Question 37 **(29 marks)**

A 2.31 g sample of a hydrocarbon was combusted, and 7.25 g of carbon dioxide and 2.97 g of water were produced.

(a) Determine the empirical formula of the hydrocarbon. (4 marks)

(b) A second 4.67 g sample of the hydrocarbon was vaporised and found to occupy 1.42 L at 150 °C and 205 kPa. Calculate the molar mass of the compound and determine its molecular formula. (5 marks)

(c) The hydrocarbon has three straight-chain isomers (no branching). Complete the table below by drawing the structure of and naming the three isomers. Show all atoms and bonds in each structure. (9 marks)

If you were unable to determine an answer to part (b) use C_5H_{10} as the molecular formula for the remaining parts of this question.

Structure	IUPAC Name

(d) State which isomer reacts with water to produce a primary alcohol. Write an equation for this reaction. (3 marks)

Isomer: _____

The alcohol produced in part (d) on page 26 can be fully oxidised by acidified potassium dichromate solution.

(e) (i) Write an ionic equation for this reaction. (3 marks)

(ii) Describe fully the observations for this reaction. (2 marks)

(f) (i) Write an equation for the reaction between the organic products from parts (d) and (e). (2 marks)

(ii) Name the organic product of this reaction. (1 mark)