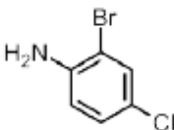
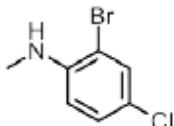
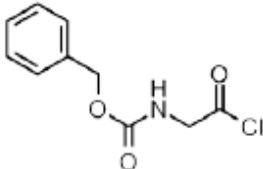
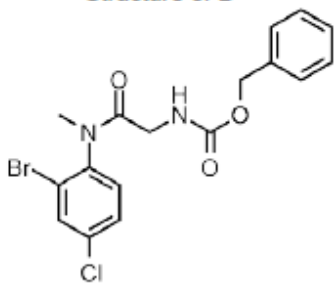
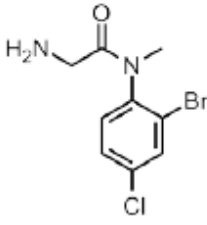
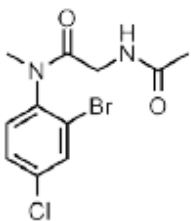
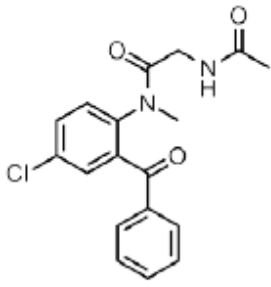
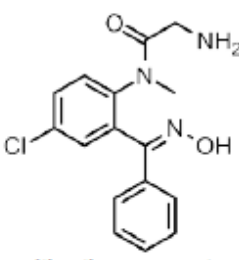
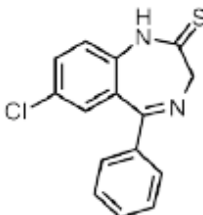
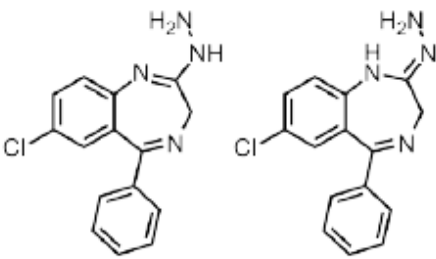
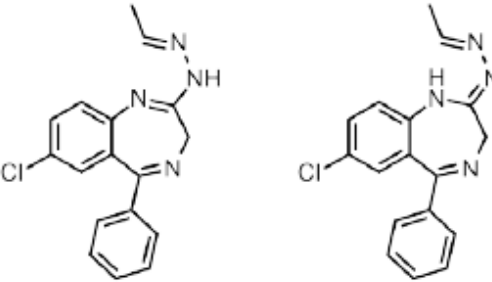


### Question 4

(a)	(i)	10.8 %  <i>More modern syntheses have considerably improved upon this overall yield.</i>	1
	(ii)	<p>Mass of diazepam per dose = <math>5 \times 10^{-3}</math> g</p> <p>Total mass of diazepam = <math>5 \times 10^{-3}</math> g <math>\times</math> 4 <math>\times</math> 365 <math>\times</math> 3  Total mass of diazepam = 21.9 g [Allow an extra day added for a leap year.]</p> <p>Amount of diazepam = 21.9 g / 284.734 g mol<sup>-1</sup>  Amount of diazepam = 0.0769 mol</p> <p>Amount of 4-chloroaniline = 0.0769 mol / 0.108  Amount of 4-chloroaniline = 0.712 mol  Molecular formula of 4-chloroaniline = C<sub>6</sub>H<sub>6</sub>NCI  M<sub>r</sub> of 4-chloroaniline = (6 <math>\times</math> 12.01 g mol<sup>-1</sup>) + (6 <math>\times</math> 1.008 g mol<sup>-1</sup>) + 35.45 g mol<sup>-1</sup> + 14.01 g mol<sup>-1</sup>  M<sub>r</sub> of 4-chloroaniline = 127.568 g mol<sup>-1</sup></p> <p>Mass of 4-chloroaniline = 0.712 mol <math>\times</math> 127.568 g mol<sup>-1</sup>  Mass of 4-chloroaniline = 90.8 g</p> <p>[Correct answer scores both marks. Error carried forward: accept answers based on incorrect answer to (a)(i)]</p>	1
(b)		<p>Structure of A</p>  <p>[If bromine atom is in wrong position on benzene ring, no credit is given here, but full credit is awarded in B, D, E and F provided rest of structure correct.]</p>	1
		<p>Structure of B</p> 	1
		<p>Structure of C</p> 	1

	<p>Structure of D</p> 	1
	<p>Structure of E</p> 	1
	<p>Structure of F</p> 	1
	<p>Structure of G</p> 	1
	<p>Structure of H</p>  <p>[Allow stereoisomer with other geometry around C=N bond.]</p>	1

(c)	<p style="text-align: center;">Structure of I</p> 	1										
	<p style="text-align: center;">Structure of J</p>  <p>[Accept either structure. Also allow stereoisomer with other geometry around the top C=N bond in the right hand structure.] <i>The left structure is believed to be the predominant one.</i></p>	1										
	<p style="text-align: center;">Structure of K</p>  <p>[Accept either structure and also any stereoisomers with alternative geometries around C=N bonds not in the ring.] <i>The left structure is believed to be the predominant one.</i></p>	1										
(d)	<table border="1" style="width: 100%; border-collapse: collapse;"><thead><tr><th style="width: 20%;">Isomerisation</th><th style="width: 20%;">Hydrolysis</th><th style="width: 20%;">Condensation</th><th style="width: 20%;">Oxidation</th><th style="width: 20%;">Reduction</th></tr></thead><tbody><tr><td></td><td></td><td></td><td style="text-align: center;">✓</td><td></td></tr></tbody></table> <p><i>DEAD is also sometimes known as DEADCAT.</i></p>	Isomerisation	Hydrolysis	Condensation	Oxidation	Reduction				✓		1
Isomerisation	Hydrolysis	Condensation	Oxidation	Reduction								
			✓									
<b>Total</b>		<b>15</b>										