OXFORD

INTERNATIONAL
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INTERNATIONAL GCSE

Chemistry

9202/1

Paper 1

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 aqa.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.	ID
01.1	atomic number		1	AO1/ 3.1.3a	G
01.2	**A**		1	AO2/ 3.1.3c	A
01.3	**B** and **F**		1	AO2/ 3.1.3b	A
01.4	they have similar chemical properties		1	AO1/ 3.1.3b	A
01.5	**E**		1	AO2/ 3.2.1e	A
01.6	compound		1	AO1/ 3.2.1a	G
Total			**6**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
02.1	mixture		1	AO1 3.10.1.1a	G
02.2	(molecules which) contain only carbon and hydrogen (atoms)		1	AO1/ 3.10.1.1b	E
02.3	C_4H_{10}		1	AO2/ 3.10.1.2a	E
02.4	crude oil is heated to evaporate / vaporise / boil the substances / hydrocarbons there is a temperature gradient in the column (vapours / fractions / hydrocarbons) condense at their boiling points **or** (vapours / fractions / hydrocarbons) condense at different levels in the column.	 allow the column is hotter at the bottom allow hydrocarbons with the highest boiling points collect at the bottom of the column	1 1 1 1	AO1 3.10.1.1c	E
02.5	gain oxygen	allow loss of electrons	1	AO1 3.10.1.2 e 3.8.4a	E
02.6	water carbon dioxide	any order allow correct formulae	1 1	AO1 3.10.1.2d	E
Total			**10**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
03.1	as (average) number of carbon atoms (per molecule) increases, viscosity increases		1	AO3/ 3.10.1.2c	E

03.2	**Level 3:** The plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO4 3.10.1.2c	E
	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 Measurement: • measure temperature of oil with thermometer • measure volume of oil with measuring cylinder/pipette • measure time taken for (fixed) volume of oil to leave cup with stop clock or measure volume of oil in a fixed time • repeat each experiment (calculate mean) temperature control: • water bath to heat oil • repeat experiment at different temperatures • range of temperatures e.g. 10–70^{o}C safety: • hazard oil is a flammable liquid • don't heat oil with a naked flame / Bunsen burner • use a water bath to heat the oil • use of safety glasses / goggles control variables: • same volume of oil • same viscometer / same size hole				

Total		**7**

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
04.1	any **one** from: • gold • silver • platinum • copper is unreactive		1 1	AO1 3.3.1.1c	E
04.2	iron oxide	ignore roman numerals	1	AO2 3.2.1a	G
04.3	$Fe_2O_3 + 3\ CO \rightarrow 2\ Fe + 3\ CO_2$	allow multiples allow for 1 mark 2 Fe **or** 3 CO **and** 3 CO_2	2	AO2 3.3.1.1d	E
04.4	any **two** from: • improve appearance • improve durability • resistance to corrosion	ignore references to cost	2	AO1 3.3.2h	E
04.5	(silver) ions gain electrons one electron gained (per silver ion)	allow (silver) ions are reduced allow **2** marks for $Ag^+ + e^- \rightarrow Ag$	1 1	AO2 3.3.2h	E
04.6	(12/60) = 0.2 (g/min) (3.4/0.2) = 17 (mins)	an answer of 17 (mins) scores **2** marks.	1 1	AO2 3.3.2h	E

04.7	giant structure / lattice / layers / close packed electrons in the highest / outer energy levels/shells delocalised electrons electrostatic attraction between positive ions and electrons	 allow mobile electrons **or** allow sea of electrons 	1 1 1 1	AO1 3.2.1i 3.2.1j	E

