



# Mark Scheme (Results)

Summer 2019

Pearson Edexcel International GCSE in  
Chemistry (4SS0)  
Paper 1C

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Additional guidance	Marks
1 (a) (i)	<p><b>M1</b> P – neutron(s)</p> <p><b>M2</b> Q – proton(s)</p> <p><b>M3</b> R- electron(s)</p>		3
(b)	nucleus	<b>ALLOW</b> nuclei	1
(c) (i)	<p><b>A</b> (5)</p> <p><b>B</b> is incorrect as 7 is the number of neutrons not the atomic number</p> <p><b>C</b> is incorrect as 12 is the mass number not the atomic number</p> <p><b>D</b> is incorrect as 17 is the total number of protons, neutrons and electrons, not the atomic number</p>		1
(ii)	<p><b>C</b> (12)</p> <p><b>A</b> is incorrect as 5 is the atomic number not the mass number</p> <p><b>B</b> is incorrect as 7 is the number of neutrons not the mass number</p> <p><b>D</b> is incorrect as 17 is the total number of protons, neutrons and electrons, not the mass number</p>		1
(iii)	Boron / B		1
		<b>Total</b>	<b>7</b>

Question number	Answer	Additional guidance	Marks
2 (a) (i)	<b>B</b> 3  A is incorrect as there are not only 2 different elements C is incorrect as there are not 4 different elements D is incorrect as 6 is the total number of atoms in the formula, not the number of different elements		1
(ii)	<b>M1</b> 56 <b>and</b> 32 <b>and</b> 16 used in calculation  <b>M2</b> 152	152 without working scores both marks  104 without working scores 1	2
(b) (i)	to increase the rate of reaction / to speed up the reaction	<b>ALLOW</b> make the reaction quicker/faster  <b>ALLOW</b> reference to more particles having the necessary activation energy  <b>IGNORE</b> reference to dissolving	1
(ii)	bubbles / fizzing / effervescence		1
(iii)	(squeaky) pop with burning /lit/lighted splint	<b>IGNORE</b> squeaky pop test without mention of burning/lit splint  <b>ALLOW</b> burns with a pop	1
(c) (i)	all of the (sulfuric) acid has reacted / the (sulfuric) acid has been used up / the acid is the limiting reagent	<b>REJECT</b> any reference to reactants used up or iron (filings) used up	1
(ii)	$\text{Fe} + \text{H}_2\text{SO}_4 \rightarrow \text{FeSO}_4 + \text{H}_2$	<b>ACCEPT</b> multiples and fractions  <b>IGNORE</b> state symbols, even if incorrect	1
<b>Total</b>			<b>8</b>

Question number	Answer	Additional guidance	Marks
3 (a)	<p><b>M1</b> acid - hydrochloric acid / HCl</p> <p><b>M2</b> alkali – sodium hydroxide / NaOH</p> <p>A description that makes reference to the following four points.</p>	<p><b>REJECT</b> hydrogen chloride /HCl(g)</p> <p><b>ALLOW</b> sodium carbonate</p> <p>If both name and formula given mark name only</p> <p><b>IGNORE</b> state symbols with NaOH even if incorrect</p>	2
(b)	<p><b>M1</b> add water (to dissolve the sodium chloride/salt)</p> <p><b>M2</b> warm / stir (to dissolve the sodium chloride/salt more quickly)</p> <p><b>M3</b> filter (to remove the glass / to separate the glass from the solution)</p> <p><b>M4</b> (heat/leave to) evaporate the water</p>	<p><b>ALLOW</b> decant / sieve</p> <p><b>ALLOW</b> heat/distil / boil to remove the water</p> <p><b>M2</b> dep on <b>M1</b> but <b>M3</b> and <b>M4</b> can still be awarded if <b>M1</b> is missing</p> <p><b>M4</b> dep on <b>M3</b></p>	4
<b>Total</b>			<b>6</b>

