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CBSE Class 12 · Chemistry

Aldehydes, Ketones and Carboxylic Acids

10 most probable questions for Boards 2027

Q1. 1 mark · Multiple choice

Which pair of suffixes is used in IUPAC nomenclature for open-chain aldehydes and ketones, respectively?

(A) –ol and –one

(B) –al and –one

(C) –al and –ol

(D) –one and –al

Answer

(B) –al and –one — the IUPAC names of open-chain aliphatic aldehydes and ketones replace the corresponding alkane ending –e with –al and –one, respectively.

Q2. 2 marks · Short answer

State the hybridisation and geometry of the carbonyl carbon, and give the approximate bond angles around it.

Answer

The carbonyl carbon is sp^2-hybridised and forms three sigma bonds. Its fourth valence electron forms a π-bond with oxygen. The carbonyl carbon and the three atoms attached to it lie in the same plane, giving a trigonal coplanar geometry with bond angles of approximately 120°.

Q3. 3 marks · Medium answer

Distinguish between the oxidation behaviour of aldehydes and ketones. Describe the observation and chemical change in Tollens' test for an aldehyde.

Answer

1. Oxidising conditions — Aldehydes: readily oxidised by common agents, even mild Tollens' or Fehling's reagents; ketones: require vigorous conditions, strong agents and elevated temperatures.
2. Products — Aldehydes: corresponding carboxylic acids; ketones: shorter-chain carboxylic acids, formed by carbon–carbon bond cleavage.
3. Tollens' test — Aldehydes: warming with freshly prepared ammoniacal silver nitrate gives a bright silver mirror and carboxylate anions; ketones do not give this test.

Q4. 5 marks · Long answer

Describe the reactions of (i) an aldehyde with an alcohol, (ii) a ketone with ethylene glycol, and (iii) an aldehyde or ketone with ammonia or one of its derivatives. Include the products and the conditions for reversing the addition products. Then name the two reductions used to convert a carbonyl group to a methylene group.

Answer

Carbonyl compounds undergo nucleophilic addition reactions with alcohols and ammonia derivatives, and some addition products are hydrolysed.
1. An aldehyde reacts with an alcohol to form a hemiacetal; further addition of alcohol forms an acetal. Aqueous mineral acids hydrolyse acetals to regenerate the aldehyde.
2. A ketone reacts with ethylene glycol to form a cyclic ketal. Aqueous mineral acids hydrolyse ketals to regenerate the corresponding ketone.
3. Ammonia and its derivatives, $H_2N–Z$, add to aldehydes and ketones to form corresponding products, such as semicarbazones from semicarbazide. The reaction is reversible and acid-catalysed.
4. Clemmensen reduction uses zinc amalgam and concentrated hydrochloric acid, whereas Wolff–Kishner reduction uses hydrazine followed by heating with sodium or potassium hydroxide in a high-boiling solvent such as ethylene glycol; both convert the carbonyl group to CH_2.
These reductions provide two routes for converting carbonyl groups into methylene groups.

Q5. 1 mark · Very short answer

What aldehyde-forming transformation does DIBAL-H bring about with nitriles or esters?

Answer

DIBAL-H selectively reduces nitriles to imines, which give aldehydes on hydrolysis; it also reduces esters to aldehydes.

Q6. 2 marks · Short answer

Name the reactions used to prepare aldehydes from (i) an acyl chloride and (ii) a nitrile. State the key reagents and the final step in the nitrile reaction.

Full answer on SmartKalike: https://smartkalike.com/cbse/class-12/chemistry/aldehydes-ketones-and-carboxylic-acids

Q7. 3 marks · Medium answer

Describe the physical state and odour of lower and higher carboxylic acids, and explain how their solubility in water changes as the carbon chain becomes longer.

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Q8. 5 marks · Long answer

Explain how a Grignard reagent reacts with carbon dioxide and how the product is converted to a carboxylic acid. Then compare the products of acidic and basic hydrolysis of an ester, including the final acidification step where required.

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Q9. 1 mark · Very short answer

Name the commercial method in which side-chain chlorination of toluene followed by hydrolysis produces benzaldehyde.

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Q10. 2 marks · Short answer

Describe how toluene is converted to benzaldehyde by (i) the Etard reaction and (ii) chromic oxide in acetic anhydride, including the intermediate formed in each method and its subsequent treatment.

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