

### Chemistry 3 - Common questions

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
7	1	(a)	(i)	I	1	sulfur / S			
				II	1	vanadium(V) oxide / vanadium oxide / vanadium pentoxide / $V_2O_5$		VO	
				III	1	sulfuric acid / $H_2SO_4$	oleum	dilute / conc	
			(ii)		3	reactants: $SO_2 + O_2$ (1) product: $SO_3$ (1) balancing: $2(SO_2)$ $2(SO_3)$ (1) – reactants and product must be correct before balancing mark awarded			
		(b)			2	(blue hydrated copper(II) sulfate) turns white (1)  (crystalline hydrated copper (II) sulfate) turns powdery / turns crumbly / loses its crystalline appearance (1)		changes colour	

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8	2	(a)			3	all points plotted correctly ( $\pm\frac{1}{2}$ square) (2) any five points plotted correctly (1)  smooth continuous curve through all points – judgement by eye  (1)			
		(b)			1	any one from: same surface area (of substances) same concentration (of peroxide solution) same temperature / all at room temperature			
		(c)			1	any one from: liver contains the most catalase / enzyme carrot contains the least catalase / enzyme any correct comparison in terms of catalase e.g. liver contains more catalase than apple / apple contains more catalase than potato / potato contains more catalase than carrot catalase present in all substances			
		(d)			1	re-lights a glowing splint – both needed			lighted splint burns brighter

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9	3	(a)	(i)		1	sodium carbonate / $\text{Na}_2\text{CO}_3$	sodium hydrogencarbonate / $\text{NaHCO}_3$		
			(ii)		1	magnesium ethanoate / $(\text{CH}_3\text{COO})_2\text{Mg}$			
		(b)			1	(ethanoic acid/it) is a weaker acid / has a higher pH (than that of sulfuric acid) ethanoic acid pH is 3/4 and sulfuric acid pH is 1/2 ethanoic acid has a lower $\text{H}^+$ ion concentration than sulfuric acid	less acidic	ethanoic acid pH is 3/4	
		(c)			1	ethanol / $\text{C}_2\text{H}_5\text{OH}$			

Question Number			
FT	HT	Mark	Guidance
10	4	6	<p>Indicative content: Reference to <i>principle</i> of fire triangle – fuel, heat and air (oxygen) are needed, removing any one factor will put fire out</p> <p>Types of fire fighting methods related to examples</p> <ul style="list-style-type: none"> <li>• heat removed by water e.g. house fires, bonfires</li> <li>• air removed: <ul style="list-style-type: none"> <li>○ fire blanket e.g. chip pan fire, person on fire</li> <li>○ CO<sub>2</sub> / powder e.g. indoor fires, chemical fire, electrical fire</li> <li>○ foam e.g. aeroplane fire</li> </ul> </li> <li>• fuel removed: <ul style="list-style-type: none"> <li>○ fire-break e.g. forest fire</li> <li>○ gas supply switched off e.g. natural gas fire</li> </ul> </li> </ul> <p>5-6 marks: 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>3-4 marks: 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>1-2 marks: 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>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>

### Chemistry 3 - Higher Tier only questions

Question Number									
FT	HT	Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
	5	(a)			2	(glucose) solution / add water (to glucose) warm / warm temperature / any temperature in the range 20-40°C absence / lack of oxygen pH 4-7  – any two for (1) each		yeast optimum / ‘right’ temperature	
		(b)			1	2 : 2			
		(c)	(i)		1	filtration / filtering / filter	decant		
			(ii)		1	distillation			fractional distillation
		(d)			1	renewable (fuel / energy resource) carbon-neutral reduces demand on fossil fuels doesn’t produce sulfur dioxide (so doesn’t cause acid rain)		cleaner / less pollution / less carbon dioxide / more environmentally friendly	more efficient

Question Number									
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	6	(a)	(i)		3	reactants: $\text{CaO} + \text{H}_2\text{O}$ (1) product: $\text{Ca(OH)}_2$ (1) balancing: 1 : 1 : 1 (1) – reactants and product must be correct before balancing mark awarded			
			(ii)	I	1	2			
				II	1	1			
			(iii)		1	(bubble in) carbon dioxide (limewater) turns milky – both needed			
		(b)			2	<i>Opinion and response must match to be awarded marks</i> Yes and advantages given e.g. building material, (local) jobs, used in blast furnace / used to extract iron, used to make cement / used to make mortar / used to make concrete, used to make glass, used to neutralise acid soil / manufacture of medicinal antacids, aggregate for roads, abrasive in toothpastes – any two for (1) each No and disadvantages given e.g. dust, noise / blasting, (heavy) lorries / traffic, landscape destruction, habitat destruction / wildlife destruction – any two for (1) each NB – Accept the counter argument i.e. ‘even though’ / ‘but’ statements e.g. No – provides jobs but only in the local areas not country wide Yes – landscape destroyed but can be reclaimed			

