

**Marks**  
**5**

- Consider the following equation.



Name all of the species in this equation.

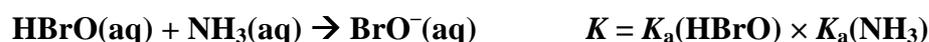
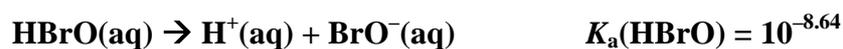
HBrO	<b>hypobromous acid</b>
BrO <sup>-</sup>	<b>hypobromite ion</b>
NH <sub>3</sub>	<b>ammonia</b>
NH <sub>4</sub> <sup>+</sup>	<b>ammonium ion</b>

Complete the following table by giving the correct p*K*<sub>a</sub> or p*K*<sub>b</sub> value where it can be calculated. Mark with a cross (✗) those cells for which insufficient data have been given to calculate a value.

Species	HBrO	NH <sub>3</sub>	BrO <sup>-</sup>	NH <sub>4</sub> <sup>+</sup>
p <i>K</i> <sub>a</sub> of acid	8.64	✗	✗	<b>9.24</b>
p <i>K</i> <sub>b</sub> of base	✗	4.76	<b>5.36</b>	✗

Determine on which side (left or right hand side) the equilibrium for the reaction above will lie. Provide a brief rationale for your answer.

**The reaction is the sum of the acid-base equilibria for HBrO and NH<sub>3</sub>:**



Hence,  $K = (10^{-8.64}) \times (10^{+9.24}) = 10^{+0.64} = 4.4$ . As  $K > 1$ , the reaction favours products.