

**GCSE Chemistry B (Twenty First Century Science)**  
**J258/02** Depth in chemistry (Foundation Tier)

**Question Set 4**

1

The **alkanes** and the **alkenes** are both examples of homologous series.

(a) **Table 4.1** shows the names and chemical formulae of some alkanes.

Alkanes	
methane	CH <sub>4</sub>
ethane	C <sub>2</sub> H <sub>6</sub>
propane	C <sub>3</sub> H <sub>8</sub>
butane	C <sub>4</sub> H <sub>10</sub>

**Table 4.1**

(i) Down the series, the number of carbon atoms and hydrogen atoms increases by the same amount each time.

Use examples from **Table 4.1** to show that this statement is true.

[2]

(ii) Pentane is an alkane with five carbon atoms.

Predict the formula of pentane.

[1]

(b) **Table 4.2** shows the names and formulae of some alkenes.

Alkene	Number of carbon atoms	Formula	Displayed formula
methene	does not exist		
ethene	2	C <sub>2</sub> H <sub>4</sub>	$  \begin{array}{c}  \text{H} \quad \quad \text{H} \\    \quad \quad   \\  \text{C} = \text{C} \\    \quad \quad   \\  \text{H} \quad \quad \text{H}  \end{array}  $
propene	3	C <sub>3</sub> H <sub>6</sub>	
butene	4	C <sub>4</sub> H <sub>8</sub>	$  \begin{array}{cccc}  \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   \\  & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\  &   & &   & &   & &   \\  & \text{H} & & \text{H} & & \text{H} & & \text{H}  \end{array}  $
pentene	5	C <sub>5</sub> H <sub>10</sub>	$  \begin{array}{ccccc}  \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   \\  & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{C} & - & \text{H} \\  &   & &   & &   & &   & &   \\  & \text{H} & & \text{H} & & \text{H} & & \text{H} & & \text{H}  \end{array}  $

**Table 4.2**

(i) Complete **Table 4.2** by drawing the displayed formula for **propene**. [2]

(ii) There is no alkene called 'methene'.

Which statement explains why 'methene' cannot exist?

Tick (✓) **one** box.

Methene cannot be a gas at room temperature.

Alkenes contain all single bonds.

Alkenes need to contain at least two carbon atoms.

Methene would be too flammable.

(c) The general formula for all of the alkenes is  $C_nH_{2n}$ .  
The empirical formula for all of the alkenes is  $CH_2$ .

[1]

(i) Use examples from **Table 4.2** to explain why all of the alkenes have the same general formula,  $C_nH_{2n}$ .

[2]

(ii) Explain why the empirical formula of all of the alkenes is  $CH_2$ .

[1]

**Total Marks for Question Set 4: 9**

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