Mark Scheme (Results)

Summer 2017

Pearson Edexcel GCSE
In Chemistry (5CH2H) Paper 01

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Summer 2017
Publications Code 5CH2H_01_1706_MS

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	Acceptable answers	Marks
1 (a)	A description linking a reaction that {takes in/absorbs} energy (1) {heat/thermal} (energy) (1)	second mark is dependent on first. less energy is given out making bonds than is taken in to break bonds (2)	**(2)**

Question number	Answer	Acceptable answers	Marks
1 (b)	An explanation linking two of the following • the products have less energy than the reactants / ORA (1) • reaction gives out heat (energy)/heat (energy) has been lost from reaction (1) • it is an exothermic reaction (1)	more energy is given out making bonds than is needed to break bonds (1)	**(2)**

Question number	Answer	Acceptable answers	Marks
1 (c) (i)	any three from larger surface area/use magnesium powder (1) higher temperature (1)	 Allow increased {mass/amount} of magnesium allow increase heat / heat the acid allow add a catalyst ignore increase volume of acid ignore increase concentration of acid ignore surface area alone ignore temperature alone ignore stirring	**(2)**

Question number	Answer	Acceptable answers	Marks
1 (c) (ii)	An explanation linking • more particles (of acid in same volume) (1) • more frequent collisions (1)	 allow ions/molecules/atoms allow more collisions per second ignore more chance of collisions ignore more successful collisions ignore more collisions alone Max 1 mark if answer refers to energy/particle speed	**(2)**

(Total for Question 1 = 8 marks)

Question number	Answer	Marks
2 (a) (i)	**C** $Al_2(SO_4)_3$ **The only correct answer is C** **A** is not correct because the charges would not balance correctly **B** is not correct because the charges would not balance correctly **D** is not correct because the charges would not balance correctly	**(1)**

Question number	Answer	Acceptable answers	Marks
2 (a) (ii)	(dilute) hydrochloric acid (1) barium chloride (solution) (1)	allow nitric acid allow barium nitrate (solution) allow solutions in either order allow correct formulae allow lead nitrate (solution) if no acid (1) or with nitric acid (2)	**(2)**

Question number	Answer	Marks
2 (b)	**C** lead sulfate **The only correct answer is C** **A** is not correct because ammonium carbonate is soluble **B** is not correct because all nitrates are soluble **D** is not correct because potassium hydroxide is soluble	**(1)**

Question number	Answer	Acceptable answers	Marks
2 (c)	• calcium (atom) loses 2 electrons (1) • (calcium) forms Ca^{2+} (1) • oxygen (atom) gains 2 electrons (1) • (oxygen) forms O^{2-} (1)	allow calcium becomes 2.8.8 allow oxygen becomes 2.8 full marks can be awarded for diagrams any mention of sharing electrons / covalent bonding – max 2 marks	**(4)**

(Total for Question 2 = 8 marks)

Question number	Answer	Marks
3 (a)	**B** chromium, Cr **The only correct answer is B** **A** is not correct because gallium is not a transition metal **C** is not correct because strontium is an alkaline earth metal **D** is not correct because sodium is an alkali metal	**(1)**

Question number	Answer	Acceptable answers	Marks
3 (b)	An explanation linking three of • increasing {size of atom / number of shells /atomic radius } (1) • (so) increased shielding (of outer electron/shell from nucleus) (1) • (so) outer {electron/shell} further from nucleus (1) • so less attraction for outer {electron/shell} (1) • therefore outer <u>electron</u> lost more easily (1)	ignore more outer shells Allow reverse argument throughout for lithium	**(3)**

Question number	Answer	Acceptable answers	Marks
3 (c)	$2K + 2H_2O \rightarrow 2KOH + H_2$ (3) LHS (1) RHS (1) balancing of correct formulae (1)	allow multiples allow KHO ignore state symbols	**(3)**

Question number	Answer	Marks
3 (d)	**C** $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$ **The only correct answer is C** **A** is not correct because chlorine is not given as a molecule **B** is not correct because the equation is not balanced **D** is not correct because bromine is not given as a molecule	**(1)**

Question number	Answer	Acceptable answers	Marks
3 (e)	An explanation linking EITHER • argon is in {unreactive/inert/a noble gas/in group 0 /in group 8} (1) • so {does not react/prevent oxygen reacting} with (hot) filament (1) OR • argon is very unreactive/inert (1) • stops the filament {reacting with oxygen in the air /being oxidised} (1) OR • oxygen in the air would react with the (hot) filament (1) • the (hot) filament {is oxidised / forms an oxide} (1)	allow group 18 allow does not {gain/lose share electrons} allow argon has a full outer shell allow metal/wire for filament throughout	**(2)**

(Total for Question 3 = 10 marks)

Question number	Answer	Acceptable answers	Marks
4 (a) (i)	$CuCl_2 + 2KOH \rightarrow Cu(OH)_2 + 2KCl$ LHS (1) RHS (1) balancing of correct formulae (1)	allow multiples ignore state symbols	**(3)**

Question number	Answer	Marks
4 (a) (ii)	D (s) **The only correct answer is D** **A** is not correct because the state symbol for a precipitate is not aqueous **B** is not correct because the state symbol for a precipitate is not gas **C** is not correct because the state symbol for a precipitate is not liquid	**(1)**

