Name of the Student:_____
Max. Marks : 15 Marks **Time : 15 Minutes**

Q1.

This question is about different pH values.

(a) For pure water at 40 °C, pH = 6.67
A student thought that the water was acidic.

Explain why the student was incorrect.

Determine the value of K_w at this temperature.

Explanation _____

_____

K_w _____ $mol^2\ dm^{-6}$

(4)

(b) Sodium hydroxide solution was added gradually from a burette to 25 cm^3 of 0.080 mol dm^{-3} propanoic acid at 25 °C
The pH was measured and recorded at regular intervals.

The results are shown in the diagram.

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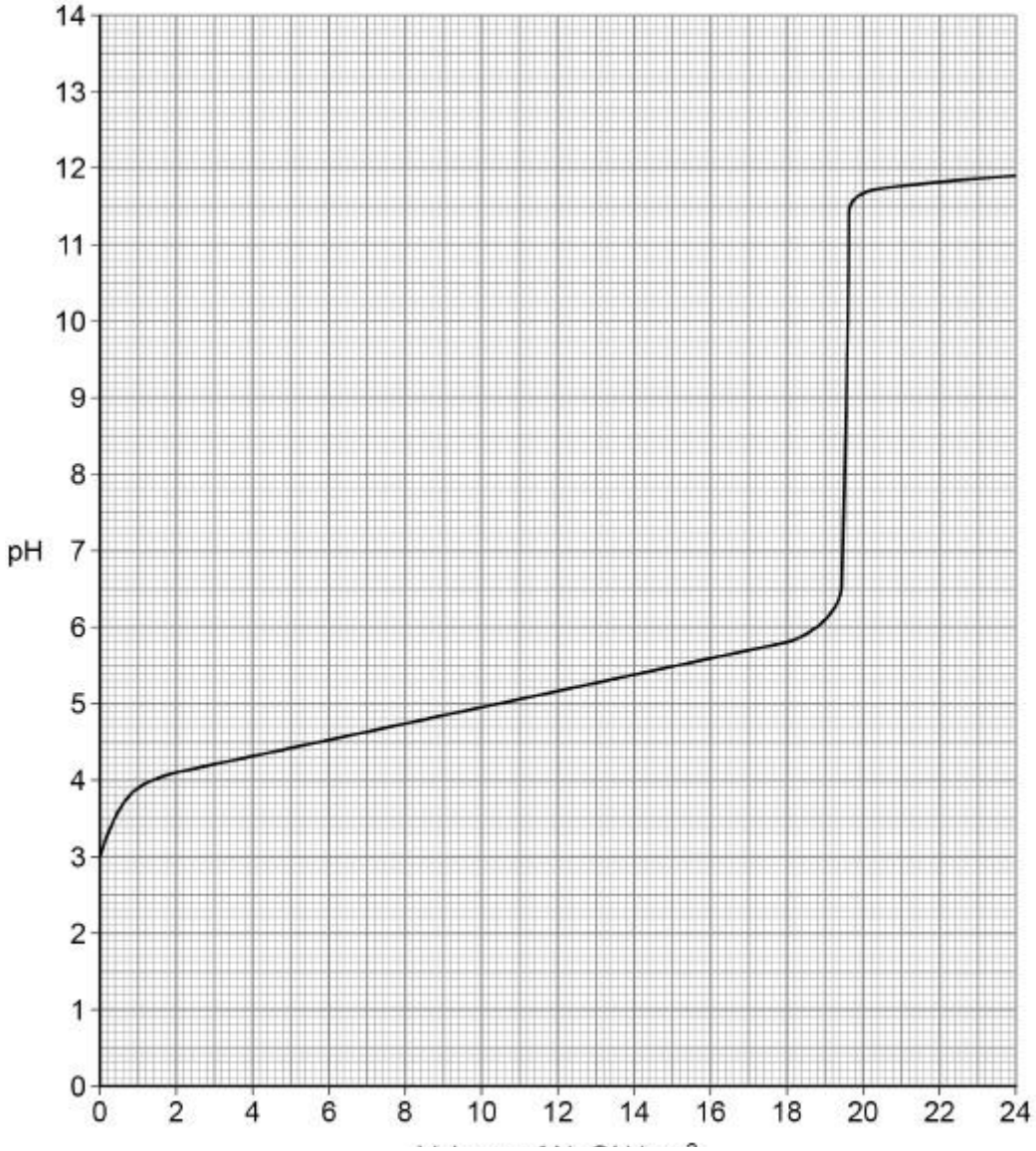

Use the diagram above to determine the value of K_a for propanoic acid at 25 °C

Show your working.

K_a _____ mol dm^{-3}

(3)

(c) Suggest which indicator is the most appropriate for the reaction in part **(b)**?
Tick (✓) **one** box.

Indicator	**pH range**	**Tick (✓) one box**
methyl orange	3.1 - 4.4	
bromothymol blue	6.0 - 7.6	

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cresolphthalein	8.2 - 9.8	
indigo carmine	11.6 - 13.0	

(1)

(d) A student prepared a buffer solution by adding 0.0136 mol of a salt KX to 100 cm^3 of a 0.500 mol dm^{-3} solution of a weak acid HX and mixing thoroughly.

The student then added 3.00×10^{-4} mol of potassium hydroxide to the buffer solution.

Calculate the pH of the buffer solution after adding the potassium hydroxide.

For the weak acid HX at 25 °C the value of the acid dissociation constant, $K_a = 1.41 \times 10^{-5}$ mol dm^{-3}.

Give your answer to two decimal places.

pH _____

(6)

(e) A buffer solution has a constant pH even when diluted.

Use a mathematical expression to explain this.

(1)

(Total 15 marks)

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