Pearson Edexcel

Mark Scheme (Results)

Summer 2019

Pearson Edexcel GCSE
In Chemistry (1CH0) Paper 1H

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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.

Mark schemes have been developed so that the rubrics of each mark scheme reflects the characteristics of the skills within the AO being targeted and the requirements of the command word. So for example the command word 'Explain' requires an identification of a point and then reasoning/justification of the point.

Explain questions can be asked across all AOs. The distinction comes whether the identification is via a judgment made to reach a conclusion, or, making a point through application of knowledge to reason/justify the point made through application of understanding. It is the combination and linkage of the marking points that is needed to gain full marks.

When marking questions with a 'describe' or 'explain' command word, the detailed marking guidance below should be consulted to ensure consistency of marking.

Assessment Objective		**Command Word**	
Strand	**Element**	**Describe**	**Explain**
AO1		An answer that combines the marking points to provide a logical description	An explanation that links identification of a point with reasoning/justification(s) as required
AO2		An answer that combines the marking points to provide a logical description, showing application of knowledge and understanding	An explanation that links identification of a point (by applying knowledge) with reasoning/justification (application of understanding)
AO3	1a and 1b	An answer that combines points of interpretation/evaluation to provide a logical description	
AO3	2a and 2b		An explanation that combines identification via a judgment to reach a conclusion via justification/reasoning
AO3	3a	An answer that combines the marking points to provide a logical description of the plan/method/experiment	
AO3	3b		An explanation that combines identifying an improvement of the experimental procedure with a linked justification/reasoning

Question number	Answer	Additional guidance	Mark
1(a)	$2H_2 + O_2 \rightarrow 2H_2O$ (2) fully correct balanced equation (2) If not (2), then H_2O as product in an equation format, regardless of any other errors (1)	Allow =, ⇌ for → Ignore all words and state symbols Allow multiples reject formulae with charges Do not penalise small letters e.g allow h_2O If H2O or H^2O in otherwise fully correct equation, allow (1)	**(2)**

Question number	Answer	Additional guidance	Mark
1(b)(i)	iron rusts/ corrodes/ reacts {with oxygen/ water} / iron oxidises / forms iron oxide	ignore erodes/ corrosive	**(1)**

Question number	Answer	Additional guidance	Mark
1(b)(ii)	platinum is a **transition** {<u>metal/ element</u>}	ignore 'in the middle' etc. ignore any irrelevant/ additional information	**(1)**

Question number	Answer	Additional guidance	Mark
1(c)	Any two from: • improves the appearance/ shiny (1) • improves resistance to corrosion/ does not corrode/ prevents reaction with {air/oxygen/water}/ prevents oxidation (1) • can make e.g. 'gold' object more cheaply using a gold layer on a cheaper base / looks more expensive than it is (1)	allow does not rust ignore durable/ protects unqualified etc. ignore 'makes more valuable'	**(2)**

(Total for question 1 = 6 marks)

Question number	Answer	Additional guidance	Mark
2(a)(i)	any two from **E, G** and **X**	allow mark if all three given for E allow B / boron for G allow O / O_2 / oxygen for X allow Ar / argon allow use of lower case letters reject answers with any other letters / element names	**(1)**

Question number	Answer	Additional guidance	Mark
2(a)(ii)	any two from **A, E** and **G**	allow mark if all three given for A allow Li / lithium for E allow B / boron for G allow O / O_2 / oxygen allow use of lower case letters reject answers with any other letters / element names	**(1)**

Question number	Answer	Additional guidance	Mark
2(a)(iii)	**A** / **J**	allow mark if both given for A allow Li / lithium for J allow Na / sodium allow use of lower case letters reject answers with any other letters / element names reject answers with + or – charges	**(1)**

Question number	Answer	Additional guidance	Mark
2(b)(i)	An explanation linking: • (atoms with) same (number of) protons (1) • (atoms with) different (number of) neutrons (1)	ignore any mention of electrons reject answers in terms of element**s** (plural) but allow element (singular) if no other mark: allow same atomic number **and** different mass number (1)	**(2)**

Question number	Answer	Mark
2(b(ii)	**A** 5 protons is the only correct answer **B** is not correct because there are 5 or 6 neutrons **C** is not correct because the atomic number is 5 **D** is not correct because there are 5 or 6 neutrons	**(1)**

