GCSE
CHEMISTRY
8462/1H

Paper 1H

Mark scheme

Specimen (set 2)

Version: 1.1

Keep secure

Please be aware that not all schools and colleges will be using these tests at the same time.

Help us to maintain the security of these papers by ensuring they are not distributed on social media or other platforms.

Important – please note

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers.

It must be stressed that a mark scheme is a working document. This mark scheme has **not** been through the full standardisation process. 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.

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.

The Information to Examiners is included as a guide to how the mark scheme will function as an operational document.

The layout has been kept consistent so that future operational mark schemes do not appear different from these test materials.

If the printing process in your school alters the scale of a diagram, measure the values on your printed papers and mark the scripts accordingly.

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement
- the Assessment Objectives, level of demand and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- 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 two 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.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise 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.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 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.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

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

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
01.1	**J**		1	AO2 4.1.2.1 Standard
01.2	**M** and **Q**	either order	1	AO2 4.1.2.1 Standard
01.3	**Q**		1	AO2 4.1.2.1 4.1.2.3 4.1.2.5 4.2.1.2 Standard
01.4	**M**		1	AO2 4.1.3.2 Standard
01.5	**L**		1	AO2 4.1.2.1 4.1.1.7 Standard

01.6	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 AO1 AO3 4.1.2.2 Standard
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content.	0	
	Indicative content **comparative points** • both tables have more than one element in a box • both have similar elements in the same column • both are missing the noble gases • both arranged elements in order of atomic weight **advantages of Mendeleev / disadvantages of Newlands** • Newlands did not leave gaps for undiscovered elements • Newlands had many more dissimilar elements in a column • Mendeleev left gaps for undiscovered elements • Mendeleev changed the order of some elements (eg Te and I) **points which led to the acceptance of Mendeleev's table** • Mendeleev predicted properties of missing elements • elements with properties predicted by Mendeleev were discovered • Mendeleev's predictions turned out to be correct • elements were discovered which fitted the gaps		

Total			**11**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
02.1	precipitate / solid formed	allow colour change	1	AO2 4.1.1.1 4.2.2.2 Standard
02.2	total mass before = 257.68 g total mass after = 257.68 g **so** the mass of products equals the mass of the reactants		1 1	AO2 4.3.1.1 Standard
02.3	0.01 (g)		1	AO2 4.3.1.1 Standard
02.4	 207 + (2 × 14) + (6 × 16) **or** 207 + 2 × [14 + (3 × 16)] = 331	an answer of 331 scores **2** marks	 1 1	AO2 4.3.1.2 Standard
02.5	CrO_4^{2-}		1	AO2 4.2.1.2 Standard
02.6	carbon dioxide is a gas the gas escapes during the reaction so the mass at the end is less than expected	allow a gas is produced	1 1 1	AO2 4.2.2.2 AO1 4.3.1.3 AO1 4.3.1.3 Standard
Total			**10**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
03.1	**(diagram)** complete circuit with power supply		1	AO1 4.4.3.4 Standard
	test solution in beaker or other appropriate apparatus		1	
	electrodes	allow carbon, platinum or inert electrodes	1	
	(independent variable) salt solutions (with different metal ions)		1	
	(observation) solid / metal deposit on the negative electrode		1	
03.2	(sometimes) hydrogen is produced		1	AO1 4.4.3.4 Standard
	(because) the metal is more reactive than hydrogen		1	
03.3	chlorine		1	AO2 4.4.3.4 Standard
	oxygen		1	
Total			**9**	

