

- Hydrogen bond strength increases in the order  $\text{N-H}\cdots\text{N} < \text{O-H}\cdots\text{O} < \text{F-H}\cdots\text{F}$ . Use this information and the data given in the table to explain the differences in boiling point of ammonia, water and hydrogen fluoride.

Compound	$\text{NH}_3$	$\text{H}_2\text{O}$	HF
Boiling point / $^{\circ}\text{C}$	-33	100	20

**$\text{NH}_3$  and HF both have two H-bond per molecule and their boiling points are in the expected order - HF has the stronger H-bonds and the higher boiling point.**

**$\text{H}_2\text{O}$  has 4 H-bonds per molecule, so although the bonds are not as strong as those of HF, there are twice as many of them. As a result the boiling point of  $\text{H}_2\text{O}$  is greater than that of HF.**