Question Number		Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
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	7	(a)			1	$C_nH_{2n+1}OH$	$C_nH_{2n+2}O$		
		(b)			2	<div> <math display="block">  \begin{array}{ccccccc}  &amp; H &amp; H &amp; H &amp; &amp; &amp; \\  &amp;   &amp;   &amp;   &amp; &amp; &amp; \\  H &amp; -C &amp; -C &amp; -C &amp; -O &amp; -H \\  &amp;   &amp;   &amp;   &amp; &amp; &amp; \\  &amp; H &amp; H &amp; H &amp; &amp; &amp;   \end{array}  </math> (1) </div> <div> <math display="block">  \begin{array}{ccccccc}  &amp; H &amp; H &amp; H &amp; &amp; &amp; \\  &amp;   &amp;   &amp;   &amp; &amp; &amp; \\  H &amp; -C &amp; -C &amp; -C &amp; -H \\  &amp;   &amp;   &amp;   &amp; &amp; &amp; \\  &amp; H &amp; OH &amp; H &amp; &amp; &amp;   \end{array}  </math> (1) </div>	$CH_3CH_2CH_2OH$  $CH_3CH_2CH_3$ $ $ $OH$		
		(c)			2	propene (1) <div> <math display="block">  \begin{array}{ccccccc}  &amp; H &amp; H &amp; H &amp; &amp; &amp; \\  &amp;   &amp;   &amp;   &amp; &amp; &amp; \\  H &amp; -C &amp; =C &amp; -C &amp; -H \\  &amp; &amp; &amp;   &amp; &amp; &amp; \\  &amp; &amp; &amp; H &amp; &amp; &amp;   \end{array}  </math> (1) </div>			

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	8	(a)			3	A     NH <sub>4</sub> Cl  B     Na <sub>2</sub> CO <sub>3</sub>  C     CuSO <sub>4</sub>  all ions correctly identified (2) 3, 4 or 5 ions correctly identified (1)  all formulae correct (1)		correct names only for all three compounds (2)		
		(b)			1	D				

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	9	(a)			1	25.0	25		
		(b)			3	number of moles NaOH = concentration $\times$ volume = $0.1 \times 25/1000$ = 0.0025 (1)  (stoichiometry / equation shows 1:1) 0.0025 mol CH <sub>3</sub> COOH : 0.0025 mol NaOH (1)  concentration CH <sub>3</sub> COOH = number of moles $\div$ volume = $0.0025 \div 25/1000$ = 0.1 (1)  – correct answer only (cao) (3) – follow through error (ft)	$cV = cV$ $c \times 25 = 0.1 \times 25$ (2)  $c = \frac{0.1 \times 25}{25} = 0.1$		
		(c)	(i)		1	60			
			(ii)		2	number of moles = concentration $\times$ volume = $0.1 \times 100/1000$ = 0.01 (1)  number of moles = mass /M <sub>r</sub> mass = number of moles $\times$ M <sub>r</sub> = $0.01 \times 60 = 0.6 \text{ g}$ ( $\therefore$ label information incorrect) (1)	number of moles in $100\text{cm}^3 = 0.083$ (1)  concentration calculated above as $0.1 \text{ mol/dm}^3$ – not $0.83 \text{ mol/dm}^3$ (1)		

Question Number			
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	10		<p>Indicative content:</p> <p>Explanation of choice of temperature and pressure conditions and rationale of presence of catalyst e.g.</p> <p>reversible reaction, left to right reaction required to produce ammonia</p> <p>(left to right reaction is exothermic and) higher yield is favoured by lower temperature however lower temperature results in lower rate so compromise made – moderately high temperature increases rate at the expense of yield rate further increased by using iron catalyst</p> <p>higher yield is favoured by higher pressure however increasing pressure increases plant costs and is potentially more hazardous – moderate pressure chosen provides moderate yield</p> <p>lower yield acceptable because unreacted nitrogen/hydrogen can be easily separated and returned to reaction vessel</p> <p>5-6 marks: 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>3-4 marks: 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>1-2 marks: 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>0 marks: The candidate does not make any attempt or give a relevant answer worthy of credit.</p>