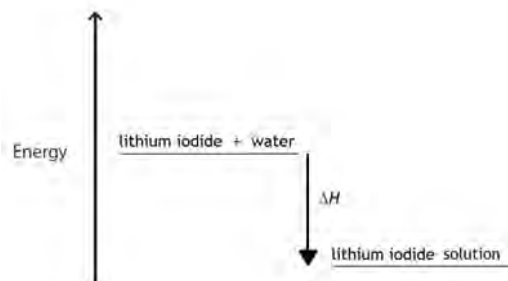


Question number			Answer	Notes	Marks
1	a		M1 (after) 22.3 M2 (before) 16.7 M3 (change) (+)5.6	All answers must be to 0.1 °C Penalise addition of trailing zero once only Award 1 mark for two correct readings in the wrong order M3 CQ on temperature readings Ignore units	3
	b	i	M1 $100 \times 4.2 \times 4.9$ M2 2058	Accept answer to 2 or 3 sf eg 2060 / 2100 Accept answer in kJ if unit given Ignore signs Allow 1 mark for correct calculation based on incorrect temperature change	2
		ii	M1 $\frac{6.3}{134}$ M2 0.047	Accept 1 or more sig figs, eg 0.05 Correct answer with no working scores 2	2

Question number		Answer	Notes	Marks
c	i	<p>M1 $\frac{2400}{0.048 \times 1000}$</p> <p>M2 50</p>	<p>Accept 50.0 and 50.00</p> <p>Award 1 mark for 50 000</p> <p>Award 2 marks for 50 000 if units changed to J/mol on answer line</p> <p>Ignore signs</p> <p>Correct answer with no working scores 2</p>	2
c	ii		<p>Mark M1 and M2 independently</p> <p>M1 for horizontal line drawn below (labelled or unlabelled)</p> <p>M2 for (vertical) line connecting the two horizontal lines AND labelled ΔH (ignore sign)</p> <p>Ignore all arrow heads</p> <p>Ignore curves for energy profiles including activation energy</p>	2
			Total 11 marks	

Question number	Answer	Notes	Marks
2 a	18.7	Give 1 mark for 18.7 and 27.2 wrong way around	1
	27.2		1
	M2-M1 / (+)8.5		1
b i	1450 ÷ 24000	Accept minimum of 2 dp Award 1 mark for a correct answer using a volume from either experiment 2 or 3	1
	0.0604(16)		1
ii	29.2 ÷ M2 from (b)(i) / 29.2 ÷ 0.0604(16)	Accept 29200 ÷ 0.0604	1
	(-)483(.315678)	Final answer in joules scores 1/2	1
iii	200 × 4.2 × 41.2	Accept minimum of 2 sf Award 1 mark for a correct calculation using 1875 for the volume of water.	1
	(-)34608		1
iv	cross in box B (not all of the heat energy is transferred to the water)		1

2 c i	$(4 \times \text{C-H}) + (2 \times \text{O=O})$	Accept $(4 \times 412) + (2 \times 496) / 1648 + 992$	1
	2640	Deduct 1 mark for each mistake Ignore sign	1
ii	$(2 \times \text{C=O}) + (4 \times \text{H-O})$	Accept $(2 \times 743) + (4 \times 463) / 1486 + 1852$	1
	3338	Deduct 1 mark for each mistake Ignore sign	1
iii	-698 (kJ/mol)	CSQ on answers given to (c)(i) and (c)(ii)	1

(Total for Question 2 = 15 marks)

Question number		Answer	Notes	Marks
3	(a)	M1 decrease M2 no effect M3 increase		3
	(b)	M1 amount of pentane = $1.88 \div 72 / 0.026$ (mol) M2 molar enthalpy change = $51900 \div 0.026 / 1996153$ J M3 (-)2000 (kJ/mol)	Accept answer in kJ Correct final answer with correct units scores (3) Accept 2 or more significant figures Accept answer in range 1987 - 2000	3
Total for Question 3				6

Question number	Answer		Accept	Reject	Marks
4 (a)	M1 temperature after	27.1	one trailing zero	more than one trailing zero	3
M2 temperature before	18.8				
M3 temperature change	(+) 8.3				
<p>Recorded temperatures correct but in wrong order scores 1 for M1 and M2</p> <p>M3 csq on M1 and M2</p>					
(b)	<p>M1 heat (energy) /thermal energy lost (to the atmosphere) ignore just energy lost</p> <p>M2 potassium hydroxide dissolves (very/too) slowly</p>		<p>water evaporates</p> <p>potassium hydroxide does not completely dissolve</p> <p>potassium hydroxide is impure</p> <p>less than 3 g of potassium hydroxide is used</p> <p>more than 50 cm³ of water is used</p>		2

Total 5 marks