

OXFORD

INTERNATIONAL  
AQA EXAMINATIONS

# INTERNATIONAL GCSE

## COMBINED SCIENCE DOUBLE AWARD CHEMISTRY

9204/CC

PAPER 2-CORE TIER

Mark scheme

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Specimen material

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

## Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

### Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

### Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

**Question 1**

Question	Answers	Extra information	Mark																											
01.1	carbon		1																											
01.2	each atom is joined to four other atoms		1																											
	it has a giant structure		1																											
01.3	alloys are mixtures containing metals		1																											
	metals can be hammered into shape		1																											
01.4	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Name of substance</th> <th style="width: 10%;">Melting point in °C</th> <th style="width: 15%;">Does the substance conduct electricity as a solid?</th> <th style="width: 15%;">Does the substance conduct electricity as a liquid?</th> <th style="width: 35%;">Type of structure</th> </tr> </thead> <tbody> <tr> <td>Zinc</td> <td style="text-align: center;">420</td> <td style="text-align: center;">Yes</td> <td style="text-align: center;">Yes</td> <td style="text-align: center;"><b>Giant</b></td> </tr> <tr> <td>Ethanol</td> <td style="text-align: center;">–114</td> <td style="text-align: center;"><b>No</b></td> <td style="text-align: center;"><b>No</b></td> <td style="text-align: center;">Small molecules</td> </tr> <tr> <td>Silicon dioxide</td> <td style="text-align: center;">1600</td> <td style="text-align: center;">No</td> <td style="text-align: center;">No</td> <td style="text-align: center;"><b>Giant / macromolecular</b></td> </tr> <tr> <td>Sodium chloride</td> <td style="text-align: center;">801</td> <td style="text-align: center;"><b>No</b></td> <td style="text-align: center;"><b>Yes</b></td> <td style="text-align: center;">Ionic lattice</td> </tr> </tbody> </table>				Name of substance	Melting point in °C	Does the substance conduct electricity as a solid?	Does the substance conduct electricity as a liquid?	Type of structure	Zinc	420	Yes	Yes	<b>Giant</b>	Ethanol	–114	<b>No</b>	<b>No</b>	Small molecules	Silicon dioxide	1600	No	No	<b>Giant / macromolecular</b>	Sodium chloride	801	<b>No</b>	<b>Yes</b>	Ionic lattice	1
	Name of substance	Melting point in °C	Does the substance conduct electricity as a solid?	Does the substance conduct electricity as a liquid?	Type of structure																									
	Zinc	420	Yes	Yes	<b>Giant</b>																									
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				1																										
				1																										
				1																										
<b>Total</b>				<b>9</b>																										

**Question 2**

Question	Answers	Extra information	Mark
<b>02.1</b>	1	must be in this order allow 1/2000 <b>or</b> negligible <b>or</b> zero	1
	very small		1
<b>02.2</b>	the mass number		1
<b>02.3</b>	C		1
<b>02.4</b>	2		1
<b>02.5</b>	3		1
<b>02.6</b>	0.9		1
<b>02.7</b>	0.04		1
<b>Total</b>			<b>8</b>

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Question	Answers	Extra information	Mark
<b>03.1</b>	sodium loses (an electron)	sharing/covalent /metallic = max <b>2</b> marks	1
	chlorine gains (an electron)		1
	1 <b>or</b> an (electron)		1
<b>03.2</b>	have no overall charge		1
<b>03.3</b>	nitric (acid)		1
<b>03.4</b>	an alkali		1
<b>03.5</b>	indicator	allow any correctly named acid- base indicator	1
<b>03.6</b>	crystallisation		1
<b>03.7</b>	any <b>one</b> from:	allow concentration ignore heat	1
	• pressure		
	• temperature		
	• catalyst.		
<b>Total</b>			<b>9</b>

**Question 4**

Question	Answers	Extra information	Mark
04.1	calcium carbonate → calcium oxide + carbon dioxide	allow $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$	1
04.2	neutralisation		1
04.3	sulfuric acid $\text{H}_2\text{SO}_4$		1 1
04.4	to speed up the reaction	allow to increase the rate of reaction <b>or</b> to increase the number <b>or</b> rate of collisions  do <b>not</b> accept “dissolves” copper oxide faster	1
04.5	to make sure all of the acid is neutralised		1 1
04.6	copper sulfate solution passes through the filter paper  copper oxide collects in the filter paper	allow dissolved copper sulfate passes through filter paper <b>or</b> smaller particles (of copper sulfate) in solution pass through filter paper  allow (black) solid collects in filter paper and filtrate <b>or</b> soluble solid <b>or</b> (blue) solution passes through filter paper	1  1
<b>Total</b>			<b>9</b>

