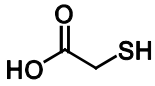
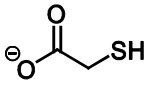
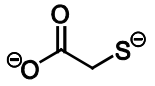
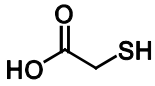
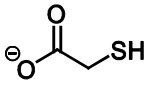
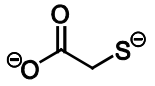
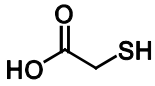
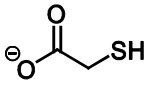
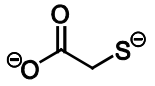


		Total for Question 1	9						
<b>Question 2</b>									
		<b>Answer</b>	<b>Marks</b>						
<b>a)</b>	<b>(i)</b>	Amount of S in moles = amount of BaSO <sub>4</sub> = 0.260 g / (137.34 + 32.06 + 4(16.00)) g mol <sup>-1</sup> = 1.114 mmol % of sulfur by mass = 1.114 mmol × 32.06 g mol <sup>-1</sup> × 100% = 3.57%	<b>1</b>						
	<b>(ii)</b>	Mass of BaSO <sub>4</sub> (aq) in 2.50 dm <sup>3</sup> = 2.4 mg dm <sup>-3</sup> × 2.50 dm <sup>3</sup> = 6.0 mg Total mass of BaSO <sub>4</sub> in 2.50 dm <sup>3</sup> = 6.0 mg + 260 mg = 266 mg % of sulfur by mass in human hair = (0.266 g / 0.260 g) × 3.57% = 3.65%	<b>1</b>						
<b>b)</b>		Oxidation	<b>1</b>						
<b>c)</b>		<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>(i) pH 0</th> <th>(ii) pH 7</th> <th>(iii) pH 14</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>	(i) pH 0	(ii) pH 7	(iii) pH 14				<b>3</b>
(i) pH 0	(ii) pH 7	(iii) pH 14							
									
<b>d)</b>		<p>Via <math>pK_a = pH - \log_{10} ([A^{2-}]/[HA^-])</math>      Or via <math>K_a = [H^+] ([A^{2-}]/[HA^-])</math>  <math>10.31 = 9 - \log_{10} ([A^{2-}]/[HA^-])</math>      <math>K_a/[H^+] = ([A^{2-}]/[HA^-])</math>  <math>\log_{10} ([A^{2-}]/[HA^-]) = -1.31</math>      <math>([A^{2-}]/[HA^-]) = (10^{-10.31}/10^{-9})</math>  <math>([A^{2-}]/[HA^-]) = 0.049</math>      <math>([A^{2-}]/[HA^-]) = 0.049</math></p> <p>Then... <math>[A^{2-}] + [HA^-] = 100\%</math>  So <math>[A^{2-}] = 4.67\%</math> and therefore <math>[HA^-] = 95.3\%</math></p>	<b>1</b> <b>1</b>						
<b>e)</b>		Ker-S-S-Ker + 2 RS-H → R-S-S-R + 2 Ker-S-H	<b>1</b>						
<b>f)</b>		Line C	<b>1</b>						
<b>g)</b>		<p>Gradient of graph allowed between <math>3.83 \times 10^{-3}</math> to <math>4.16 \times 10^{-3} \text{ min}^{-1}</math>  <math>k</math> is then calculated by gradient / 0.16  This corresponds to range of acceptable value for the rate constant <math>k</math>  Minimum <math>k = 3.99 \times 10^{-4} \text{ mol}^{-1} \text{ dm}^3 \text{ s}^{-1}</math> or <math>2.40 \times 10^{-2} \text{ mol}^{-1} \text{ dm}^3 \text{ min}^{-1}</math>  Maximum <math>k = 4.34 \times 10^{-4} \text{ mol}^{-1} \text{ dm}^3 \text{ s}^{-1}</math> or <math>2.60 \times 10^{-2} \text{ mol}^{-1} \text{ dm}^3 \text{ min}^{-1}</math>  <b>2 marks</b> for correct value with correct units; <b>1 mark</b> if correct but units missing / wrong; <b>1 mark</b> if units correct but value is calculated (correctly) from gradient outside range; <b>0 marks</b> correct units with incorrect answer.</p>	<b>2</b>						
<b>h)</b>		<p>Gradient of graph allowed between <math>1.23 \times 10^{-2}</math> to <math>1.27 \times 10^{-2} \text{ min}^{-1}</math>  Using <math>k</math> from part (g), concentration is calculated by dividing gradient by <math>k</math>.  Concentration = <math>0.499 \text{ mol dm}^{-3}</math>  Molar mass of ammonium thioglycolate = <math>(14.01 + 4 \times 1.008) + (2 \times 12.01 + 2 \times 16.00 + 3 \times 1.008 + 32.06) = 109.146 \text{ g mol}^{-1}</math>  Amount in one bottle = <math>0.500 \times 0.499 \times 109.146 = 27.2 \text{ g}</math>  <b>2 marks:</b> One of these is for calculating a correct concentration given their <math>k</math> in part (g), and one for a correct mass from their concentration. Any answer close to 27g where the correct method has been used should be given full credit.</p>	<b>2</b>						
<b>Total for Question 2</b>			<b>14</b>						