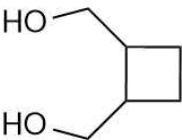
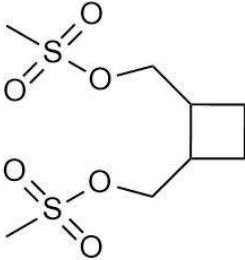
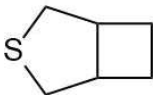
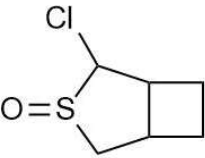
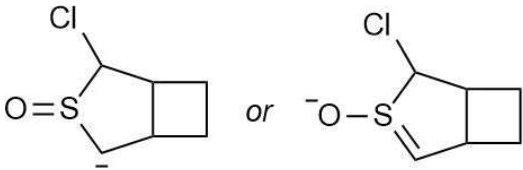
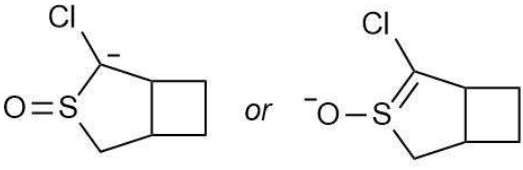
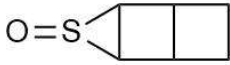
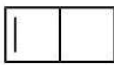

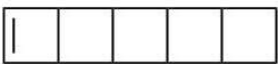
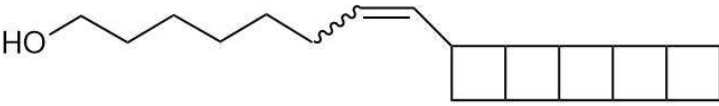
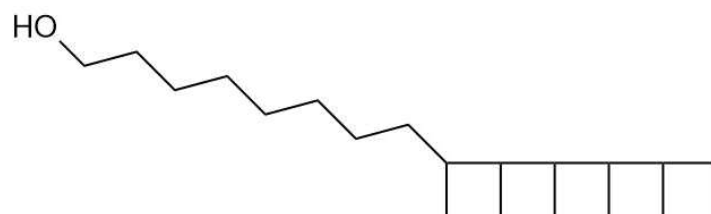


6.	This question is about anammox and ladderanes.			Mark
(a)	(i) nitrogen gas 0	ammonium ion -3		<input checked="" type="checkbox"/>
<i>Both must be correct for mark.</i>				
(a)	(ii) nitrite ion (NO ₂ ⁻) +3	hydrazine (NH ₂ NH ₂) -2	hydroxylamine (NH ₂ OH) -1	<input checked="" type="checkbox"/>
<i>All three correct two marks. Two correct one mark. One or zero correct no marks.</i>				<input checked="" type="checkbox"/>
(b)	(i) NO ₂ ⁻ + 4e ⁻ + 5H ⁺ → NH ₂ OH + H ₂ O <i>Must be fully correct for mark</i> <i>Also accept NO₂⁻ + 4e⁻ + 6H⁺ → [NH₃OH]⁺ + H₂O</i>			<input checked="" type="checkbox"/>
(b)	(ii) NH ₄ ⁺ + NH ₂ OH → NH ₂ NH ₂ + H ₂ O + H ⁺ <i>or</i> NH ₄ ⁺ + NH ₂ OH → NH ₂ NH ₂ + H ₃ O ⁺ <i>or</i> NH ₄ ⁺ + NH ₂ OH → [NH ₂ NH ₃] ⁺ + H ₂ O <i>Must be fully correct for mark</i> <i>Also accept analogous equations if hydroxylamine is protonated</i>			<input checked="" type="checkbox"/>
(b)	(iii) NH ₂ NH ₂ → N ₂ + 4e ⁻ + 4H ⁺ <i>or</i> [NH ₂ NH ₃] ⁺ → N ₂ + 4e ⁻ + 5H ⁺ <i>Must be fully correct for mark</i>			<input checked="" type="checkbox"/>
(c)	NO ₂ ⁻ + NH ₄ ⁺ → N ₂ + 2H ₂ O <i>Must be fully correct for mark</i>			<input checked="" type="checkbox"/>
(d)	<p>A</p>  <p><i>One mark. No stereochemistry required.</i></p>	<p>B</p>  <p><i>One mark. No stereochemistry required. ECF is allowed based on A only if their structure of B is consistent with molecular formula.</i></p>		<input checked="" type="checkbox"/>
(d)	<p>C</p>  <p><i>One mark. No stereochemistry required. No ECF as can work backwards.</i></p>	<p>D</p>  <p><i>One mark. No stereochemistry required. No ECF.</i></p>		<input checked="" type="checkbox"/>
				<input checked="" type="checkbox"/>

<p style="text-align: center;">Anion E⁻</p>  <p><i>No stereochemistry required. Either of these above is worth two marks.</i></p>  <p><i>Either of these incorrect structures above can be given one mark as the student has correctly realised the acidic carbon is next to sulfur. ECF: Maximum ECF score here is one mark as there is information to work forwards and backwards. ECF one mark only awarded if chlorine is in same place as on structure D and anion is on carbon next to sulfur.</i></p>	<p style="text-align: center;">F</p>  <p><i>One mark. No stereochemistry required. No ECF as can work backwards.</i></p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
<p style="text-align: center;">G</p>  <p><i>One mark. No stereochemistry required. No ECF as sufficient new information.</i></p>	<p style="text-align: center;">X</p> <p style="text-align: center;">S=O</p> <p><i>One mark. No ECF as sufficient new information.</i></p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
<p style="text-align: center;">H</p>  <p><i>One mark. No stereochemistry required. No ECF as sufficient new information.</i></p>	<p style="text-align: center;">I</p>  <p><i>One mark. No stereochemistry required. ECF can be awarded from H only if their structure of I has the correct number of signals in the ¹³C NMR and is consistent with an elimination from their incorrect structure of H.</i></p>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>
<p style="text-align: center;">J</p>  <p><i>One mark. No stereochemistry required. No ECF as sufficient new information. Accept if double bond drawn explicitly as cis or trans.</i></p>		<input checked="" type="checkbox"/>



One mark. No stereochemistry required. Must have exactly and unambiguously eight carbon atoms in the side chain to score the mark.



Total out of 20

20