UNIT 1: CHEMICAL SUBSTANCES, REACTIONS AND ESSENTIAL RESOURCES
FOUNDATION TIER

MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

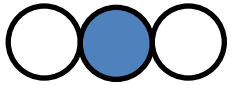
Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statements.

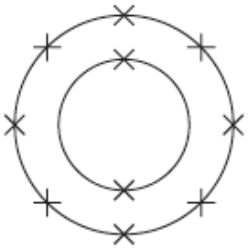
Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Award (1) for each correct answer **A** – Crust **B** – Outer core **C** – Mantle	3			3		
	(b)	(i)		Helium	1			1		
		(ii)		Award (1) for any of following Carbon dioxide Water vapour Methane	1			1		
		(iii)		Carbon dioxide	1			1		
	(c)			Glowing / smouldering splint (1) Reignites (1)	2			2		2
	(d)			Award (1) for each correct diagram  oxygen  carbon dioxide		2		2		
				Question 1 total	**8**	**2**	**0**	**10**	**0**	**2**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			Award (1) for each correct answer [max (1) if three boxes ticked] Making glass Making cement	2			2		
	(b)	(i)		Heated strongly / for several minutes	1			1		1
		(ii)		Award (1) for each of following Goes crumbly / breaks up / puffs up Forms steam / hisses	2			2		2
	(c)			Award (1) for disadvantage and (1) for sensible development of point e.g. Creates dust – from blasting, lorries Creates noise – from blasting, lorries Ruins landscape – unpleasant for residents, affects property prices Destroys habitats – harms wildlife	2			2		
				Question 2 total	**7**	**0**	**0**	**7**	**0**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)			Award (1) for each point Substance that contains one type of atom Cannot be broken down by chemical means / to a simpler substance	2			2		
	(b)	(i)		Neutron	1			1		
		(ii)		3		1		1	1	
	(c)			2		1		1	1	
	(d)	(i)				1		1		
		(ii)		All three have 10 protons (1) Neon-20 has 10 neutrons, neon-21 has 11 and neon-22 has 12 (1)		2		2	1	
				Question 3 total	**3**	**5**	**0**	**8**	**3**	**0**

<table>
<tr><th colspan="4" rowspan="2">Question</th><th rowspan="2">Marking details</th><th colspan="6">Marks Available</th></tr>
<tr><th>AO1</th><th>AO2</th><th>AO3</th><th>Total</th><th>Maths</th><th>Prac</th></tr>
<tr><td>4</td><td>(a)</td><td>(i)</td><td></td><td>Barium</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(ii)</td><td></td><td>Any of following for (1)
Phosphorus
Sulfur
Chlorine
Argon</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iii)</td><td></td><td>Li_2O</td><td></td><td>1</td><td></td><td>1</td><td></td><td></td></tr>
<tr><td></td><td></td><td>(iv)</td><td></td><td>$BaCl_2$ (2)

If formula is incorrect award (1) for identification of either barium or chloride ions</td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>(b)</td><td></td><td></td><td><table><tr><th>Compound</th><th>Mixture</th></tr><tr><td>A, D (1)
Both needed</td><td>E (1)</td></tr></table></td><td></td><td>2</td><td></td><td>2</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td>Question 4 total</td><td>0</td><td>7</td><td>0</td><td>7</td><td>0</td><td>0</td></tr>
</table>

