OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL GCSE COMBINED SCIENCE DOUBLE AWARD CHEMISTRY

9204/CE

PAPER 2 – EXTENSION TIER
Mark scheme

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	the more sodium hydrogencarbonate the greater the temperature change up to 8 spatula measures then the temperature change is constant	allow examples from the table allow any correct indication of when change occurs if no other marks awarded, allow **1** mark for the more sodium hydrogencarbonate, the lower the final temperature	1 1 1
01.2	volume of acid **or** concentration of acid **or** mass of sodium hydrogencarbonate		1
01.3	energy is taken in from the surroundings **or** endothermic		1
01.4	gas/carbon dioxide/steam/water is produced	accept carbon dioxide is a gas **or** steam/water is a gas	1
01.5	no, because (reaction) is exothermic **or** yes, to start the reaction	allow no, because (reactants) were formed by heating ignore references to cooling	1
01.6	23 +1 + 12 + (3 × 16) 84	 allow 84 with no working shown for **2** marks	1 1
01.7	14.29 (%)	allow rounding to 14.3 or 14 allow ecf from part 10.6 correctly calculated	1
Total			**10**

Question 2

Question	Answers	Extra information	Mark
02.1	hydrochloric acid / HCl carbon dioxide / CO_2	allow any named acid allow bubbles/fizz/gas **or** limewater gets milky ignore 'add limewater' do **not** accept other named gases	1 1
02.2	flame colour of (Na) and flame colour of (K) interfere/mask/mix with each other	allow can't see the colours **or** difficult to determine the colour **or** both produce **different** colours **or** a correct statement of colours **or** hard to distinguish	1
02.3	essential (mineral) **or** everyone needs it/some (salt) **or** problems with health if have no salt	accept preservative/flavouring/taste it = salt (all) foods contain/use it/sodium chloride/salt	1

Question	Answers	Extra information	Mark
02.4	**advantages** any from: • more people will be healthier • (should have) less heart disease • (should have) less cancer • (more people with) lower blood pressure. **disadvantages** any from: • not everyone affected • not enough evidence • does not provide choice • undemocratic • less taste/flavour • shorter shelf life/not preserved (as long) • too much potassium chloride might be bad.	must give at least two points from each section ignore economic arguments throughout **or** people eat less salt ignore references to too much/too little salt ignore no flavour/taste ignore references to sell by dates	6
Total			**10**

Question	Answers	Extra information	Mark
03.1	alkali metals		1
	halogens		1
03.2	sodium (atom) loses one electron		1
	chlorine (atom) gains one electron	allow **one** mark for sodium loses electrons and chlorine gains electrons	1
	sodium ion is positive/+/Na^+	allow Cl is negative	1
	chloride ion is negative/–/Cl^-	do **not** allow chlorine is negative	1
03.3	one shared pair	allow dots, crosses, 'e' or any combination	1
	chlorine atoms with 8 electrons **or** 4 pairs in outer level	circles not required	1
03.4	$2Na + 2H_2O \rightarrow 2NaOH + H_2$		
	correct formulae		1
	balancing		1
03.5	7	allow numbers expressed as words	1
	any value greater than 7 and up to 14		1
Total			**12**

Question 4

Question	Answers	Extra information	Mark
04.1	measuring cylinder/burette/pipette	allow syringe	1
04.2	0.050 × 65 3.25 **or** 3.3 (g)	 allow 3.25 with no working shown for **2** marks allow 3.2 (rounding error) for **1** mark	1 1
04.3	(polystyrene is) a better insulator **or** reduces heat loss (to the surroundings)	allow glass absorbs more energy	1
04.4	22 (°C) 41 (°C)		1 1
04.5	19 (°C)	allow ecf from 04.4	1
04.6	26 61	must be in this order	1 1
04.7	iron smallest range	 allow explanation of range using data eg smallest differences between values	1 1
04.8	magnesium above zinc **and** zinc above iron (least reactive) copper magnesium > zinc > iron in terms of energy given out or temperature change (copper lowest because) all the others displace copper **or** react with copper sulfate solution		1 1 1 1

Question	Answers	Extra information	Mark
04.9	concentration of solution	ignore amount	1
	higher concentration would give a larger temperature change		1
	because more copper sulfate could react to release more energy **or** reaction is faster so a higher temperature is reached in 1 min	allow the reaction is faster so it has less time to cool	1
	or		
	surface area / size of pieces of metal (1)		
	smaller pieces of metal would give a larger temperature change (1)	allow higher starting temperature gives a smaller temperature change because it cools faster for **2** marks	
	reaction is faster so a higher temperature is reached in 1 min (1)		
Total			**18**

