AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.6.2.2

Energy changes and reversible reactions

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**3**
Available paper years	**2013–2016**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.6.2.2 Energy changes and reversible reactions

Answer 01 · Mark scheme

June 2013 | CH3HP | Original Q6 | Legacy

Question 6

question	Answers	extra information	Mark
6(a)	air		1
6(b)	recycle (unreacted) nitrogen and hydrogen	allow re-use allow N_2 and H_2	1 1
6(c)	$N_2 + 3H_2 \rightarrow 2NH_3$	allow correct multiples	1
6(d)	 because a higher temperature would reduce (equilibrium) yield because a lower temperature would reduce rate	allow converse arguments ignore references to compromise allow higher temperature favours backward reaction	 1 1
6(e)(i)	(energy of) reactants greater than (energy of) products	allow converse allow (overall) energy decreases allow energy required to break bonds is less than the energy released making bonds	1
6(e)(ii)	line starting and finishing at same levels but with lower peak		1
Total			8

4.6.2.2 Energy changes and reversible reactions

Answer 02 · Mark scheme

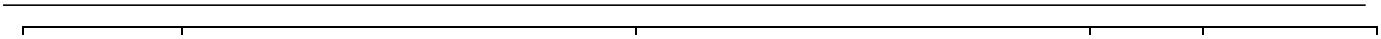
June 2015 | CH3HP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	nothing can enter **and** nothing can leave the reaction	allow sealed reaction vessel	1	**AO1** 3.5.1.c
6(a)(ii)	forward and backward reactions have same rate so there is no (overall) change in quantities of reactants and products	 allow concentrations of reactants and products	1 1	**AO1/ AO2** 3.5.1.c
6(b)(i)	natural gas	allow methane / CH_4 allow fossil fuels / hydrocarbons allow water	1	**AO1** 3.5.1.a
6(b)(ii)	provides an alternative reaction pathway which has a lower activation energy	 ignore references to collisions	1 1	**AO1** 3.3.1.h
6(b)(iii)	the amount (of ammonia) increases the equilibrium moves to the side (of the equation) with fewer (gaseous) molecules / moles	allow yield increases allow it favours the forward reaction	1 1	**AO1/ AO2** 3.5.1.d/g
6(c)(i)	vertical arrow from reactants to maximum		1	**AO2** 3.3.1.e
6(c)(ii)	(energy of) products higher than (energy of) reactants	allow converse	1	**AO2** 3.3.1.d
6(c)(iii)	amount of hydrogen iodide decreases equilibrium moves in the direction of the endothermic reaction	 allow it favours the forward reaction	1 1	**AO1/ AO2** 3.5.1.d/e
Total			**12**	

4.6.2.2 Energy changes and reversible reactions

Answer 02 · Mark scheme

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4.6.2.2 Energy changes and reversible reactions

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / SpecRef
2(a)	endothermic		1	AO1 2.5.1d
2(b)	82 (%)	correct answer with working gains **3** marks if 17 or 34 not shown in working **max 2** marks accept 82.4 accept 82.35 to full calculator display (82.35294...) correctly rounded to at least 2 sf if no answer or incorrect answer, then (M_r =) 17 gains **1** mark **or** 14/17 gains **2** marks **OR** ($2M_r$ =) 34 gains **1** mark **or** 28/34 gains **2** marks **OR** 14/their M_r shown gains **1** mark **or** correct calculation of 14/their M_r gains **2** marks	3	AO2 2.3.3a, 2.3.1f
2(c)(i)	7 / seven		1	AO1 2.6.2d
2(c)(ii)	$H^+ + OH^- \rightarrow H_2O$		1	AO1 2.6.2e
2(c)(iii)	ammonium chloride	allow NH_4Cl ignore an incorrect formula	1	AO1 2.6.2b

Question 2 continues on the next page

Question 2 continued

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / SpecRef</th></tr>
<tr><td>2(d)</td><td></td><td></td><td>6</td><td rowspan="6">2AO2 / 4AO3
2.6.2c</td></tr>
<tr><td colspan="4">Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a ‘best-fit’ approach to the marking.</td></tr>
<tr><td colspan="4"><table>
<tr><th>0 marks</th><th>Level 1 (1–2 marks)</th><th>Level 2 (3–4 marks)</th><th>Level 3 (5–6 marks)</th></tr>
<tr><td>No relevant content.</td><td>Suggestion with a reference to a graph.</td><td>Suggestion with reasons referring to more than one graph.</td><td>Suggestion with reasons from all three graphs, and linking of ideas which may explain a compromise.</td></tr>
</table></td></tr>
<tr><td colspan="4">Examples of chemistry points made in response:
A reasonable suggested amount of fertiliser would be in the region of 200 kg (per ha). Accept any suggestion from about 180 kg (per ha) to 500 kg (per ha).
Yield:
• Using fertiliser improves yield.
• Yield improved most up to about 200 kg (per ha) of fertiliser.
• Yield only increased slightly above about 200 kg (per ha).
Profit:
• About 200 kg of fertiliser gives the most profit.
• Above about 200 kg (per ha) of fertiliser profit declines.
Run off:
• Run off is at low levels until about 300 kg (per ha) of fertiliser.
• Above about 300 kg (per ha) of fertiliser, run off increases.
Examples of linking of ideas:
• Overall 200 kg gives high crop yield and most profit.
• In conclusion 200 kg gives high crop yield and low run off.
• 200 kg gives most profit and low run off.
Examples of compromise:
• Profits go down after about 200 kg (per ha) of fertiliser because cost of fertiliser is not covered by increased yield.
• 200 kg gives the highest profit although it is not the highest yield.
• 500 kg gives the best yield but has the most runoff.</td></tr>
</table>

Total			13

4.6.2.2 Energy changes and reversible reactions

Answer 03 · Mark scheme

June 2016 | CH2HP | Original Q2 | Legacy