Question number	Answer	Additional guidance	Mark
2(c)	2.8.8	allow 2,8,8 2/8/8 2 8 8 or other separator allow correct electron shell diagram	**(1)**

Question number	Answer	Additional guidance	Mark
2(d)	**MP1 for dividing by atomic mass** **A** : **G** $\frac{3.5}{7}$: $\frac{4.0}{16}$ (1) **MP2 for deriving ratio <u>from MP1</u>** 0.5 : 0.25 OR 2 : 1 (1) **MP3 for ratio in MP2 to formula** empirical formula $\mathbf{A_2G}$ (1)	A_2G with no relevant working (1) ONLY AG_2 (0) For MP2: If they go on to calculate a different ratio in addition to 0.5:0.25 or 2:1 do not award MP2 ecf on step 1: If inverted, $\frac{7}{3.5}$: $\frac{16}{4.0}$ (0) = 2 : 4 or 1 : 2 (1) AG_2 (1) allow 1 in empirical formula allow Li for A and O for G do not penalise incorrect case in formula	**(3)**

(Total for Question 2 = 10 marks)

Question number	Answer	Additional guidance	Mark
3(a)(i)	(squeaky) pop / gas burns / water forms	allow explosion / bang / flame / fire / energy released ignore reaction occurs / ignites / set alight ignore references to splints (glowing or lit)	**(1)**

Question number	Answer		Mark
3(a)(ii)	A description to include • *volumes going up:* (oxygen/ hydrogen/ gas) increase (with time) / volume (directly) proportional to time (1) • *quantitative comparing hydrogen and oxygen:* (volume of) hydrogen double (volume of) oxygen / ORA / 2:1 ratio (1)	allow hydrogen goes up by 4 (cm^3) each time / by 2 cm^3 per minute / equivalent for oxygen for MP1 explicit reference needed to a ratio and **not** just quoting 2 figures allow amount in place of volume throughout twice as much hydrogen produced as oxygen (1) **rate** of hydrogen production double that of oxygen (2)	**(2)**

Question number	Answer	Mark
3(b)	**C** lead and bromine is the only correct answer **A** is incorrect because lead is produced at the cathode **B** is incorrect because lead and bromine are produced **D** is incorrect because bromine is produced at the anode	**(1)**

Question number	Answer	Additional guidance	Mark
3(c)	An explanation linking: • (calcium) nitrate {is soluble/ dissolves}/ (calcium) carbonate {is insoluble/ does not dissolve} (1) • so **ions** {free to move in solution / not free in solid} (1)	calcium nitrate dissolves so ions can move (2) or reverse argument for calcium carbonate	**(2)**

Question number	Answer	Additional guidance	Mark
3(d)	$Zn^{2+} + 2e^{(-)} \rightarrow Zn$ (2)	if not fully correct, allow 1 for Zn^{2+} + (any number) $e^{(-)} \rightarrow$ (anything) allow ZN, zn allow multiples reverse reaction scores (0) ignore state symbols $Zn^{2+} \rightarrow Zn \ - 2e^{(-)}$ (0)	**(2)**

(Total for Question 3 = 8 marks)

Question number	Answer	Additional guidance	Mark
4(a)	8.000- 6.213 = (1.787) (g) **(1)**	allow 1.8, 1.79	**(1)**

Question number	Answer	Additional guidance	Mark
4(b)(i)	97.3(%) with or without working scores 2 $\frac{5.450}{5.600}$ (1) x 100 = 97.3214…. = 97.3(%) (1)	if fraction inverted then x 100 = 102.75… (3 or more sig fig) allow (1) for 0.973 allow (1) MP2 only for correctly x 100 some figure derived from the data given allow any sig fig except 1	**(2)**

Question number	Answer	Mark
4(b)(ii)	**A** some solid was lost from the crucible is the only correct answer **B** is incorrect because this would increase mass **C** is incorrect because this would not alter mass **D** is incorrect because this would increase mass	**(1)**

Question number	Answer	Additional guidance	Mark
4(c)(i)	An explanation linking • {rate/ mass loss} is slowing down (1) • as amount of reactant falls (1) OR • mass decreases (1) • as further decomposition occurs/ reaction continues / {gas/CO_2} {is produced/ escapes/ lost} (1)	allow amount of calcium carbonate decreases do not allow 'as time goes on' for 2nd mark: must explain in terms of a reaction	**(2)**