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref. / Demand</th></tr>
<tr><td>04.1</td><td>mass number</td><td>allow the number of protons + neutrons</td><td>1</td><td>AO1
4.1.1.5
Standard</td></tr>
<tr><td>04.2</td><td>6.02×10^{23}</td><td></td><td>1</td><td>AO1
4.3.2.1
Std./High</td></tr>
<tr><td rowspan="4">04.3</td><td colspan="2">Level 2: Scientifically relevant features are identified; the ways in which they are similar / different is made clear.</td><td>3–4</td><td rowspan="4">AO1
4.1.1.3
Std./High</td></tr>
<tr><td colspan="2">Level 1: Relevant features are identified and differences noted.</td><td>1–2</td></tr>
<tr><td colspan="2">No relevant content.</td><td>0</td></tr>
<tr><td colspan="2">Indicative content

similarities
• both have positive charges
• both have (negative) electrons
• neither has neutrons

differences
<table><tr><th>plum pudding model</th><th>nuclear model</th></tr><tr><td>ball of positive charge (spread throughout)</td><td>positive charge concentrated at the centre</td></tr><tr><td>electrons spread throughout (embedded in the ball of positive charge)</td><td>electrons outside the nucleus</td></tr><tr><td>no empty space in the atom</td><td>most of the atom is empty space</td></tr><tr><td>mass spread throughout</td><td>mass concentrated at the centre</td></tr></table></td><td></td></tr>
</table>

04.4	$\frac{(24 \times 78.6) + (25 \times 0.1) + (26 \times 11.3)}{100}$ **or** $(24 \times 0.786) + (25 \times 0.101) + (26 \times 0.113)$ = 24.3	an answer of 24.3 scores **2** marks	1 1	AO2 4.1.1.6 Std./High High

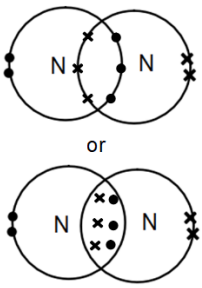
Total			**8**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
05.1	use a polystyrene cup instead of a (glass) beaker minimises energy transfer from the surroundings **or** for better insulation	allow insulate the beaker allow use a lid	1 1	AO3 4.5.1.1 Standard Std./High
05.2	concentration of hydrochloric acid		1	AO1 4.5.1.1 Std./High
05.3	$\frac{(5.6 + 5.7 + 5.4)}{3}$ = 5.6 (°C) ± 0.2	an answer of 5.6 (°C) scores the **first 2** marks	1 1 1	AO2 4.3.1.4 Standard Std./High
05.4	straight line from origin to (5.0, 6.4) horizontal line from (5.0, 6.4) to (8.0, 6.4)	must not deviate to anomalous point must not deviate to anomalous point	1 1	AO2 4.5.1.1 Standard Std./High

05.5	as mass (of potassium hydrogencarbonate) increases, temperature decrease / change increases until 5 g (to 8 g) (of potassium hydrogencarbonate has been added) (because) the reaction has finished **or** (because) all the acid has reacted **or** (because) no more solid can react **or** (because) the solid is in excess	 allow ecf from lines of best fit	1 1 1	AO3 4.3.2.4 4.5.1.1 Std./High

05.6	not stirred correctly		1	AO3 4.5.1.1 High

Total			**12**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
06.1	six electrons in the overlap 2 non-bonding electrons on each nitrogen atom	allow dots, crosses or $e^{(-)}$ for electrons **2** marks for an answer of:  	1 1	AO1 4.2.1.4 Std./High High
06.2	weak forces between molecules **or** intermolecular (which) need little energy to overcome	do **not** allow references to covalent bonding between molecules	1 1 1	AO1 4.2.2.4 Std./High
06.3	each (carbon) atom forms three covalent bonds forming layers (of hexagonal rings) (soft) (because) layers can slide over each other (conducts electricity) (because of) delocalised electrons		1 1 1 1	AO1 4.2.3.2 Standard Std./High

06.4	molecules are spherical (so molecules) will roll		1 1	AO1 AO3 4.2.3.3 Std./High

06.5	surface area (= 20 × 20 × 6) = 2400 (nm^2) volume (= 20^3) = 8000 (nm^3) ratio = 0.3 (nm^3): 1 (nm^3) **or** 1 (nm^3): 3.33 (nm^3)		1 1 1	AO2 4.2.4.1 High

06.6	(nanoparticles) have a larger surface area to volume ratio so less can be used for the same effect		1 1	AO1 AO3 4.2.4.1 Std./High High

