

1. Fred investigates the acid  $\text{CH}_3\text{COOH}$ .

(i) Which part of the formula shows you that  $\text{CH}_3\text{COOH}$  is a carboxylic acid?

Put a ring around the correct answer.

$\text{CH}_3$

$\text{CO}$

$\text{OH}$

$\text{COOH}$

[1]

(ii) The acid is a weak acid. What does this mean?

Put a tick (✓) in the box next to the correct answer.

Its formula contains carbon, hydrogen and oxygen.

It is more dilute than acids such as hydrochloric acid.

It is less reactive than acids such as hydrochloric acid.

It is more runny than acids such as hydrochloric acid.

[1]

(iii) Fred compares solutions of this weak acid with a strong acid of the same concentration.

How do the pH values of the two solutions compare?

Put a tick (✓) in the box next to the correct answer.

The weak acid has a higher pH.

The weak acid has the same pH.

The weak acid has a lower pH.

The weak acid has a much lower pH.

[1]

2. Some people have warts on their skin.

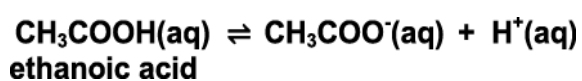


Warts can be removed by treating them with a corrosive solution of acids.

Ellen finds out that the medicine contains a mixture of acids.

One of the acids in the medicine is ethanoic acid.

The equation shows ethanoic acid behaving as an acid.



- (i) How does the equation show that ethanoic acid is an acid?

----- [1]

- (ii) Draw the fully displayed formula for ethanoic acid.

[2]

3. Hazard symbols are used to give safety information.



harmful



corrosive



oxidising



toxic



flammable

Kai uses ethanoic acid.

The table shows the hazard symbols for ethanoic acid at different concentrations.

Concentration (mol / dm <sup>3</sup> )	Hazard symbol
< 1.7	none
≥ 1.7 and < 4.0	
≥ 4.0	
very concentrated	

(i) At what concentrations is ethanoic acid harmful, but not corrosive?

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[2]

(ii) Suggest a concentration at which ethanoic acid is flammable.

----- [1]

(iii) Kai adds very concentrated ethanoic acid to ethanol and heats the mixture.

Suggest some safety procedures for Kai to use to make sure that he is safe during this experiment.

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----- [3]

**END OF QUESTION PAPER**

Question			Answer/Indicative content	Marks	Guidance
1		i	COOH	1	<p><b>Examiner's Comments</b></p> <p>Almost all candidates realised that the carboxylic acid group is –COOH.</p>
		ii	its formula contains carbon, hydrogen and oxygen <input type="checkbox"/> it is more dilute than acids such as hydrochloric <input type="checkbox"/> it is less reactive than acids such as hydrochloric <input checked="" type="checkbox"/> it is more runny than acids such as hydrochloric <input type="checkbox"/>	1	<p><b>Examiner's Comments</b></p> <p>The majority of candidates knew that weak acids are less reactive than strong acids. The most common mistake was to suggest that weak acids are more dilute than strong acids.</p>
		iii	a weak acid has a higher pH <input checked="" type="checkbox"/> a weak acid has the same pH <input type="checkbox"/> a weak acid has a lower pH <input type="checkbox"/> a weak acid has a much lower pH <input type="checkbox"/>	1	<p><b>Examiner's Comments</b></p> <p>Most candidates knew that weak acids have a higher pH than strong acids. The most common misconception was, unsurprisingly, that they have a lower pH.</p>
			<b>Total</b>	<b>3</b>	
2		i	H <sup>+</sup> ion is made ✓	1	
		ii	$\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{C} \\   \quad // \\ \text{H} \quad \text{O} \\ \quad \quad   \\ \quad \quad \text{O}-\text{H} \end{array}$ COOH drawn fully correctly ✓ CH <sub>3</sub> drawn correctly ✓	2	<p>Allow -OH without O-H bond shown</p> <p>CH<sub>3</sub> must be fully displayed</p>
			<b>Total</b>	<b>3</b>	

Question			Answer/Indicative content	Marks	Guidance
3		i	<p>quotes both 1.7 and 4.0 (mol/dm<sup>3</sup>) in answer ✓</p> <p>uses 'greater than or equal to' (1.7) and 'less than' (4.0) ✓</p>	2 (AO 2× 2.2)	<p>ALLOW 1.7 and 3.9</p> <p>ALLOW 3.9 for 'less than 4.0'</p> <p>IGNORE use of symbols</p> <p><b><u>Examiner's Comments</u></b></p> <p>This question tests the new mathematical content. Candidates are required to interpret the symbols for comparing amounts. Almost all candidates identified the correct range of concentrations. Higher ability candidates made it very clear that they understood the symbols by clearly stating in words 'equal to or greater than 1.7 but less than 4.0'</p>
		ii	5(.0) or higher / quotes value ✓	1 (AO 2.2)	IGNORE units

Question		Answer/Indicative content	Marks	Guidance
	iii	<p>Any three from:  gloves / goggles / safety screen ✓</p> <p>identifies mixture hazard as flammable ✓</p> <p>identifies mixture hazard as corrosive ✓</p> <p>additional detail: mix chemicals <u>before</u>  lighting any flame / use a water bath or  electric heater / do not heat with a naked  flame / avoid contact with skin or eyes /  wash any splashes (immediately) ✓</p>	3 (AO 3× 3.3a)	<p>ALLOW it will catch fire</p> <p>ALLOW it will burn <u>you</u> or burn <u>skin/eyes</u></p> <p>ALLOW 'protect skin/eyes'</p> <p><b><u>Examiner's Comments</u></b></p> <p>This question was an 'overlap' question and so also appeared on the foundation tier. This means that it was designed to be accessible to candidates at standard demand (grades 4/5). Therefore, general safety precautions were accepted as correct for a single mark. This meant that almost all candidates earned at least one mark for stating that the use of gloves/goggles were needed. Fewer candidates processed the provided information to identify that the hazards of the mixture are that it is both flammable and corrosive. Candidates should avoid the use of 'burn' for corrosive, as there is a confusion between this and a description of flammability. Higher ability candidates used the correct terminology so that there was no ambiguity in their answers.</p>
		<b>Total</b>	<b>6</b>	