



# **GCSE Chemistry 3**

**Higher Tier**

**Chemistry 3H**

**SPECIMEN MARK SCHEME**

**Version 1.0**

## Quality of Written Communication and levels marking

In Question 2(b) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

### Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

### Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

### Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

In order to attain a mark within a certain level, **both** the science **and** the QWC must be of a standard appropriate to that level.

**COMPONENT NUMBER: CH3HP**

**COMPONENT NAME: GCSE Chemistry 3H**

**STATUS: Specimen V1.0**

question	answers	extra information	mark
1(a)(i)	activation energy  or energy needed to start the reaction		1
1(a)(ii)	the reaction is exothermic because the energy level / value of products is less than the energy level / value of reactants	allow the reaction is exothermic because arrow <b>B</b> goes down or methanol is below methane and oxygen or arrow <b>C</b> is bigger than arrow <b>A</b>  or energy level of products is lower unqualified or the energy level of reactants is higher unqualified for 1 mark	2
1(b)(i)	use a lid / cover over the calorimeter or any mention of how the calorimeter could be safely enclosed / insulated		1
1(b)(ii)	a greater mass of methanol was burned in Experiment 2  therefore the temperature change was greater because more energy was transferred / released		1  1
1(b)(iii)	any <b>one</b> from: <ul style="list-style-type: none"> <li>• to improve or check repeatability / quality of results</li> <li>• to make it easier to spot an anomalous measurement</li> <li>• to be able to calculate an average mean value</li> </ul>		1

**Question 1 continues on the next page . . .**

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**STATUS: Specimen V1.0**

**Question 1 continued . . .**

<b>question</b>	<b>answers</b>	<b>extra information</b>	<b>mark</b>
<b>1(b)(iv)</b>	8820 (J)	for correct answer  if answer is incorrect allow one mark for 21 used as the mean temperature change	<b>2</b>
<b>Total</b>			<b>9</b>

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**STATUS: Specimen V1.0**

question	answers	extra information	mark
<b>2(a)</b>	Drain Buster is a concentrated sodium hydroxide solution that would damage the skin		1
	therefore it is diluted so that it is safe to use for the experiment		1

**2(b)**

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 2.

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a brief description of the titration that may include a risk assessment.	There is some description of the titration that may include a risk assessment.	There is a clear, balanced and detailed description of the titration and an appropriate risk assessment.

**examples of the chemistry points made in the response**

- burette / acid / HCl used correctly
- pipette used for Drain Buster solution / alkali / NaOH correctly
- read meniscus at eye level
- acid / HCl added dropwise
- indicator used
- white background / tile
- end-point of titration recorded
- swirling / mixing
- repeat

**example of risk assessment points made in the response eg**

- Wear safety goggles – to protect eyes because hydrochloric acid is corrosive / irritant and / or sodium hydroxide is caustic

<b>Total</b>			<b>8</b>
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**STATUS: Specimen V1.0**

question	answers	extra information	mark
<b>3(a)(i)</b>	on heating, the calcium hydrogencarbonate decomposes		1
	forming a scale of insoluble calcium carbonate		1
<b>3(a)(ii)</b>	the scale reduces the efficiency of the heating element <b>or</b> the scale increases energy costs / uses more energy		1
<b>3(b)(i)</b>	the sodium carbonate / carbonate ions react with calcium / magnesium ions, forming a precipitate of calcium carbonate / magnesium carbonate		1
	therefore the water is softened because this removes the calcium / magnesium ions, which cause hardness, from the water		1
<b>3(b)(ii)</b>	sodium / hydrogen ions are present in the ion exchange resin		1
	therefore the water is softened because these ions take the place of calcium / magnesium ions that cause hardness in the water		1
<b>Total</b>			<b>7</b>

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question	answers	extra information	mark
4(a)(i)	$C_nH_{2n+1}OH$		1
4(a)(ii)	OH		1
4(b)(i)	ethanol has only covalent bonds in its molecule		1
4(b)(ii)	3 (O <sub>2</sub> ) 3H <sub>2</sub> O		1 1
4(c)(i)	acidic		1
4(c)(ii)	an ester		1
<b>Total</b>			<b>7</b>

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**STATUS: Specimen V1.0**

question	answers	extra information	mark
<b>5(a)</b>	sodium – yellow flame		1
	potassium – lilac flame		1
	potassium's flame colour is masked by sodium's flame colour		1
<b>5(b)</b>	magnesium		1
<b>5(c)(i)</b>	carbonate (ions) must be present because carbon dioxide was produced when nitric acid was added		1
	chloride (ions) must be present because a white precipitate formed when acidified silver nitrate solution was added		1
<b>5(c)(ii)</b>	the student would make the same observations using either hydrochloric acid or nitric acid		1
	any conclusion would not be valid because hydrochloric acid contains chloride (ions)		1
	the explanation is that these chloride (ions) would cause a white precipitate without the presence of the low sodium salt / sodium chloride / potassium chloride		1
<b>Total</b>			<b>9</b>



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**STATUS: Specimen V1.0**

question	answers	extra information	mark
<b>6(a)</b>	reactants- 2 x H-H + 1 x O = O = 1370 (kJ)		1
	products- 4 x O-H = 1856 (kJ)		1
	energy change = 486(kJ)		1
<b>6(b)</b>	O=O has a double (covalent) bond  <b>or</b> O-H and H-H only have single (covalent) bonds		1
<b>6(c)</b>	hydrogen can be used as a fuel because when it reacts with oxygen more energy is released in bond making than used in bond breaking		1
	therefore the reaction releases energy <b>or</b> the reaction is exothermic		1
<b>Total</b>			<b>6</b>

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question	answers	extra information	mark
<b>7(a)</b>	the conclusion is that chlorine and bromine are more reactive than iodine		1
	any suitable comparisons about the extent to which the iron wool glowed eg because iron glowed with chlorine and bromine but did not glow with iodine		1
<b>7(b)</b>	iodine is less reactive than bromine because the iodine (atom) is bigger <b>or</b> <u>outer</u> electrons (level / shell) further from the nucleus	accept converse for bromine	1
	therefore the forces attracting an incoming electron are weaker <b>or</b> there is more shielding of the forces attracting an incoming electron		1
	therefore the <u>outer</u> electron gained less easily	Max 2 if no mention of <u>outer</u> energy level / shell <b>or</b> of <u>outer</u> electron(s)	1
<b>Total</b>			<b>5</b>

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question	answers	extra information	mark
<b>8(a)</b>	catalyst	accept speeds up reaction <b>or</b> lowers activation energy	1
<b>8(b)(i)</b>	an equilibrium is achieved when rate of the forward reaction is exactly the same as the rate of the backward reaction		1
<b>8(b)(ii)</b>	in this equilibrium the forward reaction to form ammonia is exothermic  therefore if the temperature is low the yield from the exothermic reaction increases		1  1
<b>8(b)(iii)</b>	in this gaseous equilibrium if the pressure is high this will favour the reaction that produces the least number of molecules, that is, the forward reaction to form ammonia		1
<b>Total</b>			<b>5</b>

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**STATUS: Specimen V1.0**

question	answers	extra information	mark
<b>9(a)</b>	for undiscovered elements		1
<b>9(b)</b>	because the elements are in order of number of electrons or proton number		1
	because the number of energy levels / shells is the number of the period		1
	because the number of electrons in the <u>outer</u> energy level / shell is the number of the group, except in the case of the noble gases		1
<b>Total</b>			<b>4</b>