**CLASS : XII**

**SUBJECT : CHEMISTRY(aldehydes, ketones and carboxylic acids)**

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| **Sr. No.** | **Knowledge Based** | **Marks** |
| 1. | Write the structures of the following compounds.  (i) α-Methoxypropionaldehyde (ii) 3-Hydroxybutanal  (iii) 2-Hydroxycyclopentane carbaldehyde (iv) 4-Oxopentanal  (v) Di-sec. butyl ketone (vi) 4-Fluoroacetophenone | 1 each |
| 2. | Give the IUPAC names of the following compounds:  (i) Ph CH2CH2COOH (ii) (CH3)2C=CHCOOH | 1 each |
| 3 | Name the following compounds according to IUPAC system of nomenclature:  (i) CH3CH(CH3)CH2CH2CHO (ii) CH3CH2COCH(C2H5)CH2CH2Cl  (iii) CH3CH=CHCHO (iv) CH3COCH2COCH3  (v) CH3CH(CH3)CH2C(CH3)2COCH3 (vi) (CH3)3CCH2COOH  (vii) OHCC6H4CHO-*p* | 1 each |
| 4 | Write the IUPAC names of the following ketones and aldehydes. Wherever  possible, give also common names.  (i) CH3CO(CH2)4CH3 (ii) CH3CH2CHBrCH2CH(CH3)CHO  (iii) CH3(CH2)5CHO (iv) Ph-CH=CH-CHO (vi) PhCOPh | 1 each |
| 5 | Describe the following reactions:  1.Stephen reaction 2.Etard reaction 3.Gatterman-Koch reaction | 1 each |
| 6 | Write short notes on:  1.Wolff-Krishner reduction 2.Aldol condensation 3.Cross- aldol 4.Cannizzaro reaction  5.Hell-Velhard-Zelinsky reaction 6.Decarboxylation | 2 each |
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| **S. No.** | **Understanding Based** |  |
| 1. | Draw the structures of the following compounds.  (i) 3-Methylbutanal (ii) *p*-Nitropropiophenone  (iii) *p*-Methylbenzaldehyde (iv) 4-Methylpent-3-en-2-one  (v) 4-Chloropentan-2-one (vi) 3-Bromo-4-phenylpentanoic acid  (vii*) p,p’*-Dihydroxybenzophenone (viii) Hex-2-en-4-ynoic acid | 1 each |
| 2. | Draw structures of the following derivatives:  (i) The 2,4-dinitrophenylhydrazone of benzaldehyde  (ii) Cyclopropanone oxime  (iii) Acetaldehydedimethylacetal  (iv) The semicarbazone of cyclobutanone  (v) The ethylene ketal of hexan-3-one  (vi) The methyl hemiacetal of formaldehyde | 1 each |
| 3 | Write the structures of products of the following reactions; | 1 each |
| 4 | Describe the mechanism of the addition of Grignard reagent to carbonyl group of a compound to form an adduct which on hydrolysis yields an alcohol. | 3 |
| 5 | Which of the following compounds would undergo aldol condensation, which  the Cannizzaro reaction and which neither? Write the structures of the expected  products of aldol condensation and Cannizzaro reaction.  (i) Methanal (ii) 2-Methylpentanal (iii) Benzaldehyde  (iv) Benzophenone (v) Cyclohexanone (vi) 1-Phenylpropanone  (vii) Phenylacetaldehyde (viii) Butan-1-ol (ix) 2,2-Dimethylbutanal | 2 each |
| 6 | Write structural formulas and names of four possible aldol condensation  from propanal and butanal. In each case, indicate which aldehyde acts as nucleophile and which as electrophile. | 3 |
| 7 | Which acid of each pair shown here would you expect to be stronger?  (i) CH3CO2H or CH2FCO2H (ii) CH2FCO2H or CH2ClCO2H  (iii) CH2FCH2CH2CO2H or CH3CHFCH2CO2H | 1 each |
| 8 | Carboxylic acid contain carbonyl group but donot show the nucleophilic addition reaction like aldehydes or ketones. Why? | 2 |
| 9 | Give plausible explanation for each of the following:  (i) Cyclohexanone forms cyanohydrin in good yield but 2,2,6-trimethylcyclohexanone  does not.  (ii) There are two –NH2 groups in semicarbazide. However, only one is involved in the formation of semicarbazones.  (iii) During the preparation of esters from a carboxylic acid and an alcohol in the presence of an acid catalyst, the water or the ester should be removed as soon as it is formed. | 1 each |
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| **S. No.** | **Application** |  |
| 1. | Arrange the following compounds in increasing order of their boiling points.  CH3CHO, CH3CH2OH, CH3OCH3, CH3CH2CH3 | 1 |
| 2. | Arrange the following compounds in increasing order of their reactivity in nucleophilic addition reactions.  (i) Ethanal, Propanal, Propanone, Butanone.  (ii) Benzaldehyde, *p*-Tolualdehyde, *p*-Nitrobenzaldehyde, Acetophenone. | 1 |
