InkChemistry

QUESTION WORKBOOK

Aldehydes and ketones: nucleophilic addition and the tests that tell them apart

Carbonyls and carboxylic acids · Unit C20

AQA 3.3.8 · OCR A 6.1.2

17 questions · 56 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 AK-Q4 Explain why aldehydes are oxidised by Tollens' reagent but ketones are not. [2]

A2 AK-Q19 Explain why the 2,4-DNP derivative is recrystallised before its melting point is measured. [2]

A3 AK-Q21 Explain why $LiAlH_4$ is used in dry ether, while $NaBH_4$ can be used in water or ethanol. [2]

SECTION B · Standard, 3 to 5 marks

B1 AK-Q7 Outline the mechanism for the reaction of propanone with KCN followed by dilute acid, and name the organic product. [5]

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B2 AK-Q6

Outline the mechanism for the reduction of propanal by $NaBH_4$. Show the hydride ion as the nucleophile and water as the source of the second hydrogen. [4]

B3 AK-Q16

Compare the reaction of HBr with propene and the reaction of HCN with propanal, in terms of the attacking species and the mechanism. [4]

B4 AK-Q18

Describe how 2,4-dinitrophenylhydrazine is used to show that an unknown liquid is a carbonyl compound and then to identify it. [4]

B5 AK-Q5

Explain why the carbon atom of a carbonyl group is attacked by nucleophiles while the carbon atoms of a C=C bond are not. [3]

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B6 AK-Q8 Explain why KCN followed by acid is used to make a hydroxynitrile rather than hydrogen cyanide, and state the hazard of the method. [3]

B7 AK-Q9 Explain why the reaction of butanal with KCN followed by dilute acid gives a racemic mixture. [3]

B8 AK-Q10 Name the organic products formed when butanal and butanone are each reduced by $NaBH_4$, and give the equation for the butanone reduction using [H]. [3]

B9 AK-Q12 Calculate the maximum mass of silver deposited when 0.220 g of ethanal reacts completely with Tollens' reagent. Mr of ethanal = 44.0; Ar of Ag = 107.9. [3]

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B10 AK-Q14 Suggest the product when propenal, $CH_2=CHCHO$, is reduced by $NaBH_4$, and the product when it is reduced by hydrogen with a nickel catalyst, and explain the difference. [3]

B11 AK-Q15 Suggest the identity of compound Y, C_4H_8O, which gives no silver mirror with Tollens' reagent and is reduced by $NaBH_4$ to an alcohol with a chiral centre. Explain each piece of evidence. [3]

B12 AK-Q17 Evaluate the conclusion of a student who warms an unknown liquid with Fehling's solution, sees the solution stay blue, and concludes that the liquid is a ketone. [3]

B13 AK-Q20 Suggest which of butanal, butanone, butan-1-ol and butan-2-ol give a pale yellow precipitate when warmed with iodine and aqueous sodium hydroxide, and explain your choice. [3]

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SECTION C · Long, 6 marks or more

C1 AK-Q22

Describe how Tollens' reagent and Fehling's solution can each be used to distinguish propanal from propanone. Give the observations and the relevant equations. [6]

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