Mark Scheme (Results)

Pearson Edexcel

Additional Sample Assessment Materials GCSE 9-1
Paper 1
Chemistry 1CH0/1H

First examination 2017

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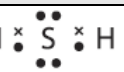
Summer 2017

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.

Pearson Edexcel Leve1 1/Level 2 GCSE (9-1) in Chemistry

Paper 1CH0/1H – Mark scheme

Question number	Answer	Mark
1(a)(i)	**B** 	**(1)**

Question number	Answer	Mark
1(a)(ii)	**C** low low poor conductor	**(1)**

Question number	Answer	Mark
1(b)(i)	(formula showing) simplest ratio of atoms (of each element in a substance)	**(1)**

Question number	Answer	Additional guidance	Mark
1(b)(ii)	no. S atoms : no. F atoms = $\frac{4.8}{32}$ (0.15) : $\frac{17.1}{19}$ (0.9) (1) = $\frac{0.15}{0.15}$ (1) : $\frac{0.9}{0.15}$ (6) (1) empirical formula SF_6 (1)	correct formula with no working scores 1	**(3)**

Question number	Answer	Additional guidance	Mark
1(c)	relative formula mass SO_2 =32.0 + (2x16.0) = 64.0 (1) amount of SO_2 = $\frac{48.0}{64.0}$ (1) number of molecules = $\frac{48.0}{64.0}$ x 6.02×10^{23} = 4.52×10^{23} (1)	4.52×10^{23} without working – 3 marks	**(3)**

(Total for question 1 = 9 marks)

Question Number	Answer	Mark
2(a)	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark) • high density (1) • (so that) Bunsen does not tip over (1)	**(2)**

Question Number	Answer	Mark
2(b)	**C** oxidised	**(1)**

Question Number	Answer	Mark
2(c)	An explanation that combines identification - knowledge (1 mark) and reasoning/justification - understanding (1 mark): • magnesium more reactive (than iron in steel) (1) • magnesium has a greater tendency to form ions/reacts instead of the iron (1)	**(2)**

Question Number	Answer	Additional guidance	Mark
2(d)	An explanation linking any three of ALUMINIUM/ PURE METAL • atoms/ions/ particles all the same size (1) • {atoms/ions/layers/sheets/rows} {slide/slip/move} over each other easily (1) ALLOY • added atoms are different size/ {atoms/ions} in an alloy have different sizes (1) • layers disrupted and cannot easily slide over each other (1)	marks can be obtained from **labels** on diagrams <u>that equate to the marking points</u> **Ignore** different shape	**(3)**

(Total for question 2 = 8 marks)

Question Number	Answer	Mark
3(a)	An answer that combines three of the following points of application of knowledge and understanding to provide a logical description • add some ammonia solution/ hydrochloric acid (to a beaker/flask) (1) • add an indicator (1) • add the other reagent until the indicator just changes colour (1) • repeat using same volumes but without indicator (to obtain pure solution) (1)	**(3)**

Question Number	Answer	Mark
3(b)	• 17.73/24.60 (0.7207) (1) • (17.73/24.60) x 100 (72.07) (1) • = 72.1% (1)	**(3)**

Question Number	Answer	Mark
3(c)	An explanation that combines identification - knowledge (1 mark) and reasoning/justification - understanding (2 marks) • rate increased / time to reach equilibrium reduced (1) • (because) gas molecules closer together (1) • (so) increased collision rate / more frequent collisions (1)	**(3)**

(Total for question 3 = 9 marks)

Question Number	Answer	Additional guidance	Mark
4(a)(i)	**C** neutral (1)		**(1)**

Question Number	Answer	Mark
4(a)(ii)	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark) • to react all the (nitric) acid in the solution (1) • so that the calcium nitrate solution is pure (1)	**(2)**

Question Number	Answer	Mark
4(a)(iii)	$CaCO_3 + 2HNO_3 \rightarrow Ca(NO_3)_2 + H_2O + CO_2$ (3) left hand side formulae (1) right hand side formulae (1) balancing correct formulae (1)	**(3)**

