Mark Scheme (Results)

Summer 2024

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

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

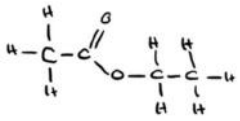
Question number	Answer	Notes	Marks
5 (a) (i)	(volumetric) pipette	ALLOW burette REJECT measuring cylinder	1
(ii)	M1 fill a burette (with sodium hydrogensulfate) M2 add sodium hydrogensulfate until the indicator changes colour M3 swirl (the conical flask) M4 add sodium hydrogensulfate dropwise near to 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