InkChemistry

QUESTION WORKBOOK

Empirical and molecular formulae

Amount of substance · Unit C02

AQA 3.1.2.4 · OCR A 2.1.3

16 questions · 51 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 EM-Q10

Explain why the mass of oxygen in an organic compound is found by difference in combustion analysis, not from the products. [2]

A2 EM-Q11

Suggest the empirical formula of a hydrocarbon whose analysis gives a mole ratio of C 1.00 : H 1.33, and justify your answer. [2]

A3 EM-Q19

Suggest which of ethyl ethanoate (boiling point 77 °C) and butanoic acid (boiling point 164 °C), both $C_4H_8O_2$, could have its Mr measured in a gas syringe held at 100 °C, and why. [2]

SECTION B · Standard, 3 to 5 marks

B1 EM-Q5

Calculate the molecular formula of a hydrocarbon that is 82.8% carbon and 17.2% hydrogen by mass and has a relative molecular mass of 58.0. [4]

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B2 EM-Q7

Calculate the empirical formula of a compound of carbon, hydrogen and oxygen, given that 0.180 g of it burns completely to give 0.264 g of carbon dioxide and 0.108 g of water. [4]

B3 EM-Q15

Calculate the empirical and molecular formulae of a compound found in rum flavouring, which contains 48.6% carbon, 8.1% hydrogen and 43.2% oxygen by mass and whose mass spectrum has a molecular ion peak at m/z = 74. [4]

B4 EM-Q2

Give the empirical formula of glucose, $C_6H_{12}O_6$, of ethane, C_2H_6, and of butane, C_4H_{10}. [3]

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B5 EM-Q3 Calculate the empirical formula of the oxide formed when 1.20 g of magnesium combines with 0.80 g of oxygen. Use Mg 24.3, O 16.0. [3]

B6 EM-Q4 Calculate the empirical formula of a compound containing 52.2% carbon, 13.0% hydrogen and 34.8% oxygen by mass. [3]

B7 EM-Q6 Calculate the empirical formula of an iron oxide that is 70.0% iron and 30.0% oxygen by mass. Use Fe 55.8, O 16.0. [3]

B8 EM-Q9 Explain why, in combustion analysis, the gases pass through the water absorber before they pass through the soda lime. [3]

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B9 EM-Q12 Suggest two compounds that could have the empirical formula CH_2, and suggest how an analyst could tell which one a sample is. [3]

B10 EM-Q13 Compare the information given by the empirical, molecular and structural formulae of ethanoic acid. [3]

B11 EM-Q14 Evaluate a student's decision to round an analysis result of C 1.00 : H 2.40 to the empirical formula CH_2. [3]

B12 EM-Q18 Explain how incomplete combustion of a sample in combustion analysis affects the masses of carbon and of oxygen calculated for it. [3]

SECTION C · Long, 6 marks or more

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C1
EM-Q16

Describe how combustion analysis is used to find the empirical formula of a compound containing carbon, hydrogen and oxygen. Include the order of the absorbers and the conditions that make the result reliable. [6]

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