Question 23 (3 marks)

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

$2C_4H_8O + 12O_2 \rightarrow 8CO_2 + 8H_2O$

~~$2C_4H_8O + 23O_2 \rightarrow 16CO_2 + 18H_2O$~~

$C_4H_8O + 12O_2 \rightarrow 4CO_2 + 4H_2O$

(b) A student measured the heat of combustion of three different fuels. The results are shown in the table. **2**

Fuel	*Heat of combustion* (kJ g^{-1})
A	–48
B	–38
C	–28

$\frac{kJ}{mol} \times \frac{mol}{g} = \frac{kJ}{g}$

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.

Fuel B is most likely to be the heat of combustion of butanol because when dividing 2676 by butanols molar mass a value of approximately 38 is achieved.