Total			**15**

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
05.1	zinc nitrate	allow $Zn(NO_3)_2$	1	AO2 3.3.1.2b 3.51c	G
05.2	produces a white precipitate **or** (limewater) goes cloudy (white)	allow (limewater) goes milky / white	1	AO1 3.4.2c 3.4.3d	E
05.3	H_2O		1	AO2 3.51e	E
05.4	allows carbon dioxide to escape stop acid splashing out of flask	allow gas can escape	1 1	AO4 3.3.1.2b	E
05.5	too small a range (of concentrations) too few different concentrations used	allow (concentrations) too close together allow too small an interval (of concentration) allow only two concentrations used	1 1	AO3 3.8.1a 3.8.1e	E
05.6	increased rate (of reaction) (because) speed of particles get faster (so) increased frequency of collisions (and) more of the particles have energy greater than (or equal to) the activation energy	allow reaction gets faster allow particles have more energy allow more chance of a collision ignore more collisions	1 1 1 1	AO1 3.8.1c 3.8.1b	E
Total			**11**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
06.1	**sub-atomic particle** / **relative mass** **proton** / 1 neutron / **1** **electron** / very small		1 1 1	AO1 3.1.2j	G
06.2	^{12}C		1	AO1 3.1.2k	A
06.3	36		1	AO2 3.1.2f	G
06.4	$\frac{65}{6.02 \times 10^{23}}$ $=1.1 \times 10^{-22}$ (g)	an answer of 1.1×10^{-22} (g) scores **2** marks allow $1.07973\ldots \times 10^{-22}$ correctly rounded to a minimum of 2 significant figures	1 1	AO2 3.6.3a 3.6.3b	E
06.5	both have same number of electrons **or** both have same electronic structure		1	AO2 3.1.2i	E
Total			**8**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
07.1	air		1	AO1 3.8.3a	E
07.2	reversible reaction	allow reaction can go in both directions	1	AO1 3.8.3c	E
07.3	catalyst	allow speeds up the reaction **or** allow increases the rate of reaction	1	AO1 3.8.3c	E
07.4	the higher the pressure the higher the yield (because) there are fewer moles / molecules (of gas) on the right (of the equation)	allow a high pressure gives a high yield allow (because) four moles / molecules produce two moles / molecules (of gas) allow (because as pressure increases) equilibrium position moves to the right	1 1	AO3/AO2 3.8.3c 3.8.2d 3.8.2e	E
07.5	yield does not increase as much above 200 atm (so) not worth the higher cost (of a higher pressure system)	 allow (so) risk of leak / explosion is greater (at a higher pressure)	1 1	AO3/AO2 3.8.3c 3.8.2d 3.8.2e	E
07.6	ammonia has a higher boiling point (than nitrogen and hydrogen) (so) ammonia liquefies on cooling (but nitrogen and hydrogen stay as gases)		1 1	1xAO1 1xAO3 3.8.3c	E
Total			**9**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
08.1	2 pairs of shared electrons 6 unbonded electrons on each Cl **and** 4 unbonded electrons on O	allow any combination of dots **or** crosses **or** $e^{(-)}$	1 1	AO2 3.2.1g	E
08.2	$\frac{3}{27}$ $\frac{12}{35.5}$ = 0.111 = 0.338 $\frac{0.111}{0.111} = 1$ $\frac{0.338}{0.111} = 3$ $AlCl_3$		1 1 1 1	AO2 3.6.2c	E
08.3	(4.95/0.05) = 99 $\frac{99}{49.5} = 2$ $C_2H_4Cl_2$		1 1 1	AO2 3.6.2c	E
08.4	type of bonding: covalent type of structure: simple molecules	 allow small molecules allow 1 mark if candidate has both correct answers but in wrong order	1 1	AO3 3.2.1g 3.2.2c 3.2.2e	E
Total			**11**		

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
09.1	(initially) as volume increases, temperature increases		1	AO3 3.9.1b 3.9.2c 3.6.4b	E
	(because) the reaction is exothermic **or**		1		
	(because) the reaction gives out energy	ignore (because) the reaction gives out heat			
	(then after 25 cm^3 added) as volume increases, temperature decreases		1		
	(because) excess acid cools the mixture	allow (because after 25 cm^3 added) reaction has finished and mixture is cooling to room temperature	1		
09.2	any **one** from: • mixture not stirred • temperature measured before highest point reached • less than 4 cm^3 of acid added		1	AO3 3.9.1b 3.9.2c	E
09.3		an answer of 1.6 (mol/dm^3) scores **3** marks		AO2 3.6.4c	
	(0.040 × 2 =) 0.08 (mol of NaOH)		1		E
	$(\frac{0.08}{2} =)$ 0.040 (mol of H_2SO_4)		1		
	$(\frac{0.040}{0.025})$ = 1.6 (mol/dm^3)		1		

09.4	an answer of 6.4g scores **3** marks (0.04 × 4) = 0.16 (mol) (0.16 × 40) = 6.4 g		1 1 1	AO2 3.6.3a 3.6.4a	E

09.5	25 cm^3 sulfuric acid neutralised 2.0 mol/dm^3 sodium hydroxide solution (so) 40 cm^3 sulfuric acid is not enough to neutralise all the 4.0 mol/dm^3 sodium hydroxide solution	allow (so) 50 cm^3 sulfuric acid required to neutralise all the 4.0 mol/dm^3 sodium hydroxide solution allow 1 mark for not enough acid to neutralise all the alkali	1 1	AO3 3.9.2c	E

Total			**13**