2.7 Organic Chemistry: 10-minute Pack

AQA 7405 · Calculator allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A technician has four unlabelled test tubes, each containing a different colourless liquid: propan-1-ol, propanal, propanoic acid and propanone. Simple chemical tests can be used to identify each compound.

(a) Describe a test, including the observation, that would distinguish propanoic acid from the other three liquids. **(2)**

(b) Describe a test, including the observations, that would distinguish propanal from propanone. **(2)**

(c) Both propanal and propanone react with 2,4-dinitrophenylhydrazine (Brady's reagent) to give an orange precipitate. State what this test confirms, and explain why it cannot be used alone to distinguish an aldehyde from a ketone. **(2)**

(d) Propan-1-ol gives no observable reaction with Tollens' reagent, 2,4-DNP or sodium carbonate. Explain why propan-1-ol gives none of these positive results. **(2)**

(Total for Question 1 is 8 marks)

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Mark scheme · 2.7 Organic Chemistry: 10-minute Pack

Question 1

(a) add solid sodium carbonate (or sodium hydrogencarbonate solution) to a sample of each liquid **B1**

(a) propanoic acid produces effervescence/bubbles of gas (CO_2, which turns limewater cloudy); the other three liquids show no reaction oe **B1**

(a) Answer: Add sodium carbonate/hydrogencarbonate: propanoic acid fizzes (CO_2 gas evolved, turns limewater cloudy), the others do not react.

(b) add Tollens' reagent (ammoniacal silver nitrate) to a sample of each and warm gently in a water bath **B1**

(b) propanal produces a silver mirror (Ag^+ is reduced to Ag); propanone shows no reaction (remains colourless) oe; accept Fehling's/Benedict's solution: propanal gives a brick-red precipitate, propanone no change **B1**

(b) Answer: Warm with Tollens' reagent: propanal gives a silver mirror, propanone shows no reaction.

(c) confirms the presence of a carbonyl group (C=O) **B1**

(c) both aldehydes and ketones contain a C=O carbonyl group, so both give the same positive (orange precipitate) result, so the test does not distinguish between them oe **B1**

(c) Answer: Confirms a carbonyl group (C=O) is present; both aldehydes and ketones contain C=O, so both give a positive result and the test cannot distinguish them.

(d) propan-1-ol does not contain a carbonyl group (C=O), so it cannot react with 2,4-DNP or be oxidised by Tollens' reagent in the same way as an aldehyde **B1**

(d) propan-1-ol is not sufficiently acidic (it is a much weaker acid than a carboxylic acid) to react with/release CO_2 from sodium carbonate oe **B1**

(d) Answer: Propan-1-ol has no C=O group, so it does not react with 2,4-DNP or Tollens'; it is not acidic enough to react with sodium carbonate.

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