Question number	Answer	Additional guidance	Mark
4(c)(ii)	mass may decrease further / not heated to constant mass / last two mass figures not the same	allow mass is still decreasing ignore there is still 5.2g solid reject mass has not gone to zero	**(1)**

Question number	Answer	Additional guidance	Mark
4(d)(i)	100 with or without working scores 2 40 + 12 + 3 x 16 (1) =100 (1)	ignore any units ecf for MP2 if using 12,16 and 40, using addition and multiplication only	**(2)**

Question number	Answer	Additional guidance	Mark
4(d)(ii)	**56% without working scores 0** $\frac{56}{100}$ (1) (x 100) = 56 (%) (1)	56/answer to 4(d)(i) (1) x 100 (1) MP2 only for correctly x 100 some figure derived from the data given 100% scores 0	**(2)**

(Total for question 4 = 11 marks)

Question number	Answer	Additional guidance	Mark
5(a)(i)	14(.2) with or without working scores 3 1kg = 1000g (1) $\frac{142}{1000}$ (1) x 100% =14(.2) (1)	If the percentage of non nickel compounds is calculated to give 85.8%/86% score 2 $\frac{142}{1000}$ or 0.142 will score MP1 and MP2 $\frac{142}{1}$ x 100 = 14200 scores (1)	**(3)**

Question number	Answer	Additional guidance	Mark
5(a)(ii)	decontaminates ground / conserves {nickel / nickel ores / ores} / allows use of low-grade ore / specified environmental reason: e.g. less noise due to mining / carbon neutral / less carbon dioxide	Ignore any reference to cost/ better for environment etc. / time / energy	**(1)**

Question number	Answer	Additional guidance	Mark
5(b)(i)	$2NiS + 3O_2 \rightarrow 2NiO + 2SO_2$ (2) all four formulae (1) balancing correct formulae only (1)	allow = for → allow multiples if wrong subscript or misuse of capital/small letter e.g. O2, O^2, niO, NIS, allow MP1 but cannot score MP2 if more than 4 formulae, can score MP1 but not MP2 ignore state symbols	**(2)**

Question number	Answer	Mark
5(b)(ii)	**B** the metal produced by electrolysis is very pure is the only correct answer **A** is incorrect because this is a disadvantage **C** is incorrect because electrolysis is expensive **D** is incorrect because heating with carbon can be used	**(1)**

Question number	Answer	Additional guidance	Mark
5(c)	An answer that describes the following points of application of knowledge and understanding to provide a logical description: • (fractional) **distillation** (1)	answers describing simple or fractional distillation are allowed Fully labelled correct diagram would score MP1 (and MP2 if heat indicated)	**(3)**
	• heat/ boil (1)	allow ‘raise temp. to 50°C’ etc. (temp >42 and <90) allow lower boiling point liquid for nickel tetracarbonyl	
	• nickel tetracarbonyl {{boils/evaporates} off first / is obtained from top of column/ vapour is condensed by condenser} ORA (1)		

(Total for question 5 = 10 marks)

Question number	Answer	Additional guidance	Mark
6(a)	A description including DECOMPOSITION • **heat** the (hydrated) {crystals / solid} (1) • (solid) goes white/ steam is observed / water produced (1) REVERSE REACTION • add water / water rejoins / water reacts with anhydrous solid (1) • (solid) goes blue (again) / heat is released (1)	ignore anything to do with Le Chatelier etc.. ignore 'closed system' MP4 independent of MP3	**(4)**

Question number	Answer	Additional guidance	Mark
6(b)	An explanation linking • less purple / lighter/ paler / fades (1) • because less iodine (1)	Ignore equilibrium shifts right, forward reaction favoured reject 'goes colourless' for MP1 reject **ALL** iodine reacts to give HI for MP2 (credit **some** iodine reacts / **some** iodine is used up) ignore 'more HI' ignore forwards reaction is favoured	**(2)**

Question number	Answer	Additional guidance	Mark
6(c)	1.8… x 10^{24} with or without working scores 2 • 3 x 6.02 x 10^{23} (1) • = 1.8 x 10^{24} (1)	allow 18 x 10^{23} , 1.81 x 10^{24} , 1.806 x 10^{24} or any other form of correct answer to 2-4 sig figs allow 2 x 6.02 x 10^{23} = 1.2 x 10^{24} (1)	**(2)**

