



Mark Scheme (Results)

Summer 2024

Pearson Edexcel International GCSE
In Chemistry (4CH1) Paper 2C

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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	Notes	Marks
1 (a) (i)	sulfur	ALLOW S	1
(ii)	beryllium	ALLOW Be	1
(iii)	boron	ALLOW B	1
(iv)	2,8,4 / 2.8.4	ACCEPT diagram showing electron configuration	1
(b)	An explanation that links the following three points M1 the outer shell is further from the nucleus in sodium/sodium has more shells/sodium has a larger atomic radius ORA M2 there is less attraction to the nucleus for the outer electron/outer shell in sodium ORA M3 so the (outer) electron is more easily lost ORA	ALLOW a sodium atom is larger than a lithium atom ALLOW Li 2,1 Na 2,8,1 ALLOW there is more shielding in sodium ORA IGNORE electrons (plural) in M1 and M2 but do not allow electrons in M3	3
			Total 7

Question number	Answer	Notes	Marks
2 (a) (i)	M1 oxygen M2 water	ALLOW air /O ₂ ALLOW moisture / water vapour /H ₂ O	2
(ii)	painting/oiling/coating with plastic/galvanising /electroplating /waxing /greasing	REJECT sacrificial protection	1
(b)	An explanation that links the following two points M1 a more reactive metal is connected to/coated on the iron OWTTE M2 the more reactive metal will react /oxidise /corrode instead of iron	ACCEPT a suitable metal, e.g. zinc/magnesium /aluminium IGNORE an element REJECT a more reactive metal rusts instead of iron	2
			Total 5

Question number	Answer	Notes	Marks
3 (a)	M1 (A) refinery gases M2 (F) bitumen		2
(b) (i)	aircraft fuel		1
(ii)	A description that refers to three of the following points M1 crude oil is heated/vaporised M2 (the vapour) passes into/rises up the (fractionating) column / chamber OWTTE M3 the kerosene /the fraction is tapped off/removed at its boiling point range /condenses and removed	IGNORE evaporated ALLOW kerosene/the fraction is removed at the 3 rd or 4th level	3
(c) (i)	M1 silica/alumina M2 any value or range between 600 and 700 (°C) inclusive	ALLOW silicon dioxide/SiO ₂ /aluminium oxide /Al ₂ O ₃ /zeolites /aluminosilicates	2
(ii)	An explanation that links three of the following points M1 there is a surplus supply of / less demand for larger fractions /molecules/hydrocarbons OR there is not enough supply / greater demand for smaller fractions/molecules /hydrocarbons M2 alkenes are produced which are needed to make polymers M3 smaller fractions /alkanes /molecules /hydrocarbons are needed for petrol	ALLOW plastics / to make ethanol ALLOW gasoline / fuel for cars	3
			Total 11

Question number	Answer	Notes	Marks
4 (a) (i)	M1 all points plotted correctly to the nearest + or - half a small square for KNO_3 M2 all points plotted correctly to the nearest + or - half a small square for NaNO_3		2
(ii)	M1 smooth curve of best fit for KNO_3 M2 smooth curve of best fit for NaNO_3	If KNO_3 and NaNO_3 are not labelled or labelled incorrectly lose 1 mark if curves are correct but allow ECF for (c) and (d) if the curves are the wrong way round	2
(b)	temperature where their lines cross (expected value approximately 68°C)		1
(c)	M1 mass at 30°C read from graph (expected value approximately 24 g) M2 4 x answer to M1 (expected value approximately 96 g)		2
(d)	M1 mass at 50°C read from graph (expected value approximately 21 g) M2 mass at 20°C read from graph (expected value approximately 8 g) M3 M1 – M2 (expected value approximately 13 g)	Need to show working on the graph for M1 and M2 to score but allow M3 for M1 - M2	3
			Total 10

Question number	Answer	Notes	Marks
5 (a)	Any two from M1 same general formula M2 same functional group M3 similar chemical properties /characteristics M4 trend in physical properties /characteristics M5 consecutive members differ by a CH ₂ group	IGNORE same chemical properties accept any trend in specified physical property	2
(b) (i)	H ₂ SO ₄		1
(ii)	M1 (from) orange M2 (to) green	must be in the correct order	2
(iii)	M1 (methanol) H H – C – O – H H M2 (methanoic acid) O H – C – O – H	Penalise once only if O – H bond not shown and both structures correct	2
(c)	CH ₃ OH + HCOOH → HCOOCH ₃ + H ₂ O	ALLOW multiples ALLOW CH ₃ OOCH IGNORE state symbols even if incorrect REJECT CH ₃ COOH and C ₂ H ₄ O ₂	1
(d) (i)	A (butyl ethanoate) B butyl methanoate is not the correct name of the ester CH ₃ COOCH ₂ CH ₂ CH ₂ CH ₃ C ethyl butanoate is not the correct name of the ester CH ₃ COOCH ₂ CH ₂ CH ₂ CH ₃ D methyl butanoate is not the correct name of the ester CH ₃ COOCH ₂ CH ₂ CH ₂ CH ₃		1
(ii)	C ₆ H ₁₂ O ₂	ALLOW symbols in any order	1
			Total 10

