

WORK SHEET
ALDEHYDES, KETONES AND CARBOXYLIC ACIDS
OBJECTIVE TYPE QUESTIONS(MCQ)

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1. When a mixture of calcium acetate and calcium formate is heated. It yields:
(a) acetone (b) acetaldehyde (c) formic acid (d) acetic acid
2. Which of the following compounds, is oxidised to prepare ethyl methyl ketone?
(a) Propan-2-ol (b) Butan-1-ol (c) Butan-2-ol (d) Tert. butyl alcohol
3. The reagent with which both acetaldehyde and acetone react easily is
(a) Fehling's solution (b) Grignard reagent (c) Schiff's reagent (d) Tollens' reagent
4. A compound that gives a positive iodoform test is:
(a) pentan-1-ol (b) pentan-2-one (c) pentan-3-one (d) pentanal
5. Schiff's reagent is:
(a) magenta solution decolourised with sulphurous acid
(b) magenta solution decolourised with chlorine
(c) ammoniacal cobalt chloride solution
(d) ammoniacal manganese sulphate solution
6. When acetaldehyde is heated with Fehling's solution, it gives a red precipitate of:
(a) Cu (b) CuO (c) CuSO₄ (d) Cu₂O
7. Hydrocarbons are formed when aldehydes and ketones are reduced with amalgamated zinc and conc. HCl. The reaction is called:
(a) Dow reduction (b) Clemensen's reduction
(c) Cope reduction (d) Wolff-Kishner reduction
8. The formation of cyanohydrin from a ketone is an example of:
(a) Electrophilic addition (b) nucleophilic addition
(c) Nucleophilic substitution (d) electrophilic substitution
9. Acetone is mixed with bleaching powder to give:
(a) Ethanol (b) acetaldehyde (c) chloroform (d) phosgene
10. Ketones react with Mg-Hg over water gives:
(a) alcohols (b) pinacols (c) pinacolones (d) none of these
11. Which of the following is not a fatty acid?
(a) Stearic acid (b) Palmitic acid (c) Propionic acid (d) Phenyl acetic acid
12. Formic acid and formaldehyde can be distinguished by treating with:
(a) Benedict's solution (b) Tollens' reagent
(c) Fehling's solution (d) NaHCO₃
13. Methyl magnesium bromide on reaction with SO₂ followed by hydrolysis gives
(a) methyl sulphonic acid (b) methane sulphinic acid (c) dithio acetic acid (d) ethanethiol

14. Oxalic acid on treatment with conc. H_2SO_4 gives:

- (a) CO only (b) CO_2 only (c) $\text{CO}_2 + \text{H}_2\text{O}$ (d) $\text{H}_2\text{O} + \text{CO} + \text{CO}_2$

15. Propionic acid with Br_2/P yields a dibromo product. Its structure would be:

- (a) $\text{CH}_2\text{BrCH}_2\text{COBr}$ (b) $\text{CH}_2\text{BrCHBrCOOH}$
(c) $\text{CHBr}_2\text{CH}_2\text{COOH}$ (d) $\text{CH}_3\text{CBr}_2\text{COOH}$

ASSERTION REASON TYPE QUESTIONS: -

Following questions consist of an Assertion (A) and the Reason (R). Use the following keys to choose the appropriate answer:

- (a) If both (A) and (R) are correct and (R) is the correct explanation of (A)
(b) If both (A) and (R) are correct but (R) is not the correct explanation of (A)
(c) If (A) is correct but (R) is incorrect.
(d) If (A) is incorrect but (R) is correct.

1. (A) Carbonyl compounds take part in nucleophilic addition reactions.

(R) These reactions are initiated by nucleophilic attack' at the electron deficient carbon atom.

2. (A) Primary alcohols can be easily oxidized to aldehyde.

(R) Aldehydes are prone to further oxidation to carboxylic acids

3. (A) The addition of ammonia derivatives on carbonyl compounds is carried in weakly acidic medium. (R) In the weakly acidic medium, attacking nucleophile-is also protonated.

4. (A) Fehling's reagent is a test for all aliphatic aldehydes.

