Mark Scheme (Results)

Summer 2025

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

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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)	helium and neon	both are required for the mark	1
		(ii)	oxygen	ACCEPT O_2	1
		(iii)	carbon dioxide	ACCEPT CO_2	1
		(iv)	carbon monoxide	ACCEPT CO	1
	(b)		M1 (bubble the gas through) limewater M2 which turns (from colourless to) cloudy/milky	M2 dependent on M1 ALLOW white precipitate	2
					Total = 6

Question number	Answer	Notes	Marks
2 (a)	(fractional) distillation		1
(b)	(surfacing) roads / road tar / tarmac/ roofs	ALLOW 'making roads'	1
(c) (i)	C_4H_{10}		1
(ii)	butane		1
(iii)	C_nH_{2n+2}		1
			Total = 5

Question number	Answer	Notes	Marks
3 (a) (i)	(a solution that) has as much solute/solid/substance as possible dissolved (at a particular temperature) OWTTE	ALLOW No more solute will dissolve	1
(ii)	the solubility decreases (as the temperature decreases)		1
(b)	M1 (mass of potassium permanganate) 1.25 (g) M2 (solubility of potassium manganate) 5 (g/100g)	 ALLOW M1×4 5 (g/100g) no working scores 2 marks	2
(c) (i)	glowing splint/spill relights	REJECT burning/lit splint	1
(ii)	197	IGNORE any units given	1
(d)	any one from: electron acceptor/gains electrons oxygen donor/loses oxygen	IGNORE 'oxidises another substance whilst being reduced itself'	1
			Total = 7

Question number	Answer	Notes	Marks
4 (a) (i)	$2Li(s) + 2H_2O(l) \rightarrow 2LiOH(aq) + H_2(g)$	All four correct scores 2 2 or 3 correct scores 1	2
(ii)	any two from:		2
	M1 effervescence	ALLOW fizzing / bubbling IGNORE hydrogen/gas produced	
	M2 gets smaller	ALLOW disappears / dissolves	
	M3 floats	moves on the surface scores **M3** and **M4**	
	M4 moves	REJECT melts/molten sphere REJECT flame/burning	
(iii)	M1 (amount of hydrogen) = 375÷24000 **OR** 0.015625 (mol)		3
	M2 (amount of lithium) = 0.03125 (mol))	ALLOW M1 × 2	
	M3 (mass of lithium) 0.21875 (g)	ALLOW M2 × 7 ALLOW any number of significant figures apart from 1 REJECT incorrect rounding ALLOW any answer that rounds to 0.22g Answer with no working scores M3 only	

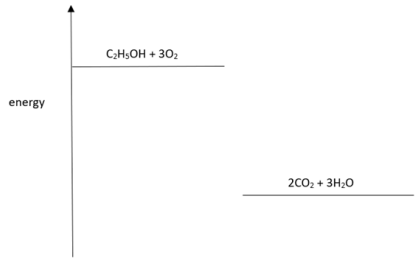
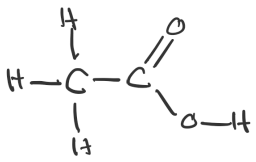
(b)	(i)	any one from: potassium melts / turns into a ball / potassium moves faster / faster effervescence/ (lilac/purple/pink) flame	 ALLOW disappears/dissolves faster	1
	(ii)	M1 potassium has a bigger atom / potassium has more shells / outer electron is further from the nucleus M2 the <u>outer</u> (shell) electron is less attracted to the nucleus **OR** the <u>outer</u> (shell) electron is more shielded (from the nuclear attraction) M3 (so outer) electron (in potassium) more easily lost	REJECT more outer shells for M1 Should be comparative for M3 IGNORE electrons (plural) in M1 and M2 but do not allow electrons in M3 ALLOW reverse argument throughout for lithium	3
				Total = 11

Question number	Answer	Notes	Marks
5 (a)	M1 electrolysis M2 as sodium is more reactive than carbon	REJECT electrolysis of an aqueous solution ALLOW it is above carbon in the reactivity series ALLOW carbon cannot displace sodium M2 dependent on M1	2
(b)	M1 layers / rows (of atoms, ions or particles) M2 can slide over one another	REJECT if mention of molecules or intermolecular forces for M1 REJECT electrons sliding for M2	2
(c)	M1 sodium loses electrons and oxygen gains electrons M2 two atoms of sodium lose one electron and oxygen gains 2 electrons	ACCEPT correctly labelled diagrams Mention of sharing electrons scores 0	2
(d)	Sodium: M1 (giant) metallic structure/lattice M2 (electrostatic) attraction between positive ions and delocalised electrons Sodium oxide: M3 giant ionic structure OR (giant) ionic lattice M4 (electrostatic) attraction between oppositely charged ions Comparison: M5 more energy is required to overcome the bonds in sodium oxide than sodium ORA	 REJECT Intermolecular forces for M1 and M2 REJECT Intermolecular forces/covalent/metallic for M3 and M4 M5 is comparative mark that is independent of M1-M4	5
			Total = 11

