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CHEMISTRY

9701/34

Paper 3 Advanced Practical Skills 2

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MARK SCHEME

Maximum Mark: 40

Published

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This document consists of **6** printed pages.

Question	Answer	Marks
1(a)	I 5 (or more) experiments completed and Table to show Volume of FB 1 , Volume of water, Time and Rate	1
	II Correct units for all data Volume: in cm^3 or cm^3 or (cm^3) or cm^3 by each volume Time: /s or (s) or s by each time (<i>not sec or seconds but allow 'in seconds'</i>) Rate: / s^{-1} or (s^{-1}) or s^{-1} by each rate	1
	III All times recorded to nearest second (minimum of 3 times)	1
	IV Two additional experiments with volume FB 1 not less than 10 cm^3 , not more than 40 cm^3 and no volume $\leq 2 \text{ cm}^3$ close to another volume.	1
	V Volumes of water chosen so that FB1 + water = 40 cm^3 for additional experiments carried out.	1
	VI Correctly calculates rate for all experiments and shown to 2 – 4 sf.	1
	VII Award if all candidate's times increase with decrease in volume of FB 1 .	1
	VIII Award if candidate's time to nearest second for Experiment 2 is within 10% of the supervisor's result	1
	IX Award if candidate's (time for FB 1 = 20)/(time FB 1 = 40) is between 1.90 and 2.40	1
	X Award if candidate's (time for FB 1 = 20)/(time FB 1 = 40) is between 2.00 and 2.30	1
1(b)	Linear scales that cover more than half the space in both directions and axes labelled correctly (allow the correct unit as the label)	1
	Points plotted correctly. Points must be within half a small square of the correct position, if the point should be on a line it must be on the line and if it should not be on the line it must not be so.	1
	Line of best fit drawn which ignores anomalous results identified by the candidate	1

Question	Answer	Marks
1(c)	Correct line drawn within 1 small square (horizontal line must be shown and some mark shown at 8).	1
	Correctly calculates = $1000/\text{rate}$ (to 2 – 4 sf or a whole number of seconds).	1
1(d)(i)	The print (on the insert) would take longer to disappear	1
	The liquid would be less deep	1
1(d)(ii)	The reaction time would be longer / reaction is slower / rate is less	1
	Accuracy improved because the percentage error in time less OR Accuracy not improved because more difficult to judge when print disappeared	1
1(e)	Expression % = $(1 / \text{Reaction time Experiment 1}) \cdot 100$ OR $(0.5 / \text{Reaction time Experiment 1}) \cdot 100$	1
1(f)	Keep volume thiosulfate / FB1 constant and vary volume acid / FB 2	1
	Keep total volume FB 2 + water constant	1
	Keep temperature constant / use same (shape) reaction vessel / use same printed sheet / carry out 5 (or more) expts with different volumes HCl / FB 2	1
1(g)(i)	Straight line through origin (with positive gradient)	1
1(g)(ii)	Straight horizontal line	1

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Question	Answer				Marks
FB 3 is NaOH(aq), FB 4 is NH ₃ (aq), FB 5 is MgCl ₂ (aq), FB 6 is CuCl ₂ (aq), FB 7 is Na ₂ S ₂ O ₃ (aq), FB 8 is Na ₂ S ₂ O ₈ (aq), FB 9 is Na ₂ SO ₄ (aq).					
2(a)(i)		FB 4	FB 5	FB 6	3
	FB 3	No reaction / no change / solution remains colourless	White ppt	(Pale / light) blue ppt	
	FB 4		White ppt	Dark / deep blue solution / (pale/light) blue ppt	
	FB 5			No reaction / no change	
	6 correct boxes = 3 marks, 4 or 5 correct boxes = 2 marks, 2 or 3 correct boxes = 1 mark.				
2(a)(ii)	OH ⁻ / hydroxide				1
2(a)(iii)	Named indicator eg red litmus ('red' could be in the results) or formula / named (aqueous) salt that gives insoluble hydroxides				1
	Positive result for alkali				1
2(a)(iv)	Two of Mg ²⁺ , Zn ²⁺ , Al ³⁺ , Ca ²⁺ , Ba ²⁺				1
2(a)(v)	Test to distinguish ions in (iv)				1
	Result of test and appropriate conclusion				1

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Question	Answer				Marks
2(b)(i)		FB 7	FB 8	FB 9	3
	KI	No reaction / no change / solution remains colourless	Yellow / brown colour	No reaction / no change / solution remains colourless	
	starch		then blue-black / black / dark blue		
	I ₂	Decolourises	No reaction	No reaction / (stays) yellow / brown	
	Ba ²⁺	No reaction no change / solution remains colourless / no ppt	(ignore responses here)	White ppt	
	9 correct boxes = 3 marks 6, 7 or 8 correct boxes = 2 marks 3, 4 or 5 correct boxes = 1 mark				

Question	Answer	Marks
2(b)(ii)	SO_4^{2-} or SO_3^{2-} (both needed)	1
2(b)(iii)	Add suitable named acid to FB 9 and $\text{Ba}(\text{NO}_3)_2$ / BaCl_2 ppt or Add (acidified aqueous) potassium manganate(VII) / KMnO_4 to FB 9 or Add named acid and test (any) gas evolved with (acidified aqueous) potassium manganate(VII)	1
	Anion present: SO_4^{2-} and No effect of acid on (white) ppt or (Solution) turns purple / purple not decolourised or No bubbles / manganate(VII) paper remains purple / blue litmus remains blue	1