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INTERNATIONAL GCSE
COMBINED SCIENCE
9204/CC

Paper 2 Chemistry Core

Mark scheme

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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.

Further copies of this mark scheme are available from oxfordaqaexams.org.uk

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

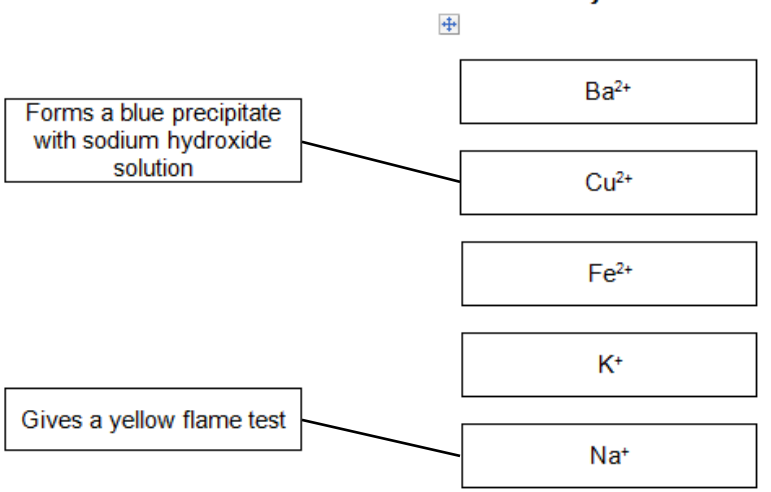
Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This 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	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	unreactive		1	AO1 3.9.1.1c
01.2	79		1	AO2 3.7.2f
01.3	equal numbers of protons and electrons		1	AO1 3.7.2e
01.4	7		1	AO2 3.7.2b
01.5	layers of atoms can slide over each other		1	AO1 3.9.1a
01.6	0.04 (mol)		1	AO2 3.12.3a
Total			**6**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	Ca^{2+}		1	AO2 3.8.1c
02.2			1 1	AO1 ×2 3.10.2a 3.10.2c
02.3	H^{+}		1	AO1 3.11.1f
02.4	$AlCl_3$		1	AO2 3.8.1c
02.5	by gaining two electrons		1	AO2 3.8.1c

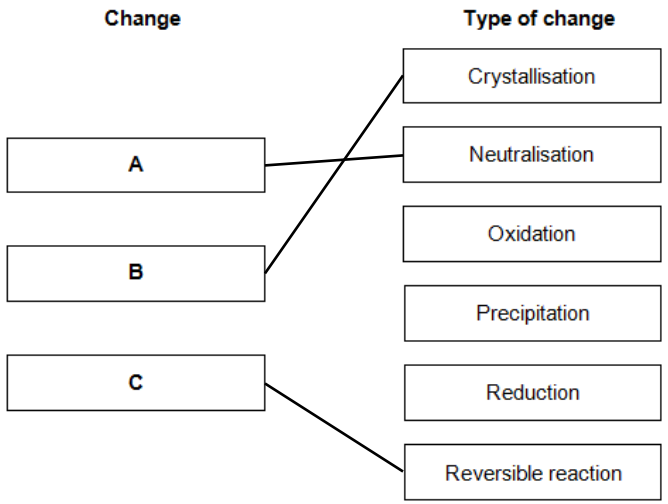
02.6	lead bromide conducts electricity when molten (because) ions (are free to) move	allow (lead bromide) allows charge to flow ignore conduction of heat ignore it is ionic ignore can vibrate if no other mark awarded, the particles can move gains **1** mark	1 1 1 1	AO1 ×2 AO2 ×2 3.8.2b
02.7	electrolyte		1	AO1 3.9.2b
02.8	bromine	do **not** accept bromide	1	AO2 3.9.2c
Total			**12**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	salt		1	AO2 3.9.1.2b
03.2	sherbet / powder dissolves (in water) bubbles (of gas) / fizzing / effervescence	 ignore named gas ignore changes in colour	1 1	AO2 3.9.1.2b
03.3	activation energy		1	AO1 3.15.2a
03.4	decreases		1	AO3 3.15.1c
03.5	84 (cm^3)		1	AO2 3.9.1.2b
03.6	30 × 1.80 = 54 (cm^3)	an answer of 54 (cm^3) scores **2** marks	1 1	AO2 AO3 3.9.1.2b
03.7	$\frac{1.40}{2.00}$ × 100 = 70 (%)	an answer of 70 (%) scores **2** marks an answer of 0.7 scores **1** mark	1 1	AO2 ×2 3.9.1.2b

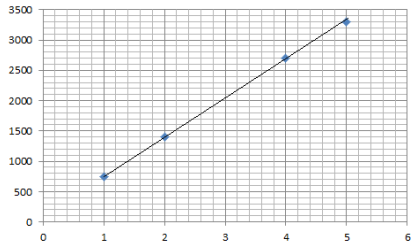
03.8	chromatography		1	AO1 3.10.1d
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	elements		1	AO1 3.8.1a
04.2	Fe_2O_3		1	AO1 3.9.1.1d
04.3	iron carbon dioxide	any order allow carbon monoxide	1 1	AO2 ×2 3.9.1.1d
04.4	loss of oxygen		1	AO1 3.9.1.1d
04.5	any **one** from: • uses less energy • less mining • conserves iron oxide • less carbon dioxide produced • produces less waste	ignore vague statements about being better for the environment	1	AO1 3.9.1.1i
04.6	mixture		1	AO1 3.9.1b
04.7	carbon		1	AO1 3.9.1b
04.8	steel has a higher tensile strength	allow because steel is stronger	1	AO3 3.9.1b
Total			**9**	

