



# Mark Scheme (Results)

Summer 2024

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

## **Edexcel and BTEC Qualifications**

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk). Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).

## **Pearson: helping people progress, everywhere**

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

Summer 2024

Question Paper Log Number P73426A

Publications Code 4CH1\_2CR\_2406\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2024

## 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 $((7.5 \times 6) + (92.5 \times 7)) \div 100$  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) $2\text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{MgO(s)}$  M1 balancing  M2 state symbols	ALLOW multiples or fractions - $\text{O}_2$ 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 = $(25 \times 2) \div 1000$ OR 0.050 (mol)  M2 amount of magnesium = $0.050 \div 2$ OR 0.025 (mol)  M3 $0.025 \times 24 = 0.60$ g/0.6 g	ALLOW ecf M1 $\div 2$  ALLOW ecf M2 $\times 24$  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 <sub>2</sub> and H <sub>2</sub> O would form	ACCEPT ethanol would be oxidised  ALLOW to form carboxylic acid ALLOW to form vinegar	2
(c) (i)	CO <sub>2</sub>		1
(ii)	12.5%  M1 (theoretical moles of ethanol from glucose) = $500 \times 2 = 1000$  M2 (100% yield) = 46 000 g  M3 (percentage yield) = $(5750 \div 46\ 000) \times 100 = 12.5\%$  OR  M1 moles of ethanol from mass = $5750/46 = 125$  M2 theoretical moles of ethanol = $500 \times 2 = 1000$  M3 (percentage yield) = $125/1000 \times 100 = 12.5\%$	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			

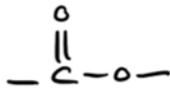
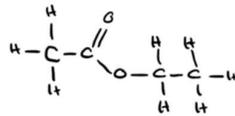
Question number	Answer	Notes	Marks
5 (a) (i)	(volumetric) pipette	ALLOW burette REJECT measuring cylinder	1
(ii)	M1 fill a burette (with sodium hydrogensulfate) M2 add sodium hydrogensulfate until the indicator changes colour M3 swirl (the conical flask) M4 add sodium hydrogensulfate dropwise near to 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) $2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$		1
	(v) 0.0237 g	correct answer (to 3 sig figs) without working scores 3	3
	M1 (moles of oxygen) $17.80 \div 24\,000$ 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	
6 (b)	(i) ions can move/are mobile OWTTE		1
	(ii) Hydrogen/it is less reactive than sodium ORA	ALLOW $\text{H}^+$ ions are more easily reduced / accept electrons more easily than $\text{Na}^+$ ions ALLOW hydrogen is below sodium in the reactivity series	1
	(iii) M1 the universal indicator turns blue / purple M2 $\text{OH}^-$ / hydroxide ions are present in solution	ALLOW solution is sodium hydroxide ALLOW the solution is alkaline	2
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) $(4 \times 414) + 614 + (2 \times 463)$ OR 3196 M2 (bonds formed) $(5 \times 414) + 346 + 358 + 463$ OR 3237 M3 sum of bonds broken – sum of bonds formed OR $-41$ /mol OR M1 (bonds broken) $614 + (2 \times 463)$ 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          <b>M2 dep on M1</b>	2

(iii)	M1 right hand line below left hand line M2 correct names/formulae of both reactants and products M3 $\Delta H$ 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		

