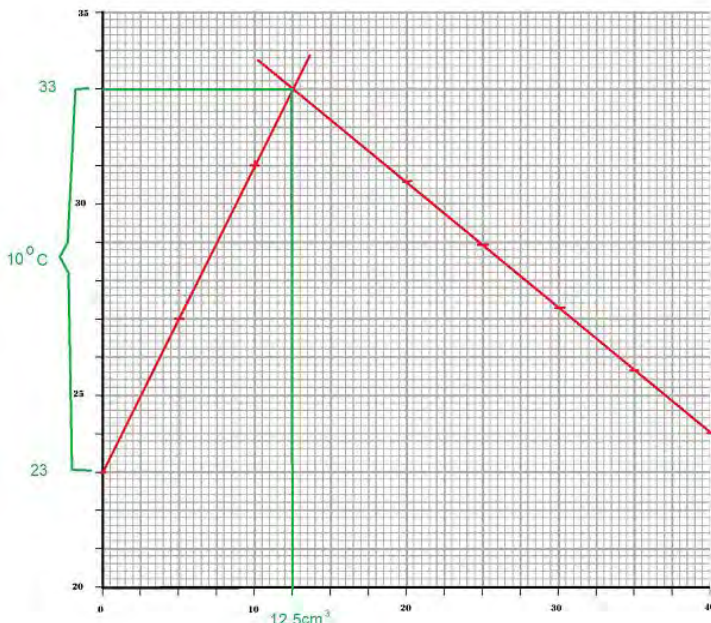
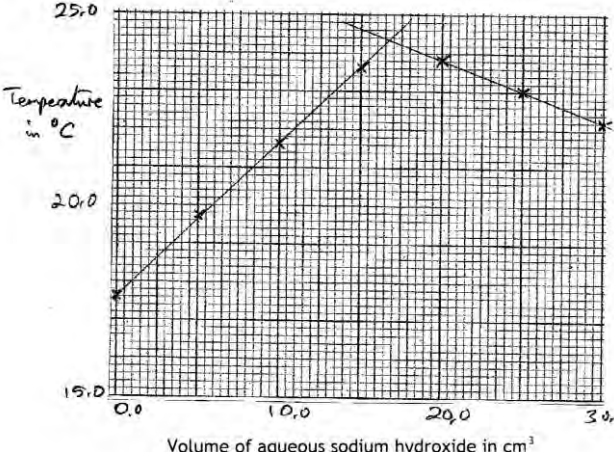


Question number	Answer	Notes	Marks
1 (a)	 <p>M1 &amp; M2 all points plotted correctly, to the nearest gridline</p> <p>M3 best fit straight line through first 3 points drawn with the aid of a ruler</p> <p>M4 best fit straight line through last 6 points drawn with the aid of a ruler</p>	<p>deduct one mark for each incorrectly plotted point</p> <p>ALLOW M3 and M4 even if lines do not intersect</p>	4
(b) (i)	value correctly read ( $\pm 0.25 \text{ cm}^3$ ) to nearest gridline from candidate's graph ( $12.5 \text{ cm}^3$ if correctly drawn)	Do not award these marks if lines do not cross	1
(b) (ii)	value correctly read ( $\pm 0.1^\circ\text{C}$ ) to nearest gridline from candidate's graph ( $10^\circ\text{C}$ if correctly drawn)		1

Question number	Answer	Notes	Marks
1 (c)	<p>M1 (water) – to remove/flush out solution (X)</p> <p>M2 (solution Y) – to remove the water / avoid diluting solution Y</p>	<p>ACCEPT so that the only liquid in the burette is solution Y</p> <p>IGNORE to remove impurities for both M1 and M2</p>	2
(d)	<p>solution Y is less concentrated (than solution X)</p> <p>OR</p> <p>solution (in Experiment 2) is less concentrated</p>	<p>IGNORE references to reactivity</p> <p>ALLOW weaker / less strong instead of less concentrated</p> <p>IGNORE refs to more/less acidic</p> <p>ACCEPT reverse argument</p>	1

Question number	Answer	Notes	Marks
2 a	(polystyrene is an) insulator / prevents/reduces heat loss	Accept is a poor conductor (of heat) Accept keeps heat in Accept doesn't conduct (heat) as well (as glass) Ignore does not heat up Ignore references to accuracy/safety/breakages Reject to keep the temperature constant	1
b	M1 (after) 19.4(0) M2 (before) 15.9(0) M3 3.5(0)	If readings are correct but in the wrong order, award 1 mark for M1 and M2  M3 CQ on (M1 – M2)	3

c	i		<p>M1+M2 all seven points plotted to nearest gridline Deduct 1 mark for each error</p> <p>M3 best fit straight line through first 4 points drawn with aid of a ruler</p> <p>M4 best fit straight line through last 3 points drawn with aid of a ruler</p> <p>No penalty if lines do not cross or if the two straight lines are joined by a curve</p> <p>values correctly read from candidate's graph Do not award these marks if lines do not cross or if curve drawn</p>	4
	ii	<p>M1 (temperature)</p> <p>M2 (volume)</p>	<p>temperature to <math>\pm 0.1\text{ }^{\circ}\text{C}</math></p> <p>volume to <math>\pm 0.25\text{ cm}^3</math> If values correct but in wrong places allow 1/2</p>	2