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5				***Indicative content*** • All rainwater is slightly acidic • Sulfur is present as an impurity in coal and forms sulfur dioxide gas when it burns • $S + O_2 \rightarrow SO_2$ • Sulfur dioxide enters the atmosphere and reacts with / dissolves in rainwater • Produces significantly acidic solution / sulfuric acid which falls as acid rain • Acid rain erodes limestone statues and buildings, corrodes metal structures such as bridges • Acid rain damages plants and vegetation and aquatic life **5–6 marks** Comprehensive description of the formation of acid rain, including the presence of sulfur impurities in fossil fuels; sulfur combustion equation; at least three effects on the environment, including one effect on a material and one effect on a living organism *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.* **3–4 marks** Basic description involving formation of sulfur dioxide gas which dissolves in rainwater; at least one effect on a material and one effect on a living organism *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.* **1–2 marks** Reference to formation of sulfur dioxide gas or sulfur dioxide dissolving in rainwater; one effect of acid rain *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.* **0 marks** *No attempt made or no response worthy of credit.*	6			6		
				Question 5 total	**6**	**0**	**0**	**6**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)			36 °C Accept 35-37		1		1	1	
	(b)			3.4 (2) If answer is incorrect award (1) for indication that 1.8 and 5.2 have been read from graph		2		2	2	
	(c)			Award (1) for each of following pH 2 is low / strongly acidic Most enzymes are active at pH close to neutral / at pH around 6-8		1	1	2		2
				Question 6 total	**0**	**4**	**1**	**5**	**3**	**2**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			$2KOH + H_2$ (2) If equation is incorrect award (1) for correct formulae of both products		2		2	1	
	(b)			Award (1) each for any two of following Floats Moves around on surface Melts into ball Ignites and burns with lilac flame Fizzing / hissing noise	2			2		2
	(c)			Reaction too vigorous/explosive/dangerous		1		1		1
	(d)			$M_r(KNO_3)$ is 101 (1) $M_r(K_2SO_4)$ is 174 (1) Conclusion – 48 % oxygen in KNO_3 and 37 % oxygen in K_2SO_4 therefore she is not correct (1)			3	3	3	
				Question 7 total	**2**	**3**	**3**	**8**	**4**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)		As the percentage of people drinking fluoridated water increases the mean DMFT decreases			1	1		
		(ii)		Award (1) for each correct answer [max (1) if three boxes ticked] Dental records Water company records		2		2		
		(iii)		Award (1) for each of following Other factors may affect DMFT People may have got fluoride from other sources e.g. toothpaste / mouthwash Could be negative side-effects			3	3		
	(b)	(i)		**A** because it requires the smallest volume of soap to form a permanent lather			1	1		
		(ii)		To remove any temporary hardness	1			1		
		(iii)		**B** because it requires less soap after boiling but still requires more than distilled water			1	1		
				Question 8 total	**1**	**2**	**6**	**9**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		All 5 points plotted correctly (2) [Credit (1) for 3 or 4 correct points] Straight line of best fit attempted (1)		2 1		3	3	3
		(ii)		Both increase as temperature increases (1) Any two of following for (1) each Solubilities the same at 50 °C KNO_3 more soluble than $Pb(NO_3)_2$ above 50 °C / KNO_3 less soluble than $Pb(NO_3)_2$ below 50°C KNO_3 increases much more than $Pb(NO_3)_2$		 2	1	 3	 1	
	(b)			4.9 g of substance **X** undissolved (1) 15.1 g of substance **X** has dissolved (in 50 g of water) (1) 30.2 (1) Award (3) for correct answer only		 3		 3	 3	 3
				Question 9 total	**0**	**7**	**2**	**9**	**7**	**6**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)			Gas syringe	1			1		1
	(b)	(i)		As concentration of acid increases the rate of reaction increases (1) Greater number of acid particles at higher concentration (1) Greater chance of (successful) collisions with magnesium / more (successful) collisions per second (1)	 1 1		1	 3		
		(ii)		No useful data was collected / 30 cm^3 of gas collected in most experiments (1) All the magnesium was used up well before 60 s / the final volume of gas was collected well before 60 s / the reaction was over well before 60 s (1)			 2	 2	1	 2
		(iii)		Temperature of the acid (1) Surface area of the magnesium (1)	 2			 2		
	(c)			Method – add three samples to water and measure loss of mass (1) Controlled variables – award (1) each for up to two of the following: same volume of each water sample same amount of time samples of same or similar size/shape/mass		 2	1	 3		3
				Question 10 total	**5**	**2**	**4**	**11**	**1**	**6**

FOUNDATION TIER

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	8	2	0	10	0	2
2	7	0	0	7	0	3
3	3	5	0	8	3	0
4	0	7	0	7	0	0
5	6	0	0	6	0	0
6	0	4	1	5	3	2
7	2	3	3	8	4	3
8	1	2	6	9	0	0
9	0	7	2	9	7	6
10	5	2	4	11	1	6
TOTAL	32	32	16	80	18	22