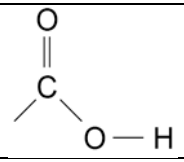
Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	12		1	AO2 3.11.1f
05.2	(limewater) turns cloudy **or** white precipitate is formed	allow turns milky	1	AO1 3.10.2d
05.3	(aq) 2		1 1	AO2 ×2 3.12.1a 3.12.1b
05.4	red flame		1	AO2 3.10.2a
05.5	white precipitate		1	AO2 3.10.2b
05.6	(the reaction) transfers energy to the surroundings	allow (the reaction) gives out heat	1	AO1 3.15.1b
05.7	prevent water (from outside) reacting with calcium oxide	allow prevent water / chemicals leaking from container	1	AO2 3.14.1e
05.8	use bigger pieces of calcium oxide	allow slow down the rate water flows from the broken tube ignore cool it down	1	AO2 3.14.1f
Total			**9**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1			1 1 1	AO3 ×3 3.10.1c 3.11.1b 3.15.1d
06.2	sulfuric		1	AO2 3.11.1c
06.3	increase the rate of reaction		1	AO4 3.14.1c
06.4	add anhydrous copper sulfate (which changes) from white to blue		1 1 1	AO3 ×3 3.15.1d
06.5	all the water has been removed (from hydrated copper sulfate)	allow all the hydrated copper sulfate has been converted into anhydrous copper sulfate allow the reaction is complete	1	AO4 3.15.1d

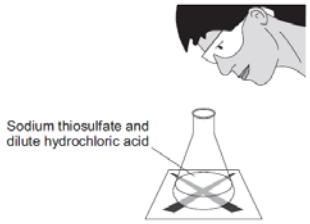
06.6	1.8 (g)		1	AO3 3.15.1d
06.7	condensation		1	AO2 3.7.1a
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(metal can is) a better (heat) conductor	allow metal is a heat conductor	1	AO4 3.9.1a
07.2	12 + (1 × 3) + 16 +1 = 32	an answer of 32 scores **2** marks	1 1	AO2 ×2 3.12.2a
07.3	750 × 2.5 = 1875 (kJ)	an answer of 1875 (kJ) scores **2** marks	1 1	AO2 AO3 3.15.1b
07.4	4 9		1 1	AO3 ×2 3.16.3.1a
07.5	all points correctly plotted line of best fit	 allow 1 mark for 3 points correctly plotted allow a tolerance of ± half a small square	2 1	AO2 ×3 3.15.1b

07.6	value from their graph (kJ/mol)	allow a tolerance of ± half a small square	1	AO3 3.15.1b
07.7	carbon dioxide water	answers in any order allow CO_2 allow H_2O	1 1	AO2 ×2 3.16.1.2(e) 3.16.3.1(b)
07.8	fermentation		1	AO1 3.16.1.2f
07.9	ethanol biofuel production uses land that could be used to grow food.		1	AO1 3.16.1.2f
Total			**15**	

Question	Answer	Extra information	Mark	AO / Spec. Ref.
08.1			1	AO1 3.16.3.2a
08.2	reacts with alcohols to produce esters		1	AO1 3.16.3.2b
08.3	**Level 3:** The plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO4 ×6 3.10.1c
	Level 2: The plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.		3–4	
	Level 1: The plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.		1–2	
	No relevant content		0	
	Indicative content • place the mixture in a beaker / container • add water • heat the water • keep water temperature below 94 ^{o}C • stir to dissolve the benzoic acid • hydrocarbon Z will not dissolve • filter when hot to remove Z • cool the filtrate to crystallise benzoic acid • filter to remove crystals from solution • wash the crystals with cold water • allow the crystals to dry			

08.4	measure the melting point exactly 122 ^{o}C	 allow **1** mark for dissolves completely in hot water (no solid impurity)	1 1	AO1 AO3 3.10.1a
08.5	$\frac{24}{12}$ **and** $\frac{4}{1}$ 2 **and** 4 **Z** = CH_2	 correct formula without working scores **1** mark only allow **1** mark for: $\frac{24}{12}$ = 2 **or** $\frac{4}{1}$ = 4	1 1 1	AO2 ×3 3.12.2c
Total			**13**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	any **one** from: • wear eye protection • carry out the experiment in a well ventilated laboratory		1	AO1 3.14.1a
09.2	(independent variable) concentration of sodium thiosulfate solution (dependent variable) time for reaction	allow volume of sodium thiosulfate ignore volume of water allow rate of reaction	1 1	AO1 ×2 3.14.1a
09.3	any **two** from: • volume of (hydrochloric) acid • concentration of (hydrochloric) acid • total volume of sodium thiosulfate + water • (initial) temperature	ignore volume of water allow moles of (hydrochloric) acid	2	AO1 ×2 3.14.1a
09.4	stand the conical flask on a black cross look down through the top of the flask stop the timer when you can no longer see the cross.	these marks may be awarded for a suitable diagram  allow stop the timer when you can no longer see through the mixture	1 1 1	AO1 ×3 3.14.1a

09.5	make more measurements (of time at each concentration) calculate a mean	allow repeat the experiment (at each concentration) allow take the average	1 1	AO3 ×2 3.14.1a
09.6	when volume of sodium thiosulfate is increased, time taken for the reaction decreases	allow increased rate of reaction when concentration of sodium thiosulfate increases	1	AO3 3.14.1a
09.7	($\frac{96}{60}$ =) 1.6 (min) $\frac{0.32}{1.6}$ = 0.2 (g/min)	an answer of 0.2 (g/min) scores **3** marks an answer of ($\frac{0.32}{96}$ =) 0.0033 (g/s) scores **2** marks	1 1 1	AO2 ×3 3.14.1a
Total			**14**	