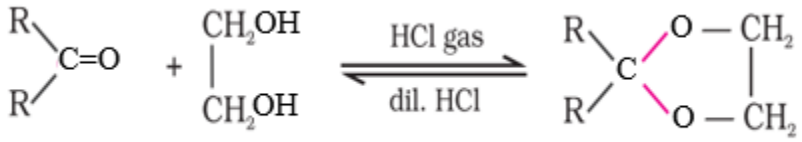
(b) What happens when (write chemical equations to support your answer)
(i) 2-Bromobutane is treated with alcoholic KOH?
(ii) Ethyl chloride is treated with $AgNO_2$?

24. Convert the following.
(a) Phenol to Anisole
(b) Propanone to 2-Methylpropan-2-ol
(c) Propene to Propan-1-ol

25. Write a mechanism for acid catalysed hydration of an alkene.

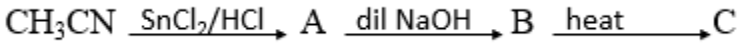
26. (a) Among the compounds CH_3CHO and C_6H_5CHO, identify the one which will
(i) undergo Aldol condensation.
(ii) undergo Cannizzaro reaction.
(iii) answer Fehling's test.
(iv) answer Iodoform test.

(b) Discuss the role of dry hydrogen chloride in the reaction below.



27. (a) Give a simple chemical test to distinguish between:
(i) $C_6H_5NH_2$ and $C_6H_5NHCH_3$
(ii) $C_6H_5NH_2$ and CH_3NH_2
(b) Tertiary amines do not undergo acylation reaction. Why?

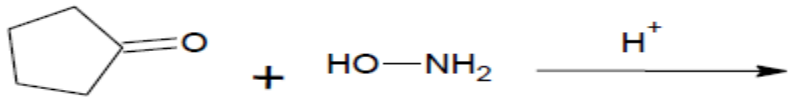
28. Complete the reaction.



OR

(a) Justify the following statements.
(i) 2-Fluorobutanoic acid is a stronger acid than 3-Fluorobutanoic acid.
(ii) Electrophilic substitution of benzaldehyde takes place at meta position.

(b) Complete the reaction.



SECTION D

The following questions are case-based questions. Each question has an internal choice and carries 4 (2+1+1) marks. Read the passage carefully and answer the questions that follow.

29.

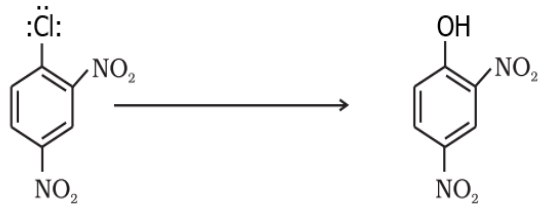
Haloalkanes are the organic compounds in which the halogen atom is bonded to the sp^3 hybridised carbon atom. Haloalkanes undergo a number of reactions like nucleophilic substitution, elimination reaction etc. Haloarenes or aryl halides are the organic compounds in which the halogen atom is bonded to the sp^2 hybridised carbon atom of an aromatic ring. Haloarenes undergo nucleophilic and electrophilic substitution reactions. Both haloalkanes and haloarenes react with metals.

In nucleophilic substitution reaction, a nucleophile reacts with the haloalkane or haloarene. There's a partial positive charge on the carbon atom bonded to halogen atom. The nucleophile substitutes the halogen atom that departs as the halide ion. Haloarenes do not undergo this reaction readily. However, under specific conditions, they do undergo these nucleophilic substitution reactions. In electrophilic substitution reaction, an electrophile replaces a group attached to haloarene. The displaced group is typically a hydrogen atom. Haloarenes undergo electrophilic substitution reactions like nitration, halogenation, Friedel Crafts reaction etc. The electrophilic substitution reaction in haloarenes occur slowly and require more drastic conditions than those in benzene.

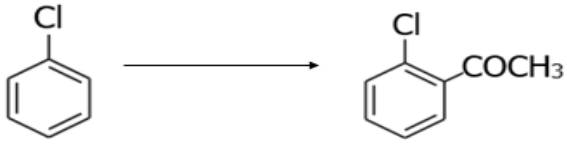
Answer the following questions.

(a) Predict the reagents and conditions required for the following conversions.

(i)



(ii)



(b) Choose the incorrect statement.

(i) The C—X bond length in haloalkane is shorter than in haloarene. Hence haloarenes are less reactive towards nucleophilic substitution than haloalkane.

(ii) Reactivity of electrophilic substitution in haloarene is controlled by the stronger inductive effect and orientation is controlled by resonance effect.

(iii) In Grignard reagents, the carbon-magnesium bond is covalent but highly polar.

(iv) In case of optically active alkyl halides, S_N1 reactions are accompanied by racemisation.

(c) Among the isomers of C_4H_9Br, choose which is/are optically active.
(i) 1−Bromobutane.
(ii) 2−Bromobutane
(iii) 1−Bromo−2−methylpropane and 1−Bromobutane.
(iv) 2−Bromo−2−methylpropane.

OR

(c) Among the isomers of C_4H_9Br, choose the one which undergoes faster S_N2 reaction.
(i) 1−Bromobutane.
(ii) 2−Bromobutane.
(iii) 1−Bromo−2−methylpropane.
(iv) 2−Bromo−2−methylpropane.

