

### Chemistry 3 - Foundation tier only questions

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
1		(a)		1	(three) factors needed for a fire to burn / fire goes out if any one factor is removed	heat, oxygen and fuel are needed		
		(b)		3	removes air / oxygen (1) removes heat (1) removes fuel (1)			
		(c)		1	water			

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FT	HT								
2		(a)			1	glucose highest rate of fermentation / reacts faster (both needed)	better <b>rate</b> than the others	biggest bar	
		(b)	(i)		3	opinion needed, unless implied in answer  Yes (1) per reason why ethanol should be used up to 3 max renewable / produces less soot / only produces carbon dioxide and water when burnt  No (1) per reason why ethanol should not be used up to 3 max large areas of land required / engines require modification / less heat per litre  credit possible for use of advantages and disadvantages for argument clearly showing that advantages outweigh disadvantages or vice versa – up to 3 max	no mark for opinion  sensible reason not in table  sensible reason not in table  further qualification of a point credited additional mark e.g. large areas of land required to grow crops (1) therefore less available to grow food crops (1)		
			(ii)		1	carbon dioxide + water <b>both</b> needed	correct formulae for <b>both</b>		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
3		(a)			3	carbon dioxide → turns limewater milky (1) ammonia → turns damp red litmus blue (1) oxygen → relights a glowing splint (1)			
		(b)			3	yellow flame (1) green flame (1) brown precipitate (1)			

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FT	HT	(a)	(i)						
4			(i)		2	<b>A</b> and <b>C</b> - <b>both</b> needed (1) <b>B</b> and <b>D</b> - <b>both</b> needed (1)	correct formulae/names for <b>both</b> correct formulae/names for <b>both</b>		
			(ii)		1	<b>E</b>	propene		
		(b)			1	$C_{10}H_{22}$	$H_{22}C_{10}$		

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
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5		(a)	(i)		2	sulfur dioxide (1) sulfur trioxide (1)	SO <sub>2</sub> SO <sub>3</sub>		
			(ii)		1	2			
			(iii)		1	far too / very exothermic or acid forms mist / white fumes form or acid is difficult to collect		dangerous / explosive / reactive	
		(b)	(i)		2	5 + 5 + 30 + 30 + 15 (1) 15 (1) follow through error (ft) correct answer only (cao) (2)			
			(ii)		1	ammonia	NH <sub>3</sub>		
			(iii)		3	overgrowth of algae (1) good description of eutrophication – up to (3) gets into water supplies (1) must be some linking of points in explanation for full marks to be awarded	gets into water supplies and can lead to blue baby syndrome (2)	kills fish pollution	

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
FT	HT								
6		(a)	(i)		1	$25\text{cm}^3 \pm 1\text{cm}^3$			
			(ii)		1	1.5 °C			
		(b)			1	acid <b>A</b> (no mark)  temperature rise is greater / produces more heat – mark can <b>only</b> be awarded if <b>A</b> given			
		(c)			3	add acid slowly from burette (1)  add indicator to sodium hydroxide solution / solution in cup (1)  indicator changes colour (1)	indication of precision  record volume required to change colour of indicator (2)		add indicator to acid/burette

### Chemistry 3 - Common questions

Question Number		Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
7	1	(a)		1	hydrogen	H <sub>2</sub>	H	
		(b)		2	iron (1)  speeds up the reaction / increases the rate of the reaction (1)			
		(c)		2	recycled / returned into reactor (1)  basic qualification required e.g. reduces cost of process / less waste of raw materials (1)	fed back in re-used	more efficient / reacted again / more yield / saves time	
		(d)		2	lower yield with higher temperature (1)  higher yield with a higher pressure (1)	vice versa		
		(e)		3	N <sub>2</sub> + H <sub>2</sub> (1)  NH <sub>3</sub> (1)  (1), 3, 2 (1)  formulae must be correct to award balancing mark			

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FT	HT								
8	2	(a)			1	significantly different/ long way out when compared to other two readings		not the same / 6 or 8 out etc.	
		(b)			2	all points plotted correctly (2) 4 points correct (1)  curve not needed so ignore if drawn			
		(c)			2	volume / rate increases with temperature up to an optimum (1)  then volume / rate goes back down (1)	up to maximum / up to 40 °C		
		(d)			2	glucose (1)  ethanol + carbon dioxide (1)	$C_6H_{12}O_6$  $C_2H_5OH + CO_2$		+ yeast
		(e)			1	enzyme	zymase	biological	



Question Number		Mark	Answer
FT	HT		
9	3	6 QWC	<p><b>Indicative content</b></p> <ul style="list-style-type: none"> <li>• heat required to turn limestone into quicklime; water added to turn quicklime into slaked lime</li> <li>• limestone glows and becomes crumbly when heated; sizzling/ steam being released when water is added</li> <li>• thermal decomposition causes calcium carbonate to decompose forming carbon dioxide gas and calcium oxide; water reacts with calcium oxide to form calcium hydroxide</li> <li>• <math>\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2</math> ; <math>\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2</math></li> </ul> <p><b>5-6 marks:</b> The candidate constructs an articulate, integrated account correctly linking relevant points, such as those in the indicative content, which shows sequential reasoning. The answer fully addresses the question with no irrelevant inclusions or significant omissions. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</p> <p><b>3-4 marks:</b> The candidate constructs an account correctly linking some relevant points, such as those in the indicative content, showing some reasoning. The answer addresses the question with some omissions. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</p> <p><b>1-2 marks:</b> The candidate makes some relevant points, such as those in the indicative content, showing limited reasoning. The answer addresses the question with significant omissions. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</p> <p><b>0 marks:</b> The candidate does not make any attempt or give a relevant answer worthy of credit.</p>