(R) Aliphatic aldehydes can be easily oxidised even with mild oxidising agents.

5. (A) 2-Methyl propanal undergoes Cannizzaro's reaction.

(R) It has an alpha-hydrogen atom.

6. (A) Formaldehyde is a planar molecule.

(R) Carbon atom in formaldehyde is sp^2 -hybridised.

7. (A) Nitromethane can give aldol condensation.

(R) alpha-hydrogen of nitromethane is acidic.

8. (A) Chloral hydrate is stable.

(R) It is stable due to its high molecular weight.

9. (A) Acetaldehyde does not show aldol condensation.

(R) Compounds having at least one alpha-hydrogen give aldol condensation.

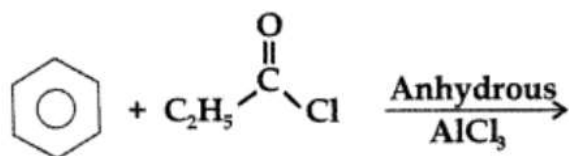
10. (A) Lower aldehydes and ketones are soluble in water but the solubility decreases as the molecular mass increases.

(R) Distinction between aldehydes and ketones can be made by Tollens' reagent

❖ **Short Answer Type Questions (2 and 3 marks)**

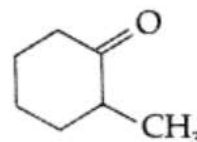
1. Acetaldehyde undergoes a reaction to form a product which exhibits properties of aldehyde and alcohols
 - (i) Name the reaction and give equation.
 - (ii) Write the structural formula of the product formed.
 - (iii) What are the reagents other than acetaldehyde required for the reaction to take place?
2. Write the structural formulae and names of the four possible aldol condensation products from propanal and butanal. In each case indicate which aldehyde acts as nucleophile and which as electrophile.
3. How do you account for the following?
 - (a) Boiling points of aldehydes lie between parent alkanes and corresponding alcohols.
 - (b) Aldehydes and ketones have high dipole moments.
4. Four different bottles containing methyl alcohol, ethyl alcohol, acetic acid and acetone have lost their labels. What chemical tests would be performed to identify them?
5. Four different bottles containing isopropyl iodide, acetone, propionaldehyde and heptane have lost their labels. What chemical tests would be performed to identify them?
6. How would you distinguish between:
 - (a) Solutions of acetic acid, formic acid and ethanol?
 - (b) Calcium formate and calcium acetate?
 - (c) Acetic acid and acetone?
7. Arrange the following in order of increasing acidity:
 - (i) Propanoic acid, chloro ethanoic acid, 3-bromopropanoic acid and trichloroacetic acid.
 - (ii) 2-Fluorobutanoic acid, 2-iodobutanoic acid, 2-bromobutanoic acid and butanoic acid.
 - (iii) Acetic acid, 2-methyl propanoic acid, 2,2-dimethyl propanoic acid.
8. How do you account for the following?
 - (a) NaHSO_3 is used for the purification of aldehydes and ketones.
 - (b) Iodoform is obtained by the reaction of acetone with hypoiodite but not with iodide
9. Do the following conversions.
 - (a) Methyl chloride to acetone.
 - (b) Propan-1-ol to propanoic acid.

10. (a) Write the structure of the product formed in the following reaction .



(b) Give the structure and IUPAC name of the product formed when propanone is reacted with methylmagnesium bromide followed by hydrolysis.

(c) Write the IUPAC name of the following



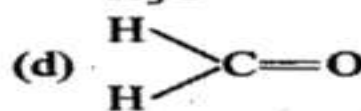
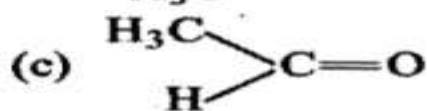
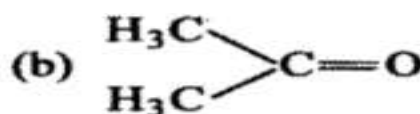
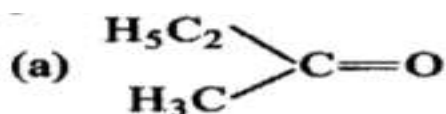
CASE BASED QUESTIONS

Q.I Aldehyde and ketones are specially susceptible to nucleophilic addition reaction because carbonyl is polar. Positive charge on carbon makes it reactive towards. This addition is catalyzed by acid. Reactivity of carbonyl towards nucleophilic addition increases with increase in the electron deficiency at carbonyl carbon. Thus (-I.E.) group increase while (+I.E.) groups decrease the reactivity of carbonyl compounds.

