Question 23 (3 marks)

(a) Write a balanced chemical equation for the complete combustion of 1-butanol.   **1**

$C_4H_9OH + H_2O \rightarrow 4CO_2 + 5H_2O$

$C_4H_9OH_{(l)} + 6O_{2(g)} \rightarrow 4CO_{2(g)} + 5H_2O_{(l)}$
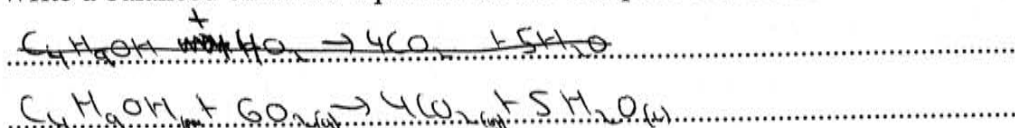
(b) A student measured the heat of combustion of three different fuels. The results   **2**
are shown in the table.

Fuel	Heat of combustion $(kJ\ g^{-1})$
A	−48
B	−38
C	−28

The published value for the heat of combustion of 1-butanol is 2676 kJ mol-1.

Which fuel from the table is likely to be 1-butanol? Justify your answer.

$n = \dfrac{m}{M}$ $\therefore B \Rightarrow$ $0.0135\ mols \rightarrow 38kJ$

$= \dfrac{1}{74.12}$ $1\ mol \rightarrow x$

$= 0.0135\ mols$ $x = 2814.8\ mkJ/mol$

$\therefore A \Rightarrow$ $0.0135\ mols \rightarrow 48kJ$ $\therefore C \Rightarrow$ $0.0135\ mols \rightarrow 28kJ$

$1\ mol \rightarrow x$ $1\ mol \rightarrow x$

$x = 3555.5\ mol/kJ$ $x = 2074.1\ kJ/mol$

$\therefore$ Fuel B is most likely 1-butanol as its ΔH is closest
to 2676 kJ mol⁻¹