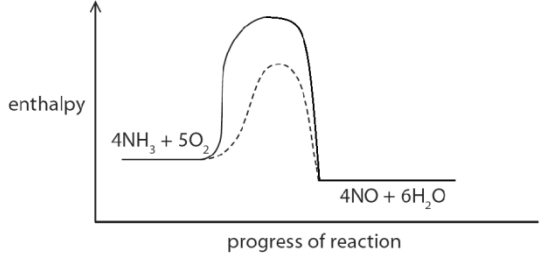
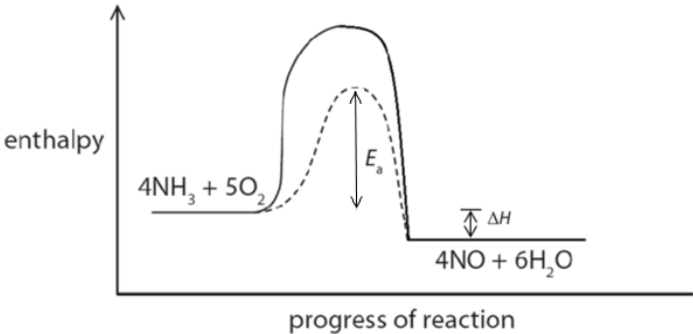


Question Number	Answer	Additional Guidance	Mark												
*3(a)	<p>This question assesses a student’s ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning.</p> <p>Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning.</p> <p>The following table shows how the marks should be awarded for indicative content.</p> <table border="1"> <thead> <tr> <th>Number of indicative marking points seen in answer</th> <th>Number of marks awarded for indicative marking points</th> </tr> </thead> <tbody> <tr> <td>6</td> <td>4</td> </tr> <tr> <td>5-4</td> <td>3</td> </tr> <tr> <td>3-2</td> <td>2</td> </tr> <tr> <td>1</td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> </tr> </tbody> </table>	Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points	6	4	5-4	3	3-2	2	1	1	0	0	<p>Guidance on how the mark scheme should be applied:</p> <p>The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points that is partially structured with some linkages and lines of reasoning, scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning).</p> <p>If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages).</p>	6
Number of indicative marking points seen in answer	Number of marks awarded for indicative marking points														
6	4														
5-4	3														
3-2	2														
1	1														
0	0														

Question Number	Answer	Additional Guidance	Mark								
<p>*3(a) cont.</p>	<p>The following table shows how the marks should be awarded for structure and lines of reasoning.</p> <table border="1"> <thead> <tr> <th></th> <th>Number of marks awarded for structure of answer and sustained line of reasoning</th> </tr> </thead> <tbody> <tr> <td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td> <td>2</td> </tr> <tr> <td>Answer is partially structured with some linkages and lines of reasoning</td> <td>1</td> </tr> <tr> <td>Answer has no linkages between points and is unstructured</td> <td>0</td> </tr> </tbody> </table> <p>Indicative content:</p> <ul style="list-style-type: none"> • temperature decrease lowers the rate of the reaction • because there are fewer molecules/particles with $E \geq E_a$ • <u>and</u> therefore there are fewer <u>successful collisions per second</u> • temperature decrease increases the yield (of the product) • because the (forward) reaction is exothermic • lower rate and increased yield are opposing factors and it is not possible to tell which has greater effect on overall yield in a given time. 		Number of marks awarded for structure of answer and sustained line of reasoning	Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2	Answer is partially structured with some linkages and lines of reasoning	1	Answer has no linkages between points and is unstructured	0	<p>Accept slows down the reaction</p> <p>Accept shifts the position of equilibrium to the right/in forward direction</p>	
	Number of marks awarded for structure of answer and sustained line of reasoning										
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2										
Answer is partially structured with some linkages and lines of reasoning	1										
Answer has no linkages between points and is unstructured	0										

Question Number	Answer	Additional Guidance	Mark
3(b)(i)	 <ul style="list-style-type: none"> curve starting at reactants level, ending at products level, and peaking lower than original curve (1) 		1
3(b)(ii)	 <ul style="list-style-type: none"> $\Delta_r H$ shown as the approximately vertical distance between reactants and products (1) E_a shown as the approximately vertical distance between reactants and peak of drawn curve for catalysed reaction (1) 	ecf from candidate's curve	2
3(c)	$K_c = \frac{[\text{NO}(\text{g})]^4 [\text{H}_2\text{O}(\text{g})]^6}{[\text{NH}_3(\text{g})]^4 [\text{O}_2(\text{g})]^5}$ (1)	State symbols not essential	1

(Total for Question 3 = 10 marks)