Question 5

Question	Answers	Extra information	Mark
05.1	gives out energy		1
05.2	rate is fastest at the start rate slows rate is zero at the end <b>or</b> reaction stops		1 1 1
05.3	21		1
05.4	particles have more energy/move faster so (particles) collide more often/frequently <b>or</b> particles more likely to collide and more of the collisions are successful <b>or</b> particles collide with more energy/harder <b>or</b> more of the particles have the activation energy	ignore particles move more/vibrate ignore collide faster ignore more collisions allow more successful collisions	1 1 1
05.5	curve steeper initially than given curve curve levels off at 21 cm <sup>3</sup> in a shorter time	max 1 mark if curve not the same shape	1 1
<b>Total</b>			<b>10</b>



**Question 6**

Question	Answers	Extra information	Mark
06.1	same group/column or similar properties or same number of outer electrons	allow some link between any two elements in the same group (in both Newlands and or the modern periodic table)	1
06.2	any <b>two</b> from: <ul style="list-style-type: none"> <li>• elements still being discovered <b>or</b> no gaps for undiscovered elements</li> <li>• some boxes have 2 elements in them</li> <li>• metals and non-metals in same column / mixed up</li> <li>• pattern for first 16 or so elements only.</li> </ul>	ignore statements about lack of evidence/proof accept some elements in same column have different properties. allow any sensible suggestion about misplaced elements eg copper in group 1 elements  allow did not work for all elements	2
06.3	Cl > Br > I  Cl has 2 reactions, Br has 1 reaction, I doesn't react	allow reactivity decreases down the group  allow Cl has most/more reactions and I has least/less reactions (must be clear about where Br fits in)	1  1
06.4	Br <sub>2</sub>	allow multiples/fractions if correctly completed and balanced	1
06.5	they have 7 outer electrons	allow (they) have 7 electrons in highest occupied (energy) level/shells/rings	1
06.6	hydrogen	allow H <sub>2</sub> /H	1
06.7	hydroxide	allow OH <sup>-</sup> allow OH do <b>not</b> accept lithium hydroxide	1

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Question	Answers	Extra information	Mark
<b>06.8</b>	any <b>one</b> from: potassium <ul style="list-style-type: none"> <li>• reacts/dissolves faster</li> <li>• bubbles/fizzes faster</li> <li>• moves faster (on the surface)</li> <li>• melts</li> <li>• produces (lilac/purple) flame.</li> </ul>	accept converse for lithium allow reacts more vigorously/quickly/violently/explodes ignore reacts more allow fizzes more allow more gas allow moves more allow forms a sphere allow catches fire/ignites do <b>not</b> accept other colours	1
<b>Total</b>			<b>10</b>

Question 7

Question	Answers	Extra information	Mark
07.1	a reasonable attempt at a smooth curve	allow a curve which is close to but does not necessarily touch all points	1
07.2	any <b>two</b> from: <ul style="list-style-type: none"> <li>biodiesel is more <b>viscous</b> than petroleum diesel at all/lower temperatures</li> <li>biodiesel – as the temperature increases the <b>viscosity</b> decreases or vice versa</li> <li>petroleum diesel – the <b>viscosity</b> does not change.</li> </ul>	allow thicker/thinner/runny used correctly for viscous  if no other mark awarded allow <b>1</b> mark for any correct conclusion based on time or rate of flow	2
07.3	does not flow as easily (through pipes/engine) <b>or</b> needs a high temperature to flow	allow could form a solid/block pipes/engine at low temperatures  allow more difficult to vaporise/ignite  ignore burning  ignore references to viscosity	1
07.4	56%		1

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Question	Answers	Extra information	Mark
<b>07.5</b>	<p>(no)</p> <p>because carbon dioxide (26%) is released / produced</p> <p>this will <b>not</b> all be absorbed by photosynthesis / growing plants for biodiesel</p> <p><b>or</b></p> <p>(yes)</p> <p>because although carbon dioxide (26%) is released/ produced (1)</p> <p>this was absorbed by photosynthesis/growing plants (for biodiesel) (1)</p>	<p>ignore reference to petroleum diesel</p> <p>allow carbon for carbon dioxide</p> <p>allow growing plants/farming uses machinery/fossil fuels release carbon dioxide</p> <p>allow this will be absorbed by photosynthesis/growing plants (for biodiesel)</p>	<p>1</p> <p>1</p>
<b>7.6</b>	land used to grow biofuels could be used to grow food		1
<b>Total</b>			<b>8</b>