Question Number	Answer	Mark
4(b)	• Ca^{2+} (1) • NO_3^- (1)	**(2)**

Question Number	Answer	Mark
4(c)	{sodium/ potassium / ammonium} carbonate (solution) / any soluble sulfate (solution) / sulfuric acid	**(1)**

(Total for question 4 = 9 marks)

Question Number	Answer	Mark
5(a)(i)	chlorine (1)	**(1)**

Question Number	Answer	Mark
5(a)(ii)	A description to include • lighted splint / ignite gas (1) • gas burns / (squeaky) pop (if air is present) (1)	**(2)**

Question Number	Answer	Mark
5(b)	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark): • sodium and chloride ions present (1) • these ions can move (in solution) (1)	**(2)**

Question Number	Answer	Mark
5(c)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (1 mark) • solution is alkaline (1) • excess hydroxide ions are present / sodium and hydroxide ions in solution / sodium hydroxide solution formed (1)	**(2)**

Question Number	Answer	Mark
5(d)	$2H^+ + 2e \rightarrow H_2$ (2) correct species (1) balancing of correct species (1)	**(2)**

(Total for question 5 = 9 marks)

Question Number	Answer	Mark
6(a)(i)	pipette	**(1)**

Question Number	Answer	Mark
6(a)(ii)	• name of indicator: suitable indicator e.g. methyl orange / phenolphthalein (1) • colour change: correct colour change of indicator eg yellow to orange / pink (magenta) to colourless (1)	**(2)**

Question Number	Answer	Additional guidance	Mark
6(a)(iii)	• swirl flask (1) • add acid drop by drop near end point (1)	allow any suitable practical technique that improves the accuracy	**(2)**

Question Number	Answer	Mark
6(b)	amount of sodium hydroxide = $\frac{25.00 \times 0.50}{1000}$ (1) amount of hydrochloric acid = amount of sodium hydroxide (1) $= \frac{25.00 \times 0.50}{1000}$ concentration of hydrochloric acid = $\frac{25.00 \times 0.50 \times 1000}{1000 \times 22.85}$ (1) = 0.547 (mol dm^{-3}) (3 sf) (1) **OR** 25.00 x 0.50 = conc HCl x 22.85 (2) conc HCl = $\frac{25.00 \times 0.50}{22.85}$ (1) = 0.547 (mol dm^{-3}) (3 sf) (1)	**(4)**

Question Number	Answer	Mark
6(c)	relative formula mass KOH = 39+16+1 (=56) (1) concentration = 0.625 x 56 (= 35 g dm^{-3}) (1)	**(2)**

(Total for question 6 = 11 marks)

Question Number	Answer	Mark
7(a)	**B** 2.8.8.2 (1)	**(1)**

Question Number	Answer	Mark
7(b)	element on left hand side of periodic table (1)	**(1)**

Question Number	Answer	Mark
7(c)	An explanation that combines identification via a judgment (1 mark) to reach a conclusion via justification/reasoning (2 marks) • (lattice of) positive ions in a sea of electrons (1) • strong forces of attraction (between metal ions and electrons) (1) • therefore large amount of heat energy needed to melt (1)	**(3)**

Question Number	Answer	Mark
7(d)(i)	<table><tr><th>isotope</th><th>mass number</th><th>number of protons</th><th>number of neutrons</th></tr><tr><td>magnesium-24</td><td>24</td><td>12</td><td>12</td></tr><tr><td>magnesium-25</td><td>25</td><td>12</td><td>13</td></tr><tr><td>magnesium-26</td><td>26</td><td>12</td><td>14</td></tr></table> all four numbers correct (2) any two numbers correct (1)	**(2)**

Question Number	Answer	Mark
7(d)(ii)	total mass of Mg-24 atoms = 78.60 x 24 = 1886.4 total mass of Mg-25 atoms = 10.11 x 25 = 252.75 total mass of Mg-26 atoms = 11.29 x 26 = 293.54 mass of 100 atoms = (78.60 x 24) + (10.11 x 25) + (11.29 x 26) (1) relative atomic mass = $\frac{(78.60 \times 24) + (10.11 \times 25) + (11.29 \times 26)}{100}$ (1) = 24.3 (2) allow (1) only for any other number of significant figures	**(4)**