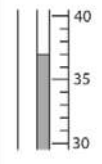
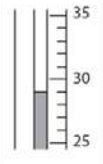
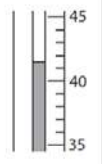
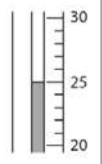
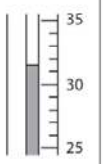
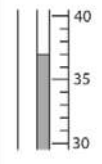
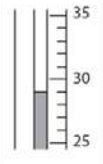
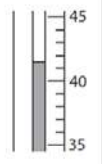
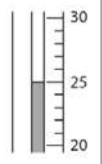
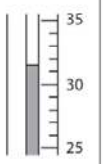
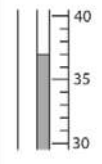
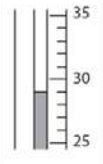
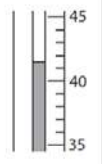
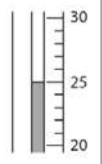
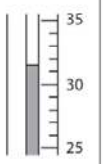
Question number	Answer	Additional guidance	Marks
4 (a) (i)	<p><b>M1</b> (a compound) containing hydrogen/H and carbon/C (atoms) (1)</p> <p><b>M2</b> only (1)</p>	<p><b>ACCEPT</b> molecule/substance for compound</p> <p><b>REJECT</b> element/mixture/atom for compound in <b>M1</b> only</p> <p><b>ACCEPT</b> alternatives for only, eg just</p> <p><b>M2</b> dep on mention of just H and C in <b>M1</b></p>	2
	(ii)	<b>ALLOW</b> upper case N or x in place of n	1
(b)	fractional distillation	<p><b>ALLOW</b> fractionation /fractionating</p> <p><b>REJECT</b> simple distillation</p> <p><b>IGNORE</b> distillation on its own</p>	1
(c)	<p>An explanation that links together the following two points:</p> <p><b>M1</b> carbon monoxide / CO</p> <p><b>M2</b> reduces the capacity of the blood/haemoglobin to carry oxygen / is poisonous /is toxic</p>	<p>If both name and formula given, both must be correct</p> <p><b>IGNORE</b> carbon oxide</p> <p><b>ACCEPT</b> combines with haemoglobin in preference to oxygen</p>	2

(d)	(i)	An explanation that links together any two of the following points:  <b>M1</b> (petrol) <u>vapour/gas/fumes</u> (produced)  <b>M2</b> diffuses (through the air)  <b>M3</b> (petrol) will ignite/catch fire/explode/ is flammable	<b>ALLOW</b> travels/moves/spreads for diffuses	2
	(ii)	petrol is more volatile	<b>ACCEPT</b> petrol evaporates more easily/more readily  <b>ACCEPT</b> petrol turns into a vapour/gas more easily/ more readily  <b>ALLOW</b> petrol is more flammable/catches fire more easily  <b>ACCEPT</b> reverse argument	1
			<b>Total</b>	<b>9</b>



Question number	Answer	Additional guidance	Marks
5 (a)	(i) red	<b>REJECT</b> brick-red / orange-red and all other colours	1
	(ii) Li <sup>+</sup>	<b>IGNORE</b> name even if incorrect	1
	(iii) An explanation that links the following two points  <b>M1</b> (litmus turns) blue  <b>M2</b> (because) hydroxide (ion) / OH <sup>-</sup> forms / solution is alkaline / an alkali	<b>REJECT</b> purple	2
(b)	(i) Any two from:  <b>M1</b> forms a ball  <b>M2</b> disappears / gets smaller  <b>M3</b> forms a white trail  <b>M4</b> bubbles/fizzes/effervescence	<b>ALLOW</b> melts  <b>ALLOW</b> dissolves  <b>IGNORE</b> hydrogen or gas given off/evolved/formed/produced	2
	(ii) $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + (1)\text{H}_2$	<b>ACCEPT</b> multiples and fractions  <b>IGNORE</b> state symbols, even if incorrect	1