Total			**16**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
07.1	heat with a water bath **or** heat with an electric heater **or** allow to evaporate / crystallise at room temperature		1	AO3 4.1.1.2 4.4.2.3 Std./High
07.2	to make sure that all the iodine reacts (as) excess iodine would remain in solution (so) iodine could not be filtered off **or** (so) the zinc iodide would not be pure	allow so can see the reaction is complete allow (whereas) <u>excess</u> zinc could be filtered off allow (so) would have to separate iodine from zinc iodide	1 1 1	AO3 4.3.2.4 4.4.2.3 Std./High High
07.3	 moles $I_2 = \frac{0.5(00)}{254} = (0.00197)$ mass Zn = 0.00197×65 (g) mass = 0.128 (g)	an answer of 0.128 (0.12795...) (g) scores **3** marks allow moles I_2 = 0.00197 allow 65g Zn: 254 g I_2 allow an expression $\frac{0.5(00) \times 65}{254}$ (g) for the first **2** marks	 1 1 1	AO2 4.3.2.2 Std./High

07.4	$92.0 = \frac{12.5}{\text{maximum mass}} \times 100$ (maximum mass=) $\frac{100}{92.0} \times 12.5$ = 13.6 (g)	an answer of 13.6 (13.5869…) (g) scores **3** marks allow 13.5869… (g)	1 1 1	AO2 4.3.3.1 Std./High High

07.5	some product lost on separation	allow incomplete reaction	1	AO3 4.3.3.1 Std./High

07.6	M_r ZnI_2 = 319 moles needed $\left(= 0.1 \times \frac{250}{1000}\right) = 0.025$ **or** mass per dm^3 = 31.9 (g) (mass) = 7.98 (g)	an answer of 7.975, 7.98 or 8.0 (g) scores **3** marks allow 7.975 / 8.0 (g)	1 1 1	AO2 4.3.2.1 4.3.2.5 Std./High

Total			**14**

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
08.1	the chemical reaction is reversible		1	AO1 4.5.2.1 Standard
08.2	any **two** from: • type of electrode • electrolyte • concentration of electrolyte • temperature		2	AO1 4.5.2.1 Std./High
08.3	H_2 + **2** OH^- → **2** H_2O + **2** e^-	allow multiples	1	AO2 4.1.1.1 4.5.2.2 High
08.4	contains OH^- ions		1	AO3 4.4.2.4 4.5.2.2 Std./High
08.5	(bonds broken) ((6 × 412) + (2 × 360) + (2 × 464) + (3 × 498)) = 5614 (bonds made) ((4 × 805) + (8 × 464)) = 6932 (overall energy change) (6932 – 5614) = −1318 (kJ/mol)	an answer of 1318 (kJ/mol) scores **3** marks allow ecf from marking point 1 and / or marking point 2	 1 1 1	AO2 4.5.1.3 Std./High High
Total			**8**	

Question	Answers	Extra information	Mark	AO / Spec. Ref. / Demand
09.1	produces H^+ / hydrogen ions in aqueous solution (but is) only partially / slightly ionised		1 1	AO1 4.4.2.4 4.4.2.6 Std./High
09.2	indicator changes colour from blue to yellow (when) the acid and alkali are (exactly) neutralised **or** (when) no excess of either acid or alkali	 allow from blue to green	1 1 1	AO1 AO3 AO1 4.4.2.5 Std./High High
09.3	pipette measures one fixed volume (accurately) (but) burette measures variable volumes (accurately)		1 1	AO1 4.4.2.5 High

09.4	$\frac{12.10 + 12.15 + 12.15}{3}$ (mean titre =) 12.13(3) (cm^3) (moles NaOH = conc × vol) = 0.00255 (moles citric acid = ⅓ moles NaOH) = 0.00085 (conc acid = moles/vol) = 0.0701 (mol/dm^3) allow ecf from steps 1, 2, 3 and / or 4 allow an answer of 0.0701 (mol/dm^3) without working for **1** mark only		1 1 1 1 1	AO2 4.3.4 4.4.2.5 Std./High High

Total			**12**