Question 8

Question	Answers	Extra information	Mark
08.1	$C_6H_{14}$	ignore size of numbers	1
08.2	only single bonds		1
08.3	$C_nH_{2n}$	ignore size do <b>not</b> allow N	1
08.4	<pre> H       H   H               C = C - C - C - H               H   H   H   H                     </pre>		1
08.5	(vapours) cool (as they rise)	allow hot at bottom/cool at top/ temperature gradient	1
	condense (into fractions)	ignore heat	1
	at different boiling points/ temperatures/levels	'it' = vapours	1
<b>Total</b>			<b>7</b>

**Question 9**

Question	Answers	Extra information	Mark
<b>09.1</b>	118		1
<b>09.2</b>	gold atom loses/transfers electrons three (electrons)	it = Au/gold atom  sharing/covalency = max <b>1</b> mark	1  1
<b>09.3</b>	O <sub>2</sub> <b>2 CO and 2 CO<sub>2</sub> or</b> correct balancing from O	allow correct multiples/fractions throughout	1  1
<b>09.4</b>	because carbon dioxide is simple molecular / small molecules there are <b>intermolecular</b> forces (between the molecules) so a small amount of energy needed (to separate molecules) <b>or</b> (intermolecular forces) are weak	ref to incorrect bonding = max <b>1</b> mark  allow <b>intermolecular</b> bonds	1  1  1
<b>09.5</b>	any <b>two</b> from: <ul style="list-style-type: none"> <li>• gold is the only catalyst for some reactions</li> <li>• catalysts are not used up</li> <li>• improves speed of reaction</li> <li>• reduces amount of energy <b>or</b> process needs low(er) temperature</li> <li>• only small quantities (of catalyst) needed.</li> </ul>	if no other mark awarded, allow catalyst reduces cost (of the process) for <b>1</b> mark	2
<b>Total</b>			<b>10</b>

Question 10

Question	Answers	Extra information	Mark
10.1	the more sodium hydrogencarbonate the greater the temperature change	allow examples from the table	1
	up to 8 spatula measures	allow any correct indication of when change occurs	1
	then the temperature change is constant	if no other marks awarded, allow <b>1</b> mark for the more sodium hydrogencarbonate, the lower the final temperature	1
10.2	volume of acid <b>or</b> concentration of acid <b>or</b> mass of sodium hydrogencarbonate		1
10.3	energy is taken in from the surroundings <b>or</b> endothermic		1
10.4	gas/carbon dioxide/steam/ water is produced	accept carbon dioxide is a gas <b>or</b> steam/water is a gas	1
10.5	no, because (reaction) is exothermic <b>or</b> yes, to start the reaction	allow no, because (reactants) were formed by heating ignore references to cooling	1
10.6	23 +1 + 12 + (3 × 16)		1
	84	allow 84 with no working shown for <b>2</b> marks	1
10.7	14.29 (%)	allow rounding to 14.3 or 14 allow ecf from part 10.6 correctly calculated	1
<b>Total</b>			<b>10</b>

Question 11

Question	Answers	Extra information	Mark
11.1	hydrochloric acid / HCl carbon dioxide / CO <sub>2</sub>	allow any named acid allow bubbles/fizz/gas <b>or</b> limewater gets milky ignore 'add limewater' do <b>not</b> accept other named gases	1 1
11.2	flame colour of (Na) and flame colour of (K) interfere/mask/mix with each other	allow can't see the colours <b>or</b> difficult to determine the colour <b>or</b> both produce <b>different</b> colours <b>or</b> a correct statement of colours <b>or</b> hard to distinguish	1
11.3	essential (mineral) <b>or</b> everyone needs it/some (salt) <b>or</b> problems with health if have no salt	accept preservative/flavouring/ taste it = salt (all) foods contain/use it/ sodium chloride/salt	1



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Question	Answers	Extra information	Mark
<b>11.4</b>	<p><b>advantages</b> any from:</p> <ul style="list-style-type: none"> <li>• more people will be healthier</li> <li>• (should have) less heart disease</li> <li>• (should have) less cancer</li> <li>• (more people with) lower blood pressure.</li> </ul> <p><b>disadvantages</b> any from:</p> <ul style="list-style-type: none"> <li>• not everyone affected</li> <li>• not enough evidence</li> <li>• does not provide choice</li> <li>• undemocratic</li> <li>• less taste/flavour</li> <li>• shorter shelf life/not preserved (as long)</li> <li>• too much potassium chloride might be bad.</li> </ul>	<p>must give at least two points from each section</p> <p>ignore economic arguments throughout <b>or</b> people eat less salt</p> <p>ignore references to too much/too little salt</p> <p>ignore no flavour/taste</p> <p>ignore references to sell by dates</p>	6
<b>Total</b>			<b>10</b>

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