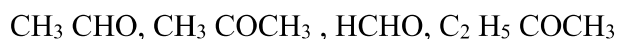
Answer the following question

1. Which is most reactive to give nucleophilic addition - FCH_2CHO and ClCH_2CHO ?

2. Which among the following carbonyl compounds is most polar



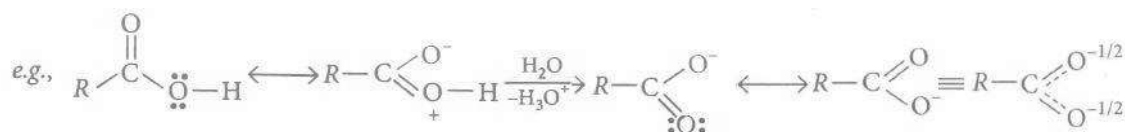
3. Arrange the following in order of their increasing reactivity towards HCN :-



4. Mention the criteria for aldehyde to undergo aldol condensation?

Q.II Carboxylic acids dissociate in water to give carboxylate ion and hydronium ion.
 $\text{RCOOH} + \text{H}_2\text{O} \rightarrow \text{RCOO}^- + \text{H}_3\text{O}^+$

The acidity of carboxyl group is due to the presence of positive charge on oxygen which liberates proton. The carboxylate ion formed is resonance stabilised.



Carboxylic acids are stronger acids than phenols. Electron withdrawing groups (EWG) increase the acidity of

carboxylic acids by stabilising the conjugate base through delocalisation of negative charge by inductive and/ or resonance effects. Electron donating group (EDG) decrease the acidity by destabilising the conjugate base.

Answer the following questions:

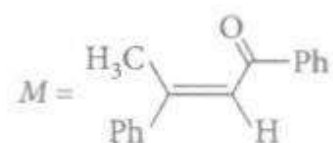
1. Complete the reaction



2. Write one chemical reactions showing the acidic property of carboxylic acid?

3. Arrange the following in decreasing order of their acidic strength and give the reason for your answer. $\text{CH}_3\text{CH}_2\text{OH}$, CH_3COOH , ClCH_2COOH , FCH_2COOH , $\text{C}_6\text{H}_5\text{CH}_2\text{COOH}$.

4. A tertiary alcohol H upon acid catalysed dehydration gives a product I. Ozonolysis of I leads to compounds J and



K. Compound J upon reaction with KOH gives benzyl alcohol and a compound L, whereas K on reaction with KOH gives only M. The structures of compound J, K and L, respectively, are-

5 MARKS QUESTIONS

1. How will you differentiate between?

- Acetaldehyde and acetone.
- Aldehydes and ketones with - (a) Tollens' reagent (b) Fehling's solution.
- Acetone and diethyl ether.
- Formaldehyde and acetaldehyde.
- Formaldehyde and ethyl alcohol.

2. What happens when?

- Formic acid is heated with conc. H_2SO_4
- Dry chlorine is passed through acetic acid in presence of sunlight.
- Oxalic acid is heated with glycerol.
- Formic acid is reacted with ammoniacal silver nitrate solution.
- Acetic acid is heated with phosphorus pentoxide.

3. Answer the following:

- Why 100% pure acetic acid is named glacial acetic acid?
- Carboxylic acids with five or fewer carbon atoms are water soluble but, higher ones are insoluble
- Why the bond length of $\text{C}=\text{O}$ in carboxylic acids is a bit longer than in aldehydes?
- Highly branched carboxylic acids are less acidic than unbranched acids.
- Acetic acid can be halogenated in presence of phosphorus and chlorine but formic acid cannot be halogenated in the same way.