30.
The large molecules necessary for life that are built from smaller organic molecules are called biological **macromolecules**. There are four major classes of biological macromolecules (carbohydrates, lipid, proteins, and nucleic acids), and each is an important component of the cell and performs a wide array of functions.

Carbohydrates are macromolecules that provide energy to the body, particularly through glucose, a simple sugar. Carbohydrates can be represented by the formula $(CH_2O)_n$, where *n* is the number of carbon atoms in the molecule. In other words, the ratio of carbon to hydrogen to oxygen is 1:2:1 in carbohydrate molecules. Carbohydrates are classified into three subtypes: monosaccharides, disaccharides, and polysaccharides.

Proteins are one of the most abundant organic molecules in living systems and have the most diverse range of functions of all macromolecules. Proteins may be structural, regulatory, contractile, or protective; they may serve in transport and storage, or they may be toxins or enzymes. They are all, however, polymers of amino acids, arranged in a linear sequence.

Answer the following questions.

(a) Define the following as related to proteins.
(i) Peptide linkage (ii) Denaturation

(b) The pentaacetate of glucose does not react with hydroxylamine. What does it indicate?

OR

(b) Name the forces that stabilise the secondary and tertiary structure of proteins.

(c) Amino acids in proteins behave like salts rather than simple amines or carboxylic acids. Why?

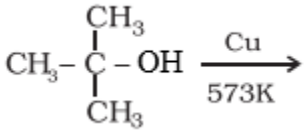
SECTION E

The following questions are long answer type and carry 5 marks each. All questions have an internal choice.

31. (a) Account for the following statements.
(i) The carbon– oxygen bond length (136 pm) in phenol is slightly less than that in methanol.
(ii) Anisole undergoes bromination with bromine in ethanoic acid even in the absence of Iron (III) bromide catalyst.

(b) Predict the products.

(i)



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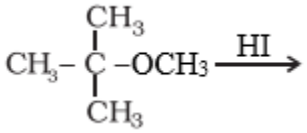

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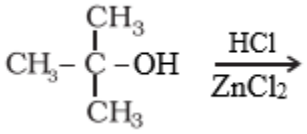


OR

(a) Explain the following using chemical equations.

(i) Reimer Tiemann reaction

(ii) Williamson ether synthesis

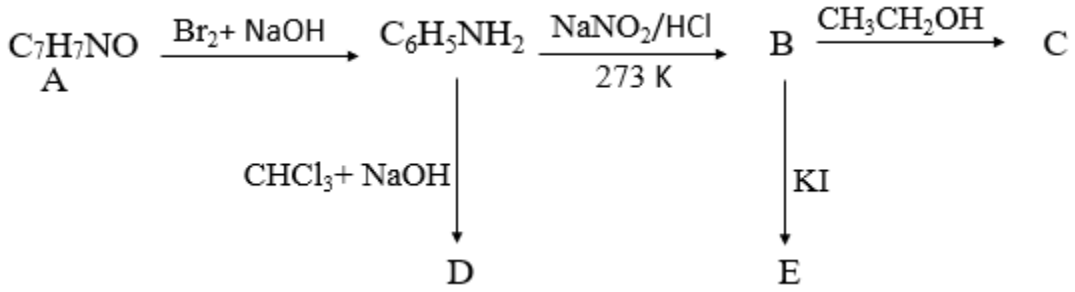
(b) Name the reagents used in the following reactions.

(i) Benzyl alcohol to benzoic acid

(ii) Ethanol to Ethoxyethane

(c) What is denaturation of alcohol?

32. An aromatic compound 'A' of molecular formula C_7H_7NO undergoes a series of reactions as shown below. Write the structures of A, B, C, D and E in the following reactions.



OR

(a) Write the structures of the main products formed along with their IUPAC name when aniline reacts with the following reagents:

(i) Br_2 water

(ii) CH_3COCl

(b) Give reasons for the following.

(i) Acetylation of aniline reduces its activation effect.

(ii) Aromatic primary amines cannot be prepared by Gabriel phthalimide synthesis.

(iii) Aniline does not undergo Friedel Crafts reaction.

33. (a) Predict the reagents for the following conversions and identify the name reaction.

(i)

(ii)

(iii)

(b) Account for the following statements.

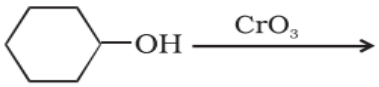
(i) Acetone forms cyanohydrin in good yield but Di-tert-butyl ketone does not.

(ii) Carboxylic acids are more acidic than phenols.

OR

(a) Predict the product(s) in the following reactions.

(i)



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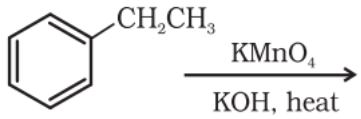

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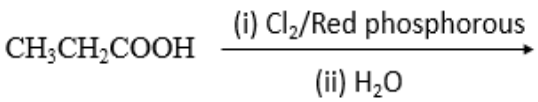

(b) Give the structures of the following.

(i) Hydrazone of Ethanal

(ii) p-Nitropropiophenone