**Question 23** (3 marks)

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

\[
(\text{C}_4\text{H}_9\text{OH})_\text{(aq)} + \frac{12}{2} \text{O}_2 \rightarrow 4 \text{CO}_2 \text{(g)} + 9 \text{H}_2\text{O}_\text{(l)}
\]

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

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Heat of combustion (kJ g(^{-1}))</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-48</td>
</tr>
<tr>
<td>B</td>
<td>-38</td>
</tr>
<tr>
<td>C</td>
<td>-28</td>
</tr>
</tbody>
</table>

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 C is 1-butanol. \(\Delta H = \frac{\text{kJ}}{\text{mol}}\)

\[
\text{kJ} = \text{m} \times \text{change in kJ/mol}.
\]

\[
\text{kJ} = \text{m} \times -28 \times 74.08 = 2676 \text{ kJ/mol}.
\]

To change from kJ/g to kJ/mol:

\[
10 \text{ J/mol} \text{ heat of combustion }.
\]