

Mark Scheme - 1.3 Water

1.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		3	David – mean of all four values ($54 \div 4 = 13.5$) (1) Haf – mean of three values, with indication which three were selected (1) Haf's value is better as she used repeatable values only / discarded the value that appears to be suspect (1)			
(b)		1	A		8	
(c)		2	B (1) some hardness has been removed by boiling but some remains (1)			
(d)		1	calcium (ion) / magnesium (ion)	$\text{Ca}^{2+} / \text{Mg}^{2+}$		

2.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		5	<p>step 1 – use of soap solution to identify distilled water, needs fair testing element for both marks</p> <ul style="list-style-type: none"> • add 1 cm³ soap (solution) to 5 cm³ of each water sample (1) • shake for 1 minute/shake for the same time (1) • distilled water most froth (1) <p>step 2</p> <ul style="list-style-type: none"> • boil unidentified samples and repeat step 1 (1) • temporary hard water lathers after boiling; permanent hard water still does not lather after boiling (1) <p>credit alternative methods – up to (3) for method/fair test and up to (2) for conclusions</p>	add soap to each water sample and shake (1)		washing up liquid
(b)		1	<p>reference to appliance needed</p> <p>furs up kettles/ kettles less efficient / boilers fur up / boilers less efficient / pipes fur up / pipes less efficient</p>		<p>reference to soap 'wastes energy' 'decreases efficiency' 'blocks pipes'</p>	

3.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	1	A – requires the most soap – both needed			
	(ii)	2	<p>D (1)</p> <p>some hardness removed by boiling but not all / temporary hardness removed by boiling but permanent hardness remained (1)</p> <p>Alternative answer accepted for all candidates due to very common mis-interpretation of question on Welsh-medium papers</p> <p>A contains permanent hardness and C contains temporary hardness (1)</p> <p>A loses none of its hardness through boiling and C loses all of its hardness (through boiling) (1)</p>			
(b)		2	<p>same trend / A still the hardest / B still the softest / D still contains both permanent and temporary hard water (1)</p> <p>different amount of water used / different concentration of soap solution / shaken for a different amount of time / different amount of lather formed (1)</p>			

4.

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)		2	A and B both needed (1) little / poor / no lather (1) second mark alone may be awarded if only A or B given			
	(ii)		2	A is temporary hard water and B is permanent (1) any of following for (1) <ul style="list-style-type: none"> • temporary is softened by boiling • permanent is not softened by boiling • temporary forms lather after boiling • permanent doesn't form lather after boiling 		ignore reference to sample C unless incorrect	

Sub-section			Mark	Answer	Accept	Neutral answer	Do not accept
(b)	(i)		3	<ul style="list-style-type: none"> • salt remains in flask / salt left behind • water boils / water turns to steam / steam enters condenser • steam condenses / steam turns back to water in condenser / steam cools to form water • distillation / desalination any 3 for (1) each maximum (1) for description of separation of ethanol and water			
	(ii)		2	a lot of lather / froth / bubbles / foam (1) (pure water) contains no dissolved solids / (pure water) contains no Ca^{2+} / (pure water) contains no Mg^{2+} (1)	accept diagram reference to calcium / magnesium		

5.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)		3	<p>two possible approaches</p> <p>either</p> <ul style="list-style-type: none"> below 54°C, NaCl more soluble (1) at 54°C, solubilities the same (1) above 54°C, CuSO₄ more soluble (1) <p>or</p> <ul style="list-style-type: none"> below 54°C, CuSO₄ increases a lot with temperature, NaCl does not (1) above 54°C, trend continues but CuSO₄ is more soluble than NaCl (1) at 54°C, solubilities the same (1) 	<p>converse</p> <p>converse</p>		
(b)		2	<p>$56 - 29 = 27$ (1) no tolerance</p> <p>$27/2 = 13.5$ (1) ecf possible</p> <p>award (2) for cao</p>			

6.

Sub-section		Mark	Answer	Accept	Neutral answer	Do not accept
(a)	(i)	1	84 – no tolerance			
	(ii)	2	32 (2) ecf possible from part (i) if incorrect award (1) for 16 or 200 – 168			
(b)		3	both increase with temperature (1)R R - must have this for full marks any 2 of the following for (1) each KNO ₃ non-linear increase/curve and KBr linear increase/straight line (1) solubilities the same at 50°C (1) below 50°C solubility of KNO ₃ is lower than KBr or above 50°C solubility of KNO ₃ is higher than KBr (1) solubility of KNO ₃ increases more than solubility of KBr (1)			

7.

Sub-section	Mark	Answer	Accept	Neutral answer	Do not accept
(a)	1	sodium chloride	NaCl		
(b)	1	62			
(c)	2	140 – 80 (1) 60 (1) cao – 2 marks			
(d)	2	increases (to maximum) then falls / up and down (1) maximum at 30 °C / maximum of 70 ± 2 g per 100 g water (1) rises more steeply than it falls – 2 marks			

8.

Mark	Answer
6	<p>Indicative content: how it is carried out – spot of each ink on pencil line and dip end of paper in water, leave for water to rise up paper what happens – water dissolves ink and carries the components different distances according to their solubilities, appear as spots/streaks on paper / as chromatogram results – if inks contain the same pigments, the pattern of spots would be identical; different pattern if inks contain different pigments</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>