Question number	Answer	Notes	Marks
2 d	<p>M1 mass = 47.7 (g)</p> <p>M2 temperature change = 5.8 (°C)</p> <p>M3 <math>(47.7 \times 4.2 \times 5.8 =) 1200</math> (J)</p>	<p>Accept 1160, 1162, 1161.97, 1161.972  Reject 1161.9  M3 CQ on M1 and M2 answer correct to two or more sig fig</p> <p>Correct final answer with or without working scores 3 marks  Accept answer in kJ if unit included  Ignore sign</p>	3

Question number	Answer	Notes	Marks
3 a	pipette		1
b	B (pink to colourless)		1
c	<p>correct reference to one of these:</p> <ul style="list-style-type: none"> <li>number of colours</li> <li>end point/colour change (accept neutral point)</li> </ul>	<p>Examples:  phenolphthalein has <u>only</u> two colours / only one colour change  / negative statement eg does not have a range of colours  / UI has several colours/more than one colour change</p> <p>sharp / definite / sudden / quick / not gradual / needs only one drop  / converse for UI</p>	1
d	<p>M1 (after) 24.15 (only this answer)</p> <p>M2 (before) 2.30 (only this answer)</p> <p>M3 (added) 21.85</p>	<p>Award 1 mark for both burette readings correct but in wrong order</p> <p>CQ on after and before readings</p> <p>In M3, penalise answer not to 2 dp unless penalty already applied in M2</p>	3

Question number	Answer	Notes	Marks
3 e i	ticks in columns 2 and 4		1
ii	M1 $\frac{26.30 + 26.40}{2}$  M2 26.35	CQ on ticked results If no results ticked, award M1 only if columns 2 and 4 averaged If only one result ticked, no marks can be awarded in (e)  CQ on results averaged Answer must be to 2 dp M2 subsumes M1	2

***For more help please visit our website [www.exampaperspractice.co.uk](http://www.exampaperspractice.co.uk)***



f		<p>In part (f):</p> <ul style="list-style-type: none"><li>• accept values in standard form, eg <math>4.5 \times 10^{-3}</math></li><li>• do not accept unevaluated fractions, eg <math>0.0045 \div 3</math> in (ii)</li><li>• do not penalise too many sig figs</li><li>• correct answer without working scores 2 marks in (i) and (iii)</li><li>• penalise missing use of 1000 in (i) and (iii) once only</li></ul>	
i	M1 $\frac{0.18(0) \times 25(.0)}{1000}$		2
	M2 0.0045(0)	Award 1 mark for 4.5	
ii	(0.0045 $\div$ 3 =) 0.0015(0)	CQ on answer to (i)	1
iii	M1 $\frac{0.0015 \times 1000}{28.3(0)}$	CQ on answer to (ii)	2
	M2 0.053(0)	Award 1 mark out of 2 for 0.000053 Award 1 mark out of 2 for 0.05  If correct final answer obtained by omission of 1000 in both (i) and (iii), award marks of 1,1, 2	
		Total 14 marks	



Question number	Answer	Notes	Marks															
4 (a)	<div><div></div><table><tr><td>Titration number</td><td>1</td><td>2</td><td>3</td><td>4</td></tr><tr><td>Volume of KMnO<sub>4</sub> solution added / cm<sup>3</sup></td><td>22.80</td><td>22.10</td><td>22.50</td><td>22.20</td></tr><tr><td>Concordant titration results (✓)</td><td></td><td>✓</td><td></td><td>✓</td></tr></table></div>	Titration number	1	2	3	4	Volume of KMnO <sub>4</sub> solution added / cm <sup>3</sup>	22.80	22.10	22.50	22.20	Concordant titration results (✓)		✓		✓		1
Titration number	1	2	3	4														
Volume of KMnO <sub>4</sub> solution added / cm <sup>3</sup>	22.80	22.10	22.50	22.20														
Concordant titration results (✓)		✓		✓														
(b)	<div><div><div><div><div><b>M1</b></div><div><math display="block">\frac{22.1(0) + 22.2(0)}{2}</math></div></div></div><div><div><b>M2</b></div><div>– 22.15 (cm<sup>3</sup>)</div></div></div></div>	<div>CSQ on boxes ticked in (a) If no results ticked, award <b>M1</b> only if columns 2 and 4 averaged If only one result ticked, no marks can be awarded in (b)</div> <div>CSQ on results averaged, but the results must be taken from the table</div> <div>Answer must be to 2dp</div> <div>correct answer with no working scores 2</div>	<div>1</div> <div>1</div>															
(c)	D (pipette)		1															

Question number	Answer	Notes	Marks
4 (d) (i)	<b>M1</b> $\frac{20(.00) \times 0.02(00)}{1000}$ -		1
	<b>M2</b> - $4(.00) \times 10^{-4}$ (mol)	0.4(00) scores 1	1
(ii)	5 x <b>M2</b> from (i) / $4(.00) \times 10^{-4} \times 5 / 2(.00) \times 10^{-3}$		1
(iii)	10 x answer to (ii) / $2(.00) \times 10^{-2}$		1
(iv)	answer to (iii) x 152 / $(2(.00) \times 10^{-2} \times 152) = 3.04$ (g)		1
(e) (i)	$m(\text{H}_2\text{O}) = (24.2 - 15.2) = 9(.0)$ (g)		1
(ii)	answer to (i) $\div 18$ / $n(\text{H}_2\text{O}) = (9.00 \div 18) = 0.5(0)$ (mol)		1
(iii)	$n(\text{FeSO}_4) = (15.2 \div 152) = 0.1(00)$ (mol)		1
(iv)	x = answer to (ii) $\div$ answer to (iii) / 5	must be given as a whole number	1