Question number	Answer	Additional guidance	Marks
5 (c) (i)	Any one from:  <b>M1</b> burns / catches fire / (lilac/purple) flame produced  <b>M2</b> moves (around the surface) more quickly	<b>REJECT</b> any incorrect flame colour  <b>ALLOW</b> reacts more vigorously	1
	(ii)		1
(d)	An explanation that links together the following two points:  <b>M1</b> rubidium/it is below potassium (in Group 1)  <b>M2</b> and the reactivity (of the elements/metals) increases down the group/as the group is descended/as atomic number/ atomic mass increases	<b>ACCEPT</b> rubidium/it is lower down in the Periodic Table  <b>ACCEPT</b> rubidium/it has bigger atoms/more shells (of electrons)/more shielding  <b>ACCEPT</b> rubidium (atom)/it loses electrons more easily/readily  <b>ACCEPT</b> correct reverse argument	2
		<b>Total</b>	<b>11</b>

Question number	Answer	Additional guidance	Marks																		
6 (a)	<table border="1" data-bbox="405 268 1144 563"> <thead> <tr> <th></th> <th>aluminium</th> <th>iron</th> <th>magnesium</th> <th>silver</th> <th>zinc</th> </tr> </thead> <tbody> <tr> <td>Thermometer reading</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Highest temperature reached in °C</td> <td>37.0</td> <td>29.0</td> <td>41.5</td> <td>25.0</td> <td>31.5</td> </tr> </tbody> </table> <p data-bbox="389 603 656 671">all 4 correct 2 marks 2 or 3 correct 1 mark</p> <p data-bbox="248 715 1061 927">(b) (i) magnesium is the most reactive (metal/element used)  OR magnesium is higher in the reactivity series /more reactive than the other metals (used)</p> <p data-bbox="315 1007 1167 1294">(ii) An explanation that links together <b>two</b> of the following points:  <b>M1</b> silver/it does not react (with copper(II) sulfate solution)  <b>M2</b> silver/it is less reactive than copper / silver/it is below copper in the reactivity series  <b>M3</b> (and therefore silver/it) does not displace copper</p>		aluminium	iron	magnesium	silver	zinc	Thermometer reading						Highest temperature reached in °C	37.0	29.0	41.5	25.0	31.5	<p data-bbox="1205 603 1563 639">Penalise missing 0 once only</p> <p data-bbox="1205 715 1787 783"><b>ALLOW</b> references to generates more thermal energy/heat (energy)</p> <p data-bbox="1205 1150 1899 1187"><b>ALLOW</b> silver is the least reactive (metal /element used)</p> <p data-bbox="1205 1262 1697 1299"><b>ACCEPT</b> does not reduce copper(II) ions</p>	<p data-bbox="1989 304 2018 341">2</p> <p data-bbox="1989 715 2018 751">1</p> <p data-bbox="1989 1150 2018 1187">2</p>
	aluminium	iron	magnesium	silver	zinc																
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Highest temperature reached in °C	37.0	29.0	41.5	25.0	31.5																

Question number	Answer	Additional guidance	Marks
6 (c)	<p>An explanation that links together the following two points:</p> <p><b>M1</b> the temperature rise will be smaller (than with 25 cm<sup>3</sup>)</p> <p><b>M2</b> because the same amount of thermal energy/heat (energy) is being used to heat a larger volume of solution</p>	<p><b>ACCEPT</b> less than 16.5 (°C)</p> <p><b>ACCEPT</b> lower than the value given in the table in (a)</p> <p><b>ALLOW</b> as there is a larger volume of /a larger amount of /more solution to heat up</p> <p><b>M2</b> dep on <b>M1</b></p>	2
(d)	<p><b>M1</b> <math>Q = mc\Delta T</math></p> <p><b>M2</b> <math>45 \times 4.2 \times 15.0</math></p> <p><b>M3</b> = 2835 (J)</p> <p><b>M4</b> = 2.8(35) (kJ)</p>	<p><b>M2</b> subsumes <b>M1</b></p> <p><b>ALLOW</b> ECF for <b>M3</b> and <b>M4</b> on incorrect values in <b>M2</b></p> <p><b>ACCEPT</b> answers correctly rounded to two or more significant figures</p> <p>Correct answer without working scores 4</p> <p>2835, 2840, 2800 all score 3</p> <p><b>ALLOW</b> use of 4.18 which gives an answer of 2.8(215)</p>	4
<b>Total</b>			<b>11</b>