Question number	Answer	Marks
4 (b)	C 97.5 **The only correct answer is C** **A** is not correct because the hydroxide group has not been doubled **B** is not correct because the hydrogen has been doubled but not the oxygen **D** is not correct because the whole formula has been doubled	**(1)**

Question number	Answer	Acceptable answers	Marks
4 (c)	$\frac{12.7}{63.5}$ = (0.2) **and** $\frac{3.2}{32}$ = (0.1) (1) 2 : 1 (1) Cu_2S (1)	reject $\frac{63.5}{12.7}$ = 5 and $\frac{32}{3.2}$ = 10 allow ECF allow Cu_2S with incorrect or no working (1) allow SCu_2	**(3)**

Question number	Answer	Acceptable answers	Marks
4 (d)	25.4 g copper = $\frac{25.4 \times 159}{127}$ = (31.8) (2) OR 25.4 g copper give = $\frac{25.4 \times 79.5}{63.5}$ = (31.8) (2) $\frac{159}{127}$ = (1.2519) (1) x 25.4 = (31.8) (1) OR $\frac{79.5}{63.5}$ = (1.2519) (1) x 25.4 = (31.8) (1)	31.8 / 31.75 alone gains 2 marks allow working using moles $\frac{25.4}{63.5}$ = (0.4) (1) 0.4 x 79.5 = (31.8) (1) OR $\frac{25.4}{127}$ = (0.2) (1) 0.2 x 159 = (31.8) (1) If no other mark scored allow {2 x 63.5 g / 127} copper gives {2 x 79.5 g /159} copper oxide (1)	**(2)**

(Total for Question 4 = 10 marks)

Question number	Answer	Marks
5 (a)	**C 1 +1** **The only correct answer is C** **A** is not correct because the relative mass and charge of the proton is wrong **B** is not correct because relative charge of the proton is wrong **D** is not correct because mass of proton is wrong	**(1)**

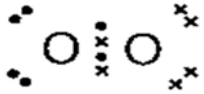
Question number	Answer	Marks
5 (b)	**B** sulfur S **The only correct answer is B** **A** is not correct because oxygen has 8 protons. **C** is not correct because cadmium has 48 protons **D** is not correct because titanium has 22 protons.	**(1)**

Question number	Answer	Acceptable answers	Marks
5 (c)	An explanation linking • group 5 (1) • five electrons in the <u>outer</u> shell (1) and • period 3 (1) • three shells of electrons (1)	ignore three outer shells allow energy levels for shells	**(4)**

Question Number		Indicative Content	Mark
QWC	***5d**	An explanation to include some of the following points neon-22 has • 10 protons • 12 neutrons • 10 electrons • protons and neutrons in nucleus • electrons surround nucleus • electrons in shells/energy levels/2.8 • same number of • protons and electrons • different number of neutrons relative atomic mass • is the average mass of an atom in the sample / represents (a weighted mean of) a mixture of the two isotopes • more neon-20 than neon-22 • neon-20 less mass than neon-22 • (therefore) relative atomic mass closer to -20 • 20 x 90 (=1800) • 22 x 10 (=220) • $\frac{1800 + 220}{100}$ (=20.2)	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation of the structure of neon-22 • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple discussion of EITHER the structure of neon-22 and a qualitative treatment of the relative atomic mass OR a quantitative treatment of relative atomic mass of the sample OR a detailed discussion of the structure of the atom. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation of why the relative atomic mass is 20.2 and a description of the atomic structure of neon 22 OR a qualitative discussion of why the relative atomic mass is 20.2 and a detailed discussion of the atomic structure. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 5 = 12 marks)

Question number	Answer	Acceptable answers	Marks
6 (a)	An explanation linking the following point {delocalised / free / sea of } electrons (1) electrons move/flow (through metal) (1)	 reject ions/molecules/atoms ignore electricity flows ignore electrons carry the current	**(2)**

Question number	Answer	Acceptable answers	Marks
6 (b)	 double bond (1) rest of molecule correct (1)	ignore inner shell(s) of electrons allow dots or crosses or a mixture of both second mark is dependent on first.	**(2)**

Question number	Answer	Acceptable answers	Marks
6 (c)	An explanation linking • strong {electrostatic attractions / electrostatic forces / bonds} between ions (1) • large amount of {heat/energy} needed to break bonds (1)	any reference to molecules/atoms/covalent/intermolecular forces scores 0 allow electrostatic attractions for bonds	**(2)**

Question Number		Indicative Content	Mark
QWC	***6d**	An explanation to include some of the following points graphite • giant molecular covalent structure • atoms in layers • strong bonds between atoms in layers • each carbon bonded to three others in layer • weak forces between layers • layers can slide – so can act as a lubricant • {delocalised / free} electrons between layers • {delocalised / free} electrons can move – so can conduct electricity • unreactive • high melting point diamond • giant molecular covalent structure • each carbon atom bonded to four others • strong bonds between atoms • to break a sample many bonds need to be broken • needs high amount of energy – so strong structure (for cutting tools)	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation e.g. a description of the structure of graphite or diamond • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• ☐a simple explanation of the structure of diamond and graphite OR a detailed description of the structure of diamond and how it is related to its use OR a detailed description of the structure of graphite and how it is related to its use • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• a detailed explanation of the structure of diamond and graphite related to their uses • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(Total for Question 6 = 12 marks)

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