(Total for question 6 = 8 marks)

Question number	Answer	Mark
7(a)	**D** the metal is oxidised **A** is incorrect because the reaction is with oxygen **B** is incorrect because the reaction is with oxygen **C** is incorrect because the metal does not decompose	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(i)	An explanation linking • stainless steel resistant to {corrosion/ rusting/ oxidation} / corrosion rate slower / does not react with {air/oxygen} and water • neither rod would rust/ react (in a few days) / there would be no {rusting / reaction}/ no change would occur / it would take a long time for any result (1)	Ignore iron corrodes but ALLOW iron corrodes **faster** than stainless steel / iron rusts but stainless steel does not (1)	**(2)**

Question number	Answer	Additional guidance	Mark
7(b)(ii)	measuring cylinder accurate enough / accuracy of pipette not needed / no need to be (more) accurate / the volume of water is not critical	allow exact/ precise for accurate allow pipettes only used for accurate/ precise/ exact volumes	**(1)**

Question number	Answer	Additional guidance	Mark
7(b)(iii)	An explanation linking • (A) the magnesium has {corroded/ reacted/ oxidised} / (B) {rusting / corrosion / oxidation} has occurred (1) • because magnesium is more reactive than iron / (magnesium has reacted) instead of the iron (1)	MP1 describes reaction that occurs MP2 reason – ignore 'sacrificial protection' etc.	**(2)**

Question number	Answer	Additional guidance	Mark
7(c)	An explanation linking • {less oxygen / no oxygen / oxygen is removed} by the hydrazine (1) • oxygen is needed for {rusting / reaction} / corrosion/so oxidation prevented (1)	For MP1 allow 'oxygen reacts with hydrazine instead of the metal' (1) ignore hydrazine {displaces/ more reactive than} oxygen no oxygen so no rusting scores 2	**(2)**

Question number	Answer	Additional guidance	Mark
7(d)(i)	Haber process (1)	accept phonetically correct spellings e.g Harber	**(1)**

Question number	Answer	Mark
7(d)(ii)	rate increased / speeded up / quicker / faster (1)	**(1)**

Question number	Answer	Mark
7(d)(iii)	yield unchanged/ stays same / none (1)	**(1)**

(Total for question 7 = 11 marks)

Question number	Answer	Additional guidance	Mark
8(a)	Any two from: • {(red-)brown / orange / pink} solid formed (1) • (some) {grey/silver} solid remains (1) • (blue solution) becomes colourless (1)	Ignore substance names – descriptions are required allow {grey/silver} solid disappears / reduces / dissolves Answers that include fizzing/ effervescence/ bubbles in addition to correct response have **max** score of 1.	**(2)**

Question number	Answer	Additional guidance	Mark
8(b)	An explanation linking • zinc oxidised (1) • because (zinc) lose electrons/ half equation (1) • copper (ions) reduced (1) • because copper (ions) gained electrons/ half equation (1)	ignore copper sulfate is reduced ignore copper sulfate gains electrons marks are independent e.g zinc is reduced because it loses electrons = 1 zinc is oxidised because it gains electrons = 1	**(4)**

		If no other mark scored allow one mark for oxidation is the loss of electrons **and** reduction is the gain of electrons	

Question number	**Answer**	**Additional guidance**	**Mark**
8(c)	0.005/ 5 x 10^{-3} mol with or without working scores 3 Mr = 63.5 + 32 + 4 x 16 (1) (=159.5) AND EITHER mass of copper sulfate = 50/1000 x 15.95 (1) (= 0.7975 g) moles = 0.7975/159.5 (1) (= 0.005 mol) OR conc = 15.95/159.5 (1) (=0.1 moldm^{-3}) moles = 50/1000 x 0.1 = (0.005 mol)	2 marks for (MUST show working): 5 0.1 ecf in all stages	**(3)**

Question number	**Answer**	**Additional guidance**	**Mark**
8(d)	2.8g with or without working scores 2 0.043 x 65 (1) (=2.795) = 2.8 g (1)	allow 1 mark for a different calculation using 65 and 0.043 , correctly evaluated, with working, rounded to 1 decimal place	**(2)**