Question 5

Question	Answers	Extra information	Mark
05.1	sulfur		1
05.2	precipitate/solid/sulfur produced	ignore cloudy	1
05.3	sensible scale	plotted points must cover half the grid in each direction	1
	all points correct	± ½ square **1** mark if 4 points plotted correctly	2
	best fit curve	must not deviate towards anomalous point but allow ecf from incorrect plotting	1
05.4	point at 40, 65 circled	allow ecf from incorrect plotting	1
05.5	temperature of reaction is not the temperature in the table	allow temperature has dropped	1
	because the acid has not been heated **or** cold acid has been added **or** delay after heating	allow only the thiosulfate was heated	1
	measure temperature after acid added **or** heat the acid to the same temperature eg in a water bath **or** record temperature all through the reaction	if no other mark scored, no thermometer in flask **or** thermometer removed gains **1** mark	1
05.6	rate increases as temperature increases	allow readings from the graph showing that increasing temperature increases rate ignore faster at higher temperature ignore gradient increasing	1

Question	Answers	Extra information	Mark
05.7	because increase in temperature increases (kinetic) energy of particles or particles move faster	ignore vibrate faster	1
	so collisions are more frequent or particles collide more often	not just 'more collisions'	1
	and more particles have the activation energy or more collisions are successful	allow more successful collisions	1
05.8	(no because) the line is a curve/not a straight line	allow readings from the graph showing that doubling temperature does not double rate ignore references to the origin	1
Total			**15**

Question 6

Question	Answers	Extra information	Mark
06.1	iron		1
	carbon		1
	mixture of two elements		1
06.2		max **3** marks if incorrect bonding	
	giant structure or lattice or macromolecule		1
	strong bonds (between carbon/atoms)		1
	covalent (bonds)		1
	each carbon/atom forms 4 bonds	allow tetrahedral	1
		if no other marks awarded allow carbon (atoms) for **1** mark	
06.3		max **3** marks if incorrect bonding	
		reference to 'weak covalent bonds' = max **2**	
		allow correctly drawn diagram for first two marking points eg (tangled) lines with no cross-links	
	chains **or** large molecules	ignore layers	1
	with intermolecular forces **or** forces between chains	allow bonds for forces	1
		accept no cross-links	
	that are weak	must relate to 2nd marking point	1
	and are easily overcome/ broken (when heated)	accept molecules/chains can flow/move	1
Total			**11**

Question 7

Question	Answers	Extra information	Mark
07.1	ΔT = (64 – 17) = 47 °C		1
	750 x 4.2 x 47	allow ecf using their ΔT	1
	148 050 (J) or 148.05 (kJ)	allow 148 (kJ)	1
		allow 148 050 with or without marking for **3** marks	
		ignore sign	
07.2	6/44 = 0.136 mol		1
	1085.7	allow answer in range 1080 - 1089	1
		allow 1085.7 without working shown for **2** marks	
		allow answer in range 1 080 000 – 1 089 000 for **1** mark	
07.3	inaccuracies likely to have similar effects	allow systematic errors	1
07.4	(6 x 803) = 4818		1
	(8 x 464) = 3712		1
	8530		1
		allow 8530 without working shown for **3** marks	
07.5	(6481 – 8530) = (–)2049	ignore sign	1
		allow ecf from 07.4 correctly calculated	
Total			**10**

Question 8

Question	Answers	Extra information	Mark
08.1	ions can move so charge can flow	do not accept atoms/electrons/ molecules/particles allow so can conduct electricity	1 1
08.2	$3e^-$	accept $-3e^-$ on left hand side	1
08.3	gold/it loses electron(s)	do **not** accept reference to oxygen	1
08.4	gold ions have a positive charge so are attracted to the negative electrode	do **not** accept incorrect particle if no other mark awarded allow opposite (charges) attract for **1** mark	1 1
08.5	any **three** from: • high (relative) hardness • high melting point • high (relative) electrical • conductivity • low (relative) price.	do **not** accept tin max **2** if silver or nickel given	3
Total			**9**

Question 9

Question	Answers	Extra information	Mark
09	**Divide by A_r:** Na = 22.8 / 23 B = 21.8 / 11 O = 55.4 / 16	if student has calculated moles upside down they can score mp 3 mp 4 and mp 5 as follows: Na 23 / 22.8 B 11 / 21.8 O 16 / 55.4	1
	Values 0.991 1.98 3.46	1.01 0.505 0.289	1
	Divide by the smallest 1 : 2 : 3.5	**Divide by the smallest** (1) 3.5 : 1.75 : 1	1
	Whole number ratio 2 : 4 : 7	**Whole number ratio** (1) 14 : 7 : 4	1
	Empirical formula $Na_2B_4O_7$	**Empirical formula** (1) $Na_{14}B_7O_4$ if no working shown allow **4** marks for $Na_2B_4O_7$	1
Total			**5**