



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

Question number	Answer	Additional guidance	Marks
2 (a) (i)	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)	M1 56 and 32 and 16 used in calculation M2 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	ALLOW make the reaction quicker/faster ALLOW reference to more particles having the necessary activation energy IGNORE reference to dissolving	1
(ii)	bubbles / fizzing / effervescence		1
(iii)	(squeaky) pop with burning /lit/lighted splint	IGNORE squeaky pop test without mention of burning/lit splint ALLOW 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	REJECT any reference to reactants used up or iron (filings) used up	1
(ii)	$\text{Fe} + \text{H}_2\text{SO}_4 \rightarrow \text{FeSO}_4 + \text{H}_2$	ACCEPT multiples and fractions IGNORE state symbols, even if incorrect	1
		Total	8

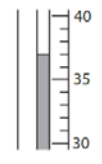
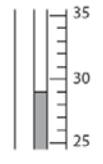
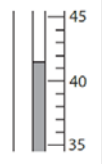
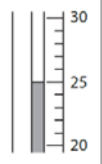
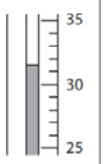
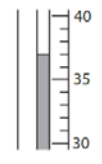
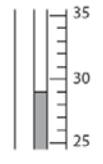
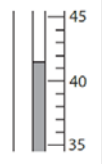
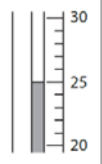
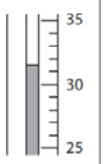
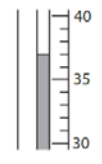
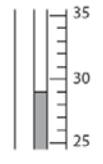
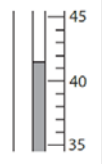
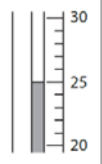
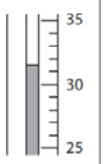
Question number	Answer	Additional guidance	Marks
3 (a)	<p>M1 acid - hydrochloric acid / HCl</p> <p>M2 alkali – sodium hydroxide / NaOH</p> <p>A description that makes reference to the following four points.</p>	<p>REJECT hydrogen chloride /HCl(g)</p> <p>ALLOW sodium carbonate</p> <p>If both name and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

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

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

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

Question number	Answer	Additional guidance	Marks
5 (c) (i)	Any one from: M1 burns / catches fire / (lilac/purple) flame produced M2 moves (around the surface) more quickly	REJECT any incorrect flame colour ALLOW reacts more vigorously	1
(ii)	Any number or range of numbers between 8 and 14 inclusive		1
(d)	An explanation that links together the following two points: M1 rubidium/it is below potassium (in Group 1) M2 and the reactivity (of the elements/metals) increases down the group/as the group is descended/as atomic number/ atomic mass increases	ACCEPT rubidium/it is lower down in the Periodic Table ACCEPT rubidium/it has bigger atoms/more shells (of electrons)/more shielding ACCEPT rubidium (atom)/it loses electrons more easily/readily ACCEPT correct reverse argument	2
		Total	11

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="394 608 651 671">all 4 correct 2 marks 2 or 3 correct 1 mark</p> <p data-bbox="248 715 1061 746">(b) (i) magnesium is the most reactive (metal/element used)</p> <p data-bbox="394 791 434 815">OR</p> <p data-bbox="394 863 1120 927">magnesium is higher in the reactivity series /more reactive than the other metals (used)</p> <p data-bbox="315 1010 1164 1042">(ii) An explanation that links together two of the following points:</p> <p data-bbox="394 1082 1120 1114">M1 silver/it does not react (with copper(II) sulfate solution)</p> <p data-bbox="394 1153 1106 1217">M2 silver/it is less reactive than copper / silver/it is below copper in the reactivity series</p> <p data-bbox="394 1265 1055 1297">M3 (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 608 1559 639">Penalise missing 0 once only</p> <p data-bbox="1205 715 1783 778">ALLOW references to generates more thermal energy/heat (energy)</p> <p data-bbox="1205 1153 1899 1185">ALLOW silver is the least reactive (metal /element used)</p> <p data-bbox="1205 1265 1697 1297">ACCEPT does not reduce copper(II) ions</p>	<p data-bbox="1989 312 2011 336">2</p> <p data-bbox="1989 715 2011 738">1</p> <p data-bbox="1989 1153 2011 1177">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>M1 the temperature rise will be smaller (than with 25 cm³)</p> <p>M2 because the same amount of thermal energy/heat (energy) is being used to heat a larger volume of solution</p>	<p>ACCEPT less than 16.5 (°C)</p> <p>ACCEPT lower than the value given in the table in (a)</p> <p>ALLOW as there is a larger volume of /a larger amount of /more solution to heat up</p> <p>M2 dep on M1</p>	2
(d)	<p>M1 $Q = mc\Delta T$</p> <p>M2 $45 \times 4.2 \times 15.0$</p> <p>M3 = 2835 (J)</p> <p>M4 = 2.8(35) (kJ)</p>	<p>M2 subsumes M1</p> <p>ALLOW ECF for M3 and M4 on incorrect values in M2</p> <p>ACCEPT 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>ALLOW use of 4.18 which gives an answer of 2.8(215)</p>	4
Total			11

Question number	Answer	Additional guidance	Marks																
7 (a)	<table border="1" data-bbox="405 328 1137 539"> <thead> <tr> <th></th> <th>Ca²⁺</th> <th>Al³⁺</th> <th>NH₄⁺</th> </tr> </thead> <tbody> <tr> <th>F⁻</th> <td>CaF₂</td> <td></td> <td></td> </tr> <tr> <th>NO₃⁻</th> <td></td> <td>Al(NO₃)₃</td> <td></td> </tr> <tr> <th>SO₄²⁻</th> <td></td> <td></td> <td>(NH₄)₂SO₄</td> </tr> </tbody> </table>		Ca ²⁺	Al ³⁺	NH ₄ ⁺	F ⁻	CaF ₂			NO ₃ ⁻		Al(NO ₃) ₃		SO ₄ ²⁻			(NH ₄) ₂ SO ₄	<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>ACCEPT correct formulae including correct charges on the ions</p>	3
	Ca ²⁺	Al ³⁺	NH ₄ ⁺																
F ⁻	CaF ₂																		
NO ₃ ⁻		Al(NO ₃) ₃																	
SO ₄ ²⁻			(NH ₄) ₂ SO ₄																

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

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