(Total for question 8 = 11 marks)

Question number	Answer	Additional Guidance	Mark
9(a)(i)	use pH meter/ pH probe (1)	allow pH paper / Universal indicator **reject** other named indicators / 'just 'indicator'	**(1)**

Question number	Answer	Mark
9(a)(ii)	**D** ten times higher **A** is incorrect because a pH difference in 1 reflects a 10 fold difference in [H^+] **B** is incorrect because a pH difference in 1 reflects a 10 fold difference in [H^+] **C** is incorrect because a lower pH means a higher [H^+]	**(1)**

Question number	Answer	Additional guidance	Mark
9(b)(i)	ACID use measuring cylinder / pipette / burette (1) BASE balance / scales / weigh out amount (1)	must name apparatus ignore weigh the liquid allow use portion of known mass / use measured amount **in g** / specific mass given [from 0.1 to 10g] allow weight for mass	**(2)**

Question number	Answer	Additional guidance	Mark
9(b)(ii)	START colourless END pink / magenta	**both** START **and** END required for mark ignore clear	**(1)**

Question number	Answer	Additional guidance	Mark
9(b)(iii)	An explanation linking • {hydrogen **ions**/ H^+} {reacted / neutralised} (1) • {concentration falls/ fewer} H^+ / {concentration rises/ more} OH^- (1)	allow $H^+ + OH^- \rightarrow H_2O$ (1) for MP1	**(2)**

Question number	Indicative content	Mark
9(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO3 (6 marks)** • **A** is copper oxide • copper oxide is black • copper oxide reacts with sulfuric acid to make {copper sulfate / blue solution} but no gas • **B** is magnesium • magnesium is silver coloured • magnesium reacts/ bubbles with water • magnesium reacts with sulfuric acid to give hydrogen / equation • **C** is sodium hydroxide • sodium hydroxide is white • sodium hydroxide solution is colourless • sodium hydroxide reacts with sulfuric acid to form a colourless solution / equation • sodium hydroxide solution is alkaline • sodium hydroxide has hydroxide ions • **D** is copper carbonate • copper carbonate is green • carbonates are insoluble	**(6)**

	• copper carbonate reacts with sulfuric acid to form copper sulfate and {gas / carbon dioxide} • copper carbonate reacts with sulfuric acid to form carbon dioxide / equation • copper sulfate (solution) is blue	

Level	Mark	Descriptor
	0	• No rewardable material.
Level 1	1-2	• Deconstructs scientific information but understanding and connections are flawed. An unbalanced or incomplete argument that provides limited synthesis of understanding. • Judgements are supported by limited evidence. (AO3)
Level 2	3-4	• Deconstructs scientific information and provides some logical connections between scientific concepts. An imbalanced argument that synthesises mostly relevant understanding, but not entirely coherently. • Judgements are supported by evidence occasionally. (AO3)
Level 3	5-6	• Deconstructs scientific information and provide logical connections between scientific concepts throughout. A balanced, well-developed argument that synthesises relevant understanding coherently. • Judgements are supported by evidence throughout. (AO3)

Level	Mark	Descriptor	Additional Guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then: No solids are correctly identified/ One solid is identified but no reason is given
Level 1	1–2	Additional Guidance **Three solids are correctly identified** but only one or none have valid reasoning (2) **Two solids are correctly identified** and one has valid reasoning (2) **Two solids are correctly identified** but neither has valid reasoning (1) **One solid is correctly identified** with a valid reason (1)	Possible candidate response A is copper oxide. D is copper carbonate because carbonates fizz with acid. – 2 correctly identified, one has a sufficient reason (2)
Level 2	3–4	Additional Guidance **All four solids are correctly identified** but only one or none have valid reasoning -No solid has valid reasoning (3) -One solid has valid reasoning (4) **Three solids are correctly identified** and at least two have valid reasoning -Three have valid reasoning (4) -Two have valid reasoning (3) **Two solids are correctly identified** and both have valid reasoning (3)	Possible candidate response A is copper oxide because it has pH 7, B is magnesium because metals are silver coloured, C is sodium hydroxide because it reacts with acid, D is copper carbonate because it has pH 7. – 4 correctly identified, only 1 has a sufficient reason (magnesium is silver) (4)
Level 3	5–6	Additional Guidance **All four solids are correctly identified** and at least two have valid reasoning.	Possible candidate response

