Mark Scheme (Results)

Summer 2024

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)	B (3) A is not the correct answer because sulfur is not in period 2 C is not the correct answer because sulfur is not in period 4 D is not the correct answer because sulfur is not in period 6		1
(ii)	D (2−) A is not the correct answer because the charge on a sulfide ion is not 1+ B is not the correct answer because the charge on a sulfide ion is not 2+ C is not the correct answer because the charge on a sulfide ion is not 1−		1
(b) (i)	the reaction has a high activation energy	ALLOW to give zinc and sulfur enough energy to react ALLOW speeds reaction up/increases rate of reaction/reacts quicker ALLOW the reaction is very slow at room temperature IGNORE unreactive/does not react ALLOW gains kinetic energy	1
(ii)	97	IGNORE any units given	1
			Total marks for question 1 = 4

Question number	Answer	Notes	Marks
2 (a) (i)	C (neutron) A is not the correct answer because electrons are not in the nucleus B is not the correct answer as ions are not in the nucleus D is not the correct answer as protons have a positive charge		1
(ii)	C (9) A is not the correct answer because the proton number = 4 B is not the correct answer as there are 5 neutrons D is not the correct answer because 13 is the number of protons + neutrons + electrons		1
(b) (i)	similarity = number of protons/proton number difference = number of neutrons	ALLOW number of electrons ALLOW one has 3 neutrons and the other has 4 neutrons IGNORE reference to atomic number and mass numbers	2
(ii)	M1 ((7.5 × 6) + (92.5 × 7)) ÷ 100 M2 6.925/6.93/6.9	 ALLOW 2 or more significant figures Answer 6.925/6.93/6.9 without working scores 2 marks Answer of 7 with correct method scores M1 Answer of 7 without working scores 0	2
			Total marks for question 2 = 6

Question number	Answer	Notes	Marks
3 (a) (i)	M1 (positive) ion/cation M2 (delocalised) electron	ALLOW atom REJECT proton for M1	2
(ii)	M1 layers (of atoms / ions) M2 (atoms/ions) can slide over one another	ALLOW particles REJECT references to intermolecular forces	2
(b) (i)	$2Mg(s) + O_2(g) \rightarrow 2MgO(s)$ M1 balancing M2 state symbols	 ALLOW multiples or fractions – O_2 must also be changed to score.	2
(ii)	magnesium gains oxygen	ALLOW magnesium loses electrons IGNORE magnesium reacts with oxygen	1
(c) (i)	to increase the rate of reaction OWTTE		1
(ii)	to ensure all the acid has reacted/neutralise the acid OWTTE		1
(iii)	M1 amount of HCl = (25 × 2) ÷ 1000 OR 0.050 (mol) M2 amount of magnesium = 0.050 ÷ 2 OR 0.025 (mol) M3 0.025 × 24 = 0.60 g/0.6 g	 ALLOW ecf M1 ÷ 2 ALLOW ecf M2 × 24 Answer of 0.60 g without working scores 3 Answer of 1.20 g with working scores 2	3
			Total marks for question 3 = 12

Question number	Answer	Notes	Marks
4 (a)	M1 30°C M2 (enzymes from) yeast	ALLOW values within the range of 30°C- 40°C ALLOW zymase IGNORE glucose/anaerobic/pressure	2
(b)	M1 oxygen in the air would react with ethanol M2 to form ethanoic acid OR M1 ethanol would not be formed M2 CO_2 and H_2O would form	ACCEPT ethanol would be oxidised ALLOW to form carboxylic acid ALLOW to form vinegar	2
(c) (i)	CO_2		1
(ii)	12.5% M1 (theoretical moles of ethanol from glucose) = 500 x 2 = 1000 M2 (100% yield) = 46 000 g M3 (percentage yield) = (5750 ÷ 46 000) × 100 = 12.5% OR M1 moles of ethanol from mass = 5750/46 = 125 M2 theoretical moles of ethanol = 500 x 2 = 1000 M3 (percentage yield) = 125/1000 × 100 = 12.5%	Answer of 12.5% without working scores 3 marks ALLOW ecf from M1 ALLOW ecf from M2 Allow ecf for M3	3
			Total marks for question 4 = 8