(Total for question 7 = 11 marks)

Question Number	Answer	Mark
8(a)(i)	An explanation that combines identification - knowledge (1 mark) and reasoning/justification - understanding (1 mark) • allow air/oxygen to enter (1) • (so) more magnesium reacts (1)	**(2)**

Question Number	Answer	Mark
8(a)(ii)	**C** 0.36 0.56 0.20	**(1)**

Question Number	Answer	Mark
8(a)(iii)	An explanation that combines identification - improvement of the experimental procedure (1 mark) and justification/reasoning which must be linked to the improvement (1 mark) • reheat the crucible and contents (1) • redetermine the mass / mass is constant (1)	**(2)**

Question Number	Indicative content	Mark
***8(b)**	An explanation that combines identification - knowledge (3 marks) and reasoning/justification - understanding (3 marks) • each magnesium atom loses electrons • two (electrons) • to form magnesium cation / Mg^{2+} • $Mg \rightarrow Mg^{2+} + 2e^{(-)}$ • electrons transferred from magnesium atoms to oxygen atoms • each oxygen atom gains electrons • two (electrons) • to form oxide anion / O^{2-} • $O + 2e^{(-)} \rightarrow O^{2-}$ • ionic bonds form • (ionic bonds form) between oppositely charged ions • strong electrostatic forces • between oppositely charged ions • regular arrangement of ions / lattice structure • require large amounts of energy to separate (hence high melting point)	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3-4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)
Level 3	5-6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

(Total for question 8 = 11 marks)

Question Number	Answer	Mark
9(a)	**D** calcium carbonate (1)	**(1)**

Question Number	Answer	Mark
9(b)	180 g glucose produces 2 x 24 dm^3 carbon dioxide (1) 75 kg glucose produces 2 x 24 x $\frac{75000}{180}$ dm^3 carbon dioxide (1) = 20000 dm^3 (1)	**(3)**

Question Number	Answer	Mark
9(c)	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark) • water (vapour) is in excess (1) • same volume of product formed because same volume of ethene reacts (1)	**(2)**

Question Number	Indicative content	Mark
***9(d)**	An explanation that combines identification via a judgment (3 marks) to reach a conclusion via justification/reasoning (3 marks) • raw materials: fermentation uses plants which can be regrown / hydration uses crude oil which is finite resource • temperature: fermentation low therefore low energy cost / hydration high therefore high energy cost • atom economy: fermentation lower /hydration of ethene 100% • production rate: fermentation slow / hydration fast • purification: fermentation needs energy for fractional distillation / hydration product pure • carbon dioxide produced by fermentation could be useful product • high pressure needed for hydration means more expensive plant	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	• Deconstructs scientific information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. • Judgements are supported by limited evidence. (AO3)
Level 2	3-4	• Deconstructs scientific information and provides some logical connections between scientific concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently. • Judgements are supported by evidence occasionally. (AO3)
Level 3	5-6	• Deconstructs scientific information and provide logical connections between scientific concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently. • Judgements are supported by evidence throughout. (AO3)

(Total for question 9 = 12 marks)

Question Number	Answer	Mark
10(a)	An answer that combines knowledge (1 mark) and understanding (2 marks) to provide a logical description • use of a pH (probe and) meter / suitable universal indicator paper (1) • (after each addition of calcium oxide) stir (1) • record pH after each addition (1)	**(3)**

Question Number	Answer	Mark
10(b)	$H^+ + OH^- \rightarrow H_2O$ (2) left hand side (1) right hand side (1)	**(2)**

Question Number	Answer	Mark
10(c)	An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark) • acid is diluted 10 times (1) • causes increase in pH by 1 / pH of diluted solution is 2 (1)	**(2)**

Question Number	Answer	Mark
10(d)	An explanation that combines identification - application of knowledge (2 marks) and reasoning/justification - application of understanding (2 marks) • hydrochloric acid is (almost) fully dissociated into ions (1) • ethanoic acid is only slightly dissociated into ions (1) • but the concentration of acid in the hydrochloric acid is lower (1) • so the concentration of hydrogen ions in the hydrochloric acid is lower (1)	**(4)**

(Total for question 10 = 11 marks)