Question number	Answer	Additional guidance	Marks																
7 (a)	<table border="1"><thead><tr><th></th><th data-bbox="512 328 721 379">Ca<sup>2+</sup></th><th data-bbox="721 328 929 379">Al<sup>3+</sup></th><th data-bbox="929 328 1137 379">NH<sub>4</sub><sup>+</sup></th></tr></thead><tbody><tr><th data-bbox="405 379 512 430">F<sup>-</sup></th><td data-bbox="512 379 721 430">CaF<sub>2</sub></td><td data-bbox="721 379 929 430"></td><td data-bbox="929 379 1137 430"></td></tr><tr><th data-bbox="405 430 512 481">NO<sub>3</sub><sup>-</sup></th><td data-bbox="512 430 721 481"></td><td data-bbox="721 430 929 481">Al(NO<sub>3</sub>)<sub>3</sub></td><td data-bbox="929 430 1137 481"></td></tr><tr><th data-bbox="405 481 512 533">SO<sub>4</sub><sup>2-</sup></th><td data-bbox="512 481 721 533"></td><td data-bbox="721 481 929 533"></td><td data-bbox="929 481 1137 533">(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub></td></tr></tbody></table>		Ca <sup>2+</sup>	Al <sup>3+</sup>	NH <sub>4</sub> <sup>+</sup>	F <sup>-</sup>	CaF <sub>2</sub>			NO <sub>3</sub> <sup>-</sup>		Al(NO <sub>3</sub> ) <sub>3</sub>		SO <sub>4</sub> <sup>2-</sup>			(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>	<p>1 mark for each correct formula</p> <p>Penalise incorrect use of upper case and lower case letters, and incorrect use of subscripts once only</p> <p><b>ACCEPT</b> correct formulae including correct charges on the ions</p>	3
	Ca <sup>2+</sup>	Al <sup>3+</sup>	NH <sub>4</sub> <sup>+</sup>																
F <sup>-</sup>	CaF <sub>2</sub>																		
NO <sub>3</sub> <sup>-</sup>		Al(NO <sub>3</sub> ) <sub>3</sub>																	
SO <sub>4</sub> <sup>2-</sup>			(NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub>																

<p>(b)</p>	<p>An explanation that links together the following points:</p> <p><b>M1</b> the (electrostatic) forces (of attraction) between the aluminium ions and the fluoride ions / the oppositely charged ions in aluminium fluoride</p> <p><b>M2</b> are strong</p> <p><b>M3</b> the intermolecular forces/ forces (of attraction) between molecules in aluminium bromide</p> <p><b>M4</b> are weak</p> <p><b>M5</b> (therefore) more energy is required to overcome the forces /break the bonds in aluminium fluoride</p> <p><b>OR</b> (therefore) less energy is required to overcome the forces in aluminium bromide</p>	<p><b>M2</b> DEP on mention of correct forces (of attraction) in aluminium fluoride</p> <p><b>ACCEPT</b> (ionic) bonds (in aluminium fluoride) are strong as an alternative to <b>M1</b> and <b>M2</b> for 1 mark only</p> <p>No <b>M1</b> or <b>M2</b> if reference to covalent/metallic bonds or intermolecular forces in aluminium fluoride</p> <p><b>ALLOW</b> intermolecular bonds/ bonds between molecules / attraction between molecules</p> <p><b>M4</b> DEP on mention of correct forces (of attraction) in aluminium bromide</p> <p>No <b>M3</b> or <b>M4</b> if reference to weak covalent /metallic / ionic bonds in aluminium bromide</p> <p><b>ALLOW</b> heat as an alternative to energy</p> <p><b>REJECT</b> less energy is required to break the covalent bonds in aluminium bromide</p>	<p>5</p>
<b>Total</b>			<b>8</b>

