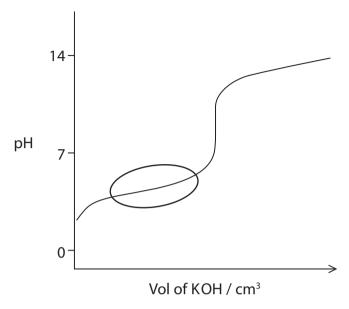
1 A student carried out a titration by adding 0.032 mol dm<sup>-3</sup> potassium hydroxide solution to 25.0 cm<sup>3</sup> of 0.024 mol dm<sup>-3</sup> propanoic acid. A sketch graph of pH against volume of potassium hydroxide solution added is shown below.



(a) \*(i) Describe and explain the behaviour of the solution formed in the region circled on the sketch graph.

(3)

*(ii) Explain why the pH at the equivalence point of this titration is greater than 7.	
	(3)
(iii) By considering the amount of excess alkali remaining, calculate the pH of the solution formed when 40 cm <sup>3</sup> of 0.032 mol dm <sup>-3</sup> potassium hydroxide solution has been added to 25.0 cm <sup>3</sup> of 0.024 mol dm <sup>-3</sup> propanoic acid.	

 $K_{\rm w} = 1.0 \times 10^{-14}~mol^2~dm^{-6}$  at 298 K

(5)

(b) The student made the following statement:	
'The pH of pure water is always 7.0'	
Is the student correct? Use the following information to justify your answer.	
• $H_2O(I) \rightleftharpoons H^+(aq) + OH^-(aq)$	
• $K_{\rm w} = 1.0 \times 10^{-14}  \rm mol^2  dm^{-6}  at  298  K$	
$ullet$ $\Delta H$ is positive for the forward reaction in the equilibrium.	(3)
(Total for Question = 14 ma	arks)

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