- The element boron forms a series of hydrides, which includes B_2H_6, B_4H_{10}, B_5H_9, B_6H_{10} and $B_{10}H_{14}$. Which one of these hydrides consists of 85.63% boron by mass?

Marks 2

The molar mass of the boranes are:

molar mass of B_2H_6 = (2×10.81 (B)) + (6×1.008 (H)) g mol^1 = 27.668 g mol^{-1}
molar mass of B_4H_{10} = (4×10.81 (B)) + (10×1.008 (H)) g mol^1 = 53.32 g mol^{-1}
molar mass of B_5H_9 = (5×10.81 (B)) + (9×1.008 (H)) g mol^1 = 63.122 g mol^{-1}
molar mass of B_6H_{10} = (6×10.81 (B)) + (10×1.008 (H)) g mol^1 = 74.94 g mol^{-1}
molar mass of $B_{10}H_{14}$ = (10×10.81 (B)) + (14×1.008 (H)) g mol^1 = 122.212 g mol^{-1}

$$\textbf{The percentage of boron} = \frac{\textbf{mass of boron in one mole of hydride}}{\textbf{molar mass of hydride}} \times 100\%$$

$$\textbf{percentage boron in } B_2H_6 = \frac{2\times 10.81}{27.668}\times 100\% = 78.14\%$$

$$\textbf{percentage boron in } B_4H_{10} = \frac{4\times 10.81}{53.32}\times 100\% = 81.10\%$$

$$\textbf{percentage boron in } B_5H_9 = \frac{5\times 10.81}{63.122}\times 100\% = 85.63\%$$

$$\textbf{percentage boron in } B_6H_{10} = \frac{6\times 10.81}{74.94}\times 100\% = 86.55\%$$

$$\textbf{percentage boron in } B_{10}H_{14} = \frac{10\times 10.81}{122.12}\times 100\% = 88.45\%$$

Answer: **B_5H_9**

- Complete the following table.

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Formula	Name
K_2SO_4	**potassium sulfate**
$CuCl_2$	copper(II) chloride
SF_4	**sulfur(IV) fluoride (or sulfur tetrafluoride)**
K_2CrO_4	potassium chromate