Question number	Answer	Notes	Marks
6 (a)	A description that refers to the following three points M1 filter (the mixture) M2 wash (the precipitate/solid/lead(II) bromide with distilled water) M3 suitable drying method	e.g. dry with filter paper /leave to dry/dry in a desiccator/dry in an oven REJECT M3 if they attempt to crystallise the filtrate If any attempt to evaporate the solution allow MAX 1	3
(b) (i)	$2(.0) \times 0.025 = 0.05(0)$ (mol) OR $\frac{2(.0) \times 25}{1000} = 0.05(0)$ (mol)	ACCEPT $25 \div 1000 = 0.025$ $0.05 \div 0.025 = 2$ All working must be shown to gain full marks	1
(ii)	M1 $(n \text{ PbBr}_2) = 0.05(0) \div 2 = 0.025$ M2 $0.025 \times 367 = 9.175$ (g) OR M1 $0.05 \times 367 = 18.35$ (g) M2 $18.35 \div 2 = 9.175$ (g)	ALLOW $2:1 = 0.05:0.025$ ACCEPT 9.18/9.2/9 (g) ACCEPT 9.18/9.2/9 (g) All working must be shown to gain full marks	2
(c) (i)	An explanation that links the following three points M1 when solid the ions are in fixed positions/in a lattice M2 so there are no ions/electrons/charged particles free to move M3 (when molten) the ions are free to move so can conduct electricity/carry a current	IGNORE carry charge REJECT solution for M3 REJECT electrons moving /delocalised electrons for M3	3

	(ii) An explanation that links the following two points M1 graphite M2 resistance to high temperature /has a high melting point	IGNORE carbon ALLOW platinum ALLOW conducts electricity / doesn't react with product /is inert M2 dependent on graphite /carbon /a transition metal	2
	(iii) $\text{Pb}^{2+} + 2\text{e}^{(-)} \rightarrow \text{Pb}$	ACCEPT multiples IGNORE state symbols even if incorrect	1
(d)	(i) brown vapour/gas/fumes	ALLOW red-brown vapour/gas/fumes REJECT orange/orange-brown/red alone	1
	(ii) bromide (ions)/Br^- loses electrons	ALLOW electrons are lost REJECT bromine loses electrons	1
			Total 14

Question number	Answer	Notes	Marks
7 (a)	M1 (electrostatic) attraction between nuclei (of both atoms) M2 and a shared/bonding pair of electrons OR M1 (electrostatic) attraction between a shared/bonding pair of electrons M2 and nuclei (of both atoms)	nuclei must be plural nuclei must be plural	2
(b)	An explanation that links the following four points M1 (in the organic solvent) litmus paper stays blue/has no change M2 because there are no (H⁺) ions/ the solution is not acidic /does not dissociate in an organic solvent M3 (in the aqueous solution) litmus paper turns red M4 because H⁺ ions are formed/hydrochloric acid forms	No M1 or M2 if litmus paper turns red REJECT M3 if litmus is bleached or turns white M4 dep on litmus turning red initially	4
(c) (i)	M1 reactants bond energy = 436 + 242 OR 678 (kJ) M2 products bond energy = 2 x 431 OR 862 (kJ) M3 – 184 (kJ/mol)	correct answer – 184 with or without working scores 3 (+)184 scores 2 ALLOW ecf on incorrect values on M1 and/or M2	3
(ii)	M1 show correct positions of horizontal lines and activation energy hump M2 correct labelling of (reactants) H₂ + Cl₂ and (products) 2HCl M3 vertical line in correct position labelled ΔH	ALLOW ecf if positive answer in (i) M3 REJECT arrow pointing down ACCEPT arrow pointing down or double headed arrow REJECT arrow pointing up	4

	M4 vertical line in correct position labelled E_a or activation energy	ACCEPT arrow pointing up or double headed arrow REJECT arrow pointing down	Total 13
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