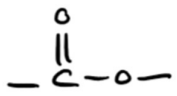
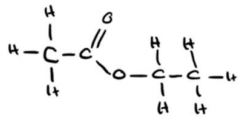
Question number	Answer	Notes	Marks
5 (a) (i)	(volumetric) pipette	ALLOW burette REJECT measuring cylinder	1
(ii)	M1 fill a burette (with sodium hydrogensulfate) M2 add sodium hydrogensulfate until the indicator changes colour M3 swirl (the conical flask) M4 add sodium hydrogensulfate dropwise near to the endpoint/end M5 repeat until concordant results	REJECT NaOH in burette for M1	5
(b)	M1 heat until crystals first start to form/a saturated solution forms/crystallisation point is reached M2 cool and crystallise/leave to crystallise M3 pour off any excess liquid M4 leave in a warm place to dry	ALLOW heat until volume is about half original volume ALLOW filter IGNORE washing with water ALLOW leave to dry OR dry using a desiccator OR warm oven OR dry between pieces of filter paper If heated to dryness then MAX 1 MARK	4

(c)	M1 mass of sodium sulfate = 2.84 g M2 mass of water = 3.6 g M3 moles of sodium sulfate = 0.02 **AND** moles of water = 0.20 M4 x = 10 OR M1 mass of sodium sulfate = 2.84g M2 mass of hydrated salt = 6.44g M3 Mr of hydrated salt = 6.44/0.02 = 322 M4 xH_2O = 322-142 = 180 so x = 10	Answer of 10 without working scores 4 Allow ecf for M4 if dividing by the smallest number but only if x is given as a whole number	4
			Total marks for question 5 = 14

Question number	Answer	Notes	Marks
6 (a) (i)	platinum	ALLOW silver / gold / graphite	1
(ii)	glowing splint relights		1
(iii)	lit splint (with a squeaky) pop		1
(iv)	$2H^+ + 2e^- \rightarrow H_2$		1
(v)	0.0237 g	correct answer (to 3 sig figs) without working scores 3	3
	M1 (moles of oxygen) 17.80 ÷ 24 000 OR 0.000742		
	M2 M_r of oxygen = 32		
	M3 0.0237 g	ALLOW ecf from M1 and M2 answer must be to 3 sig figs for M3	
(b) (i)	ions can move/are mobile OWTTE		1
(ii)	Hydrogen/it is less reactive than sodium ORA	ALLOW H^+ ions are more easily reduced / accept electrons more easily than Na^+ ions ALLOW hydrogen is below sodium in the reactivity series	1
(iii)	M1 the universal indicator turns blue / purple		2
	M2 OH^- / hydroxide ions are present in solution	ALLOW solution is sodium hydroxide ALLOW the solution is alkaline	
			Total marks for question 6 = 11

Question number	Answer	Notes	Marks
7 (a) (i)	M1 yield decreases AND reaction shifts towards the left hand side M2 which is the side with more moles (of gas)	ALLOW backward reaction ALLOW molecules	2
(ii)	M1 The yield (of ethanol) does not change M2 as (adding a catalyst) increases the rate of the forwards and backwards reactions equally		2
(b) (i)	M1 (bonds broken) (4 × 414) + 614 + (2 × 463) OR 3196 M2 (bonds formed) (5 × 414) + 346 + 358 + 463 OR 3237 M3 sum of bonds broken − sum of bonds formed OR −41 /mol OR M1 (bonds broken) 614 + (2 × 463) OR 1540 M2 (bonds formed) 414 + 346 + 358 + 463 OR 1581 M3 sum of bonds broken − sum of bonds formed OR −41 kJ/mol	answer of −41 with no working scores 3 answer of -40 with no working scores 0	3
(ii)	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 OR M1 Breaking bonds is endothermic/takes in energy and making bonds is exothermic/releases energy M2 More energy is released than taken in	 If state/imply that energy required to make bonds scores 0 If state/imply that energy released when bonds are broken scores 0 **M2 dep** on **M1**	2

(iii)	M1 right hand line below left hand line M2 correct names/formulae of both reactants and products M3 ΔH correctly shown and labelled		3

(c)	(i)	M1 displayed ester linkage  M2 rest of molecule correct 		2
	(ii)	ethyl ethanoate		1
				Total marks for question 7 = 15

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