Question number	Answer	Notes	Marks
6 (a)	any two of the following pairs of points: **M1** use a pipette (instead of a measuring cylinder) **M2** so the volume of alkali added is more precise OR **M1** add the acid dropwise towards the endpoint **M2** so the exact endpoint is seen **OR** **M1** swirl the flask **M2** so the acid and alkali are fully mixed/reacted **OR** **M1** repeat the titration **M2** so concordant results are obtained OR so anomalous results can be ignored **OR** **M1** do the titration on a white tile **M2** so the colour change can easily be seen **OR** **M1** rinse the burette with acid **M2** so that the concentration of acid in the burette is not affected	IGNORE choice of indicator M2 is dependent on M1 ALLOW accurate ALLOW stir	4
(b)	M1 (amount of potassium hydroxide) (25 × 0.150) ÷ 1000 **OR** 0.00375 (mol) M2 0.00375 ÷ 3 OR 0.00125 (mol) M3 (0.00125 ÷ 0.04) × 1000 M4 31.3(cm^3)	 ALLOW M1÷3 ALLOW ecf from M2 M3 to 3 sig figs 31.3 (cm^3) scores 4 31.25 (cm^3) scores 3 93.8 (cm^3) scores 3 93.75 (cm^3) scores 2	4
(c) (i)	$2K_3PO_4 + 3CaCl_2 \rightarrow Ca_3(PO_4)_2 + 6KCl$		1

(ii)	M1 (amount of calcium phosphate) 0.0200 (mol) M2 (mass of calcium phosphate) 6.2 (g) M3 (5.7 ÷ 6.2 × 100) = 91.9 % OR M1 (amount of calcium phosphate) = 5.7/310 OR 0.0184 (mol) M2 0.0184 × 2 OR 0.0368 (mol) M3 (0.0368/0.04 × 100) = 91.9 %	 ALLOW M1 × 310 ALLOW any number of significant figures from 2 ALLOW M1 × 2 ALLOW any number of significant figures from 2	3
(iii)	M1 filter (the calcium phosphate) M2 wash the residue (with distilled water) M3 leave to dry (on a windowsill) /dry between filter papers /dry in a desiccator / dry in a warm oven	If evaporation to form crystals/a soluble salt method then **M3 only** for a suitable drying method. REJECT hot oven or direct heating with Bunsen Burner for M3 REJECT if solid is washed again after drying for M3	3
			Total = 15

Question number			Answer	Notes	Marks
7	(a)	(i)	yeast	ALLOW zymase/enzymes from yeast	1
		(ii)	C 30°C A is not the correct answer because 0°C is too low for fermentation B is not the correct answer because 10°C is too low for fermentation D is not the correct answer because 100°C is too high for fermentation		1
		(iii)	An explanation using either of the following linked pairs: M1 oxygen (in the air) would react with ethanol/ alcohol M2 to form ethanoic acid **OR** M1 (in the presence of air) the glucose would react with the oxygen M2 so ethanol does not form	 ALLOW ethanol would be oxidised ALLOW to form carboxylic acid ALLOW to form vinegar/acetic acid ALLOW correct reference to aerobic respiration ALLOW forms CO_2 and H_2O	2
	(b)	(i)	M1 346 + (5 × 414) + 358 + 463 + (3 × 498) **OR** 4731 M2 (4 × 804) + (6 × 463) **OR** 5994 M3 −1263 (kJ/mol) OR M1 346 + (5 × 414) + 358 + (3 × 498) **OR** 4268 M2 (4 × 804) + (5 × 463) **OR** 5531 M3 −1263 (kJ/mol)	 −1263 kJ/mol scores 3 ALLOW ecf for M3	3

(ii)	 M1 right-hand line below left-hand line M2 correct names/balanced formulae of both reactants M3 correct names/balanced formulae of both products	IGNORE any activation energy hump IGNORE enthalpy change arrow If only use words reactants (on left) and products (on right) award 1 mark from M2 and M3 If no/incorrect coefficients then 1 mark from M2 and M3	3
(iii)	An explanation that links together the following two points: M1 more energy is given out when the bonds are made M2 than is taken in when the bonds are broken ACCEPT correct reverse argument **OR** M1 breaking bonds is endothermic/takes in energy AND making bonds is exothermic/releases energy M2 the energy released is more than the energy taken in	If state/imply that energy required to make bonds OR If state/imply that energy released when bonds are broken scores 0/2 M2 dep on M1	2
(c) (i)	M1 displayed formula for ethanoic acid  M2 displayed formula for water/H_2O	ACCEPT any shape	2

(ii)	ethyl ethanoate	IGNORE hyphens	1
			Total = 15

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