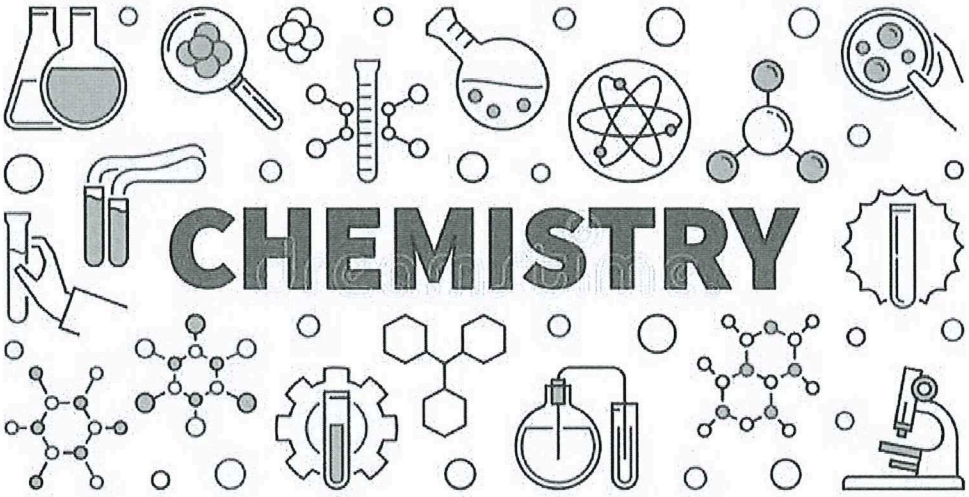
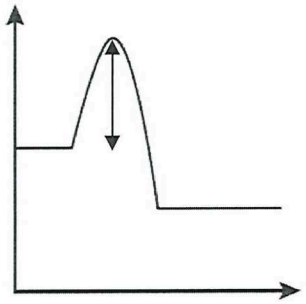


WJEC Chemistry 2

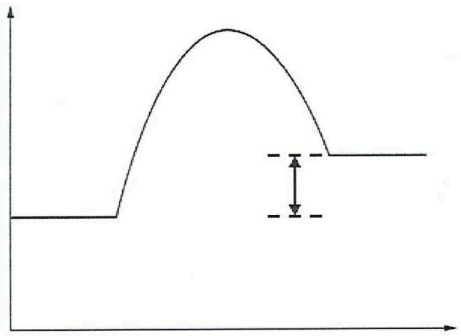
Option – Higher Tier

2.4 Mark Scheme

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	*(a)*			**Advantages** award (1) each for up to **two** of following • cane sugar is a renewable raw material / sustainable • plant photosynthesis uses CO_2 and fermentation produces CO_2 making it carbon neutral • low pressure making it cheaper to operate / safer to operate **Disadvantage** award (1) each for up to **two** of following • dilute solution of ethanol formed / ethanol not pure - therefore needs further processing / distillation • carbon dioxide formed - contributes to global warming • batch process so labour intensive / inefficient / time consuming • crops used therefore less land for food production / more expensive food	2		2	4		
	(b)			$C_2H_5OH + O_2 \rightarrow$ **$CH_3COOH + H_2O$** **both** products needed		1		1		
	(c)	(i)		498 (2) if answer incorrect award (1) for either of following 5616 – (2 × 2061) 1494		2		2	2	
		(ii)		6932 (2) if answer incorrect award (1) for (4 × 805) + (8 × 464)		2		2	2	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
		(iii)		award (1) for any of following • energy released > energy needed • energy out > energy in • overall energy change has a negative value • overall energy change is = –1316		1		1		
		(iv)			1			1		
	(d)			butan-1-ol **C** butan-2-ol **B** 2-methylpropan-1-ol **D** 2-methylpropan-2-ol **A** award (2) for all **four** correct award (1) for any **two** correct	2			2		
				Question 8 total	**5**	**6**	**2**	**13**	**4**	**0**

Higher Tier only questions

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			464 (2) ignore minus sign if incorrect award (1) for either of following 4(O—H) $\frac{1856}{4}$		2		2	2	
	(b)			498 (2) ignore minus sign if incorrect award (1) for either of following 2(H—H) (2 × 436) 872		2		2	2	
	(c)				1			1		
				Question 4 total	**1**	**4**	**0**	**5**	**4**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			80 (2) if answer incorrect award (1) for any of following 84 000 J in method final answer of 0.008 or 8 no ecf possible if formula is rearranged incorrectly or if incorrect energy value taken from table		2		2	2	
	(b)			award (2) for all points plotted correctly - tolerance ±1 square award (1) for any 3 points plotted correctly award (1) for straight line through all point - ruler must be used		3		3	3	
	(c)			award (2) for high-level quantitative description • as the mass doubles, the energy doubles • mass and energy are directly proportional award (1) for lower-level description • as the mass increases, the energy increases • mass and energy are proportional • mass and energy are directly correlated • mass and energy have a linear relationship		2		2	2	

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			award (1) for resolution and (1) for sensible explanation e.g. change glass beaker to copper can (1) copper is a better conductor (of heat) / increase heat transfer (1) shield the apparatus (1) prevent draughts / reduce heat loss to surroundings (1) lower the beaker (nearer the flame) (1) increase heat transfer / reduce heat loss to surroundings (1) use a lid / insulate the beaker (1) reduce heat loss to surroundings (1)			2	2		2
				Question 8 total	**0**	**7**	**2**	**9**	**7**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)		<table><tr><td>Part of the energy profile</td><td>Letter</td></tr><tr><td>energy change for the reaction</td><td>C</td></tr><tr><td>energy of the reactants</td><td>A</td></tr><tr><td>activation energy of the reaction</td><td>B</td></tr></table> award (2) for **all** three correct award (1) for **any** one correct	2			2		
		(ii)		the (minimum) energy required for a reaction to happen / start accept 'the <u>minimum</u> energy required to activate the reaction' neutral answer – the energy required to activate the reaction	1			1		
		(iii)		award (1) for any of following • the energy of the products is lower than the energy of the reactants • the product line is below the reactant line / **E** is below **A** • energy given out is greater than energy taken in / **D** is greater than **B** • lower energy at the end than at the beginning neutral answer – negative energy change		1		1		
				Question 7/1 total	4	3	2	9	0	3

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	(a)			435 (3) if answer incorrect credit each correct step in method 2340 – 94 = 2246 (1) 2246 – 941 = 1305 (1) H—H = 435 (1) alternative method 2340 – 94 = 2246 (1) N≡N + 3(H—H) = 2246 (1) H—H = 435 (1)			3	3	3	
	(b)			yield is lower / is too low / less ammonia is formed (1) reaction rate is lower / too low reaction is slower / is too slow (1)	2			2		
	(c)			$HNO_3 + NH_3 \rightarrow NH_4NO_3$ reactants (1) product (1)		2		2		

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
	(d)			accept any of the following approaches but the second point must directly follow from the first for both marks (leads to) high numbers of algae / microorganisms (1) ⇨ decomposition of algae depletes oxygen (1) stops sunlight reaching plants below the surface (1) ⇨ plants unable to photosynthesise (1) plants unable to photosynthesise (1) ⇨ reduction in oxygen content of water (1) excessive plant growth stops obsorption of oxygen (from air) ⇨ not enough oxygen for fish (1)	2			2		
				Question 7 total	**4**	**2**	**3**	**9**	**3**	**0**