		-Two or three solids have valid reasoning (5) -All four have valid reasoning (6)	A is copper oxide because it is the only black solid. B is magnesium because metals are silver coloured. C is sodium hydroxide because it dissolves to form an alkaline solution. D is copper carbonate because it forms copper sulfate which is blue in the reaction with acid <u>and fizzes</u>. 4 correctly identified, 4 with sufficient reasons (6)

(Total for question 9 = 13 mark)

Question number	Answer	Additional guidance	Mark
10(a)(i)	neutralisation OR exothermic	allow exothermic	**(1)**

Question number	Answer	Mark
10(a)(ii)	**D** ammonium nitrate is the only correct answer **A** is incorrect because the cation is ammonium and the anion is nitrate **B** is incorrect because the cation is ammonium **C** is incorrect because anion is nitrate	**(1)**

Question number	Answer	Additional guidance	Mark
10(b)	2000 dm^3 with or without working scores 4 moles NO = 1000/30 (1) (= 33.3…) moles O_2 = moles NO /2 (1) (= 16.666…) volume O_2 = moles x 24 = 16.666… x 24 (1) (=400 dm^3) volume air = volume O_2 x 100/20 (1) (=2000 dm^3) OR 2 mol NO = 60 g (1) 60 g NO : 24 dm^3 oxygen (1) 1000 g NO reacts with 24 x 1000/60 (1) (=400 dm^3) volume air = volume O_2 x 100/20 (1) (=2000 dm^3)	ecf on all stages **3 marks** all working up to 400 x 20/100 = 80	**(4)**

Question number	Indicative content	Mark
*10(c)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlines in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 & AO2 (6 marks)** EXCESS AIR • increases oxygen concentration • so excess air favours right hand side • and gives higher yield • excess air increases concentration of oxygen • equilibrium reached faster PRESSURE • 9 molecules on left and 10 on right • so higher pressure favours left hand side • and gives lower yield • higher pressure increases concentration of gases • more frequent collisions • equilibrium reached faster TEMPERATURE • heat energy given out in forward reaction • higher temperature favours reaction that takes in heat energy • so higher temperature favours left hand side • hence lower yield • molecules move faster at higher temperature	**(6)**

	• more frequent collisions • therefore more reactions in given time • equilibrium reached faster	

Level	Mark	Descriptor
	0	• No awardable content
Level 1	1-2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas lacks detail. (AO1) • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3-4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1) • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5-6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1) • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Level	Mark	Descriptor	Additional guidance
	0	No rewardable material.	Read whole answer and ignore all incorrect material/ discard any contradictory material then:
Level 1	1–2	Additional guidance **One** factor is discussed with a **statement** of effect on yield **and/or** rate (1) **One** factor is discussed with **explanation** of yield **and/or** rate (2) **Two or three** factors are discussed with **statement** of effect on yield **and/or** rate (2)	Possible candidate responses A higher pressure gives a lower yield because there are more gas molecules on the right hand side. Factor and reason – 2 marks
Level 2	3–4	Additional guidance **One** factor is **fully** discussed with **explanation** of yield **and** rate. (3) **Two** factors are discussed with **explanation** of yield **and/or** rate in one case and just **statement** of yield **and/or** rate in one case(3) **Two** factors are discussed with **explanation** of yield **and/or** rate in each case (4) **Three** factors are discussed with **statement** of effect on yield **and/or** rate with **explanation** for at least one (4)	Possible candidate responses A higher pressure gives a lower yield because there are more gas molecules on the right hand side. A higher temperature gives a lower yield because the forward reaction is exothermic. 2 factors both with reasons – 4 marks
Level 3	5–6	Additional guidance All **three** factors are discussed, with **explanation** of yield **and/or** rate in each case (6) All **three** factors are discussed, with **explanation** of yield **and/or** rate in two cases (5)	Possible candidate responses Excess air gives a higher yield. A higher pressure gives a higher rate because the gas molecules are closer and collide more frequently. A higher temperature gives a higher rate because more molecules have the activation energy. 3 factors, 2 have reasons, 1 statement (air) – 5 marks

(Total for question 10 = 12 marks)

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