| 3 | Predict the products of the following reactions**:** | 1 each |
| 4 | Predict the products formed when cyclohexanecarbaldehyde reacts with  following reagents.  (i) PhMgBr and then H3O+ (ii) Tollens’ reagent  (iii) Semicarbazide and weak acid (iv) Excess ethanol and acid  (v) Zinc amalgam and dilute hydrochloric acid | 2 each |
| 5 | How will you convert ethanal into the following compounds?  (i) Butane-1,3-diol (ii) But-2-enal (iii) But-2-enoic acid | 1 each |
| 6 | Show how each of the following compounds can be converted to benzoic acid.  (i) Ethylbenzene (ii) Acetophenone  (iii) Bromobenzene (iv) Phenylethene (Styrene) | 1 each |
| 7 | Arrange the following compounds in increasing order of their property as indicated:  (i) Acetaldehyde, Acetone, Di-*tert*-butyl ketone, Methyl *tert*-butyl ketone (reactivity towards HCN)  (ii) CH3CH2CH(Br)COOH, CH3CH(Br)CH2COOH, (CH3)2CHCOOH, CH3CH2CH2COOH (acid strength)  (iii) Benzoic acid, 4-Nitrobenzoic acid, 3,4-Dinitrobenzoic acid, 4-Methoxybenzoic acid (acid strength) | 1 each |
| 8 | Give simple chemical tests to distinguish between the following pairs of compounds.  (i) Propanal and Propanone (ii) Acetophenone and Benzophenone  (iii) Phenol and Benzoic acid (iv) Benzoic acid and Ethyl benzoate  (v) Pentan-2-one and Pentan-3-one (vi) Benzaldehyde and Acetophenone  (vii) Ethanal and Propanal | 2 |
| 9 | How will you bring about the following conversions in not more than two steps?  (i) Propanone to Propene (ii) Benzoic acid to Benzaldehyde  (iii) Ethanol to 3-Hydroxybutanal (iv) Benzene to *m*-Nitroacetophenone  (v) Benzaldehyde to Benzophenone (vi) Bromobenzene to 1-Phenylethanol  (vii) Benzaldehyde to 3-Phenylpropan-1-ol  (viii) Benazaldehyde to -Hydroxyphenylacetic acid  (ix) Benzoic acid to *m*- Nitrobenzyl alcohol | 1 each |
| 10 | How will you prepare the following compounds from benzene(use reagent having not more than one carbon atom)  (i)methyl benzoate  (ii) *m*-Nitrobenzoic acid  (iii) *p*-Nitrobenzoic acid (iv) Phenylacetic acid  (v) *p*-Nitrobenzaldehyde. | 1 each |
| 11 | Although phenoxide has more number of resonating structures than carboxylate ion, carboxylic acid is a stronger acid than phenol. Why? | 2 |
| 12 | Complete each synthesis by giving missing starting material, reagent or products | 2 |
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| **S.No.** | **Value Based** |  |
| 1. | Karan is an obedient student but his classmates were very mischieveous. In chemistry lab, Karan saw some students removing the labels from bottles containing methanol and dimethyl ether. Seeing this , Karan approached the teacher and informed about the incident   1. Mention the values shown by Karan 2. Teacher asked the students to perform test to identify methanol and dimethyl ether ? how will they do that? State the reactions | 3 |
| 2. |  |  |
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| **S.No.** | **HOTS** |  |
| 1. | An organic compound with the molecular formula C9H10O forms 2,4-DNP derivative, reduces Tollens’ reagent and undergoes Cannizzaro reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound. | 3 |
| 2. | An organic compound (A) (molecular formula C8H16O2) 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. | 3 |
| 3 | An organic compound contains 69.77% carbon, 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollens’ reagent but forms an addition compound with sodium hydrogensulphite and give positive iodoform test. On vigorous oxidation it gives ethanoic and propanoic acid. Write the possible structure of the compound. | 3 |
| 4 | An organic compound A(C3H4) on hydration in the presence of H2SO4/HgSO4 gives a compound B(C3H6O). compound B gives white crystalline product D with sodium hydrogensulphite. It gives negative Tollen’s test and positive Iodoform test. On drastic oxidation B gives compound C(C2H4O2) along with formic acid. Identify the compound A,B,C,D and its reactions. | 3 |
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