

Quantitative Analysis

Q1. (2018) – 10a (ii)

10(a)(ii)	all <u>atoms</u> in the reactants are present in the product / only one product is formed	allow no atoms are wasted (in the reaction) / no waste products / nothing is wasted allow total mass of reactants = mass of useful products allow complete calculation to show that atom economy is 100% ignore equation is balanced / same number of atoms on both sides	(1) AO 1 1
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Q2. (2018) – 10b

10(b)	final answer of 90 with or without working (4) OR total mass : $2 \times 223 + 12 / (2 \times 207) + 44 (= 458)$ (1) mass of useful products : $2 \times 207 = 414$ $\frac{414}{458} (1) \times 100 (1) (= 90.39)$ 458 = 90 (1)	allow ECF throughout 458 seen (1) 90.39 / 90.4 for 3 marks 110.628... / 111 (2) 110 (3) correct rounding of an answer with working to 2 sig fig (1)	(4) AO 2 1
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Q3. (2018) – 10c (ii)

10(c)(ii)	any two from - incomplete / reversible reactions - competing/unwanted/side reactions - practical losses during the experiment / loss on transfer from one piece of equipment to another	ignore gases formed / impure substances / losses through incompetence / products not used up	(2) AO 1 1
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Q4. (2019) – 10b (ii)

10(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)
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Q5. (2019) – 10c (ii)

10(c)(ii)	mass may decrease further / not heated to constant mass / last two figures not the same allow mass is still decreasing reject mass not gone to 0 ignore there is still 5.2g solid	(1)
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Q6. (2019) – 10d (ii)

10(d)(ii)	56% without working scores 0	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)
	$\frac{56}{100}$ (1) (x 100) = 56 (%) (1)		

Q7. (2020) – 10b (iii, iv)

A)

10(b)(iii)	{the salt/solid/potassium chloride} was still wet/ not all of the water had been evaporated off	(1)
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B)

10(b)(iv)	final answer of 80.5 with or without working (4) OR total mass: $56 + 36.5 (=92.5) /$ $74.5 + 18 (=92.5)$ (1) $\frac{74.5}{92.5} (= 0.8054)$ (1) $\frac{74.5}{92.5} \times 100 (=80.540)$ (1) = 80.5 (1)	allow ECF throughout 92.5 seen (1) incorrect answer with working to 1 decimal place (1) 50.0/100.0 does not score MP4	(4)
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Q8. (2022) – 10a (i, iii)

A)

10(a)(i)	Actual yield – {mass/amount/yield} (of product) formed in the {reaction / experiment} (1) Theoretical yield – calculated {mass/amount/yield} of product formed (using the balanced equation) / {mass/amount/yield} of product formed if all reactant used to form product only with no losses (1)	allow how much (product) formed ignore 'actual' allow maximum {mass / amount/yield} of product that could be formed (with no losses) ignore estimated / predicted / expected mass formed ignore what would form theoretically	(2) A01-1
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B)

10(a)(iii)	Any two from: • Some reactant remained unreacted (1) • Some product is lost during {the reaction /processes/extraction/purification} (1) • Side reactions occur (1)	allow reaction not left long enough allow above 15% ethanol, enzymes in yeast denature allow oxidation of ethanol ignore reactants are lost in experiment ignore yield is lost / loss of yield do not allow self-deprecating answers allow impurities in the reactants ignore reversible reaction	(2) A01-1
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Q9. (2022) – 10b

A)

10(b)(i)	$342 + 18 = 360 / 4 \times 46 + 4 \times 44 = 360$ and 4×46 (1) (=184) $(4 \times 46) \times 100$ (1) (= 51.111...) 360 51(%) (to 2 sig figs) (1)	award full marks for 51 with or without working 0.5111 scores 1 mark 12.8 or 12.78 or 12.778 scores 1 mark 13 scores 2 51.1 / 51.11 (or more sig figs) scores 2 marks 25.555 scores 1 26 scores 2 marks sig fig mark can still be awarded if answer from an incorrect calculation has been given to 2 sig figs if using numbers from question	(3) AO2-1
B)	10(b)(ii) An explanation linking - carbon dioxide becomes {useful/a desired product / no longer a waste product} (1) - so atom economy increases (to 100%) (1)	ignore any increased atom economy less than 51%	(2) AO2-1

Q10. (2023)

10(a) Group A	final answer of 34 with or without working scores 4 total mass = 191 (1) $\frac{64}{191} = 0.33507$ (1) $\times 100 = 33.507$ (1) = 34 (1)	allow ecf at MPs 2-4 MP2 must be for 64/ total mass from MP1 note: 63.5/191 is not correct MP3 must be for multiplying fraction from MP2 that has been produced using question data $\times 100$ MP4 for rounding correctly number produced using question data to 2s.f. and must be <100% 33.5/ 33.51 scores 3 0.33 scores 2 0.34 scores 3 33 scores 3 $64/382 \times 100 = 17$ scores 3 $191/64 \times 100 = 298$ scores 2 $64/127(.5) \times 100 = 50$ scores 3 $191/191 \times 100 = 100$ scores 1	AO2-1 (4)
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Q11. (2023) – 10c (iii)

10(c)(iii) Group B	Any two of the following - incomplete reaction - loss {of substance/reactant/product} (during practical)/ practical losses - unwanted reactions / side-reactions	ignore impure reactants/ contaminants/ reaction conditions/ human error/ measurement errors/ reversible reaction allow reaction incomplete/ reactant left over/ not all reactants used allow reasonable examples e.g. left in apparatus/ in transfers/ escape to air/ not in a closed system/ lost to surroundings ignore incompetence e.g. spillages allow reasonable example e.g product reacts with air ignore waste products/ byproducts	AO1-1 (2)
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Q12. (2024) – 10a (ii, iii)

A)

10(a)(ii)	any two reasons valid for <u>this</u> process - not enough magnesium used (1) - not all titanium oxide reacted (1) - magnesium reacts with something else (1) - some titanium lost during {separation / purification} (1)	allow impurities in reactants allow not all reactants used allow incomplete reaction allow side reactions allow practical losses during {separation / purification} allow left on equipment ignore spillages ignore reactants /products lost	(2) AO2-1
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B)

10(a)(iii)	38 with or without working scores 3 marks	37.5 with or without working scores 2 marks	(3) AO2-1
	$48 + (2 \times 16) + (2 \times 24) = 128$ (1) $\frac{48}{128} \times 100 = 37.5$ (1) 38 % (1)	to score MP1, 128 must have working or appear as denominator in MP2 allow ecf from MP1 as long as working is shown allow MP3 for correct rounding of an incorrectly calculated value to 2 sig figs, only if using numbers from the question	

Q13. (2024) – 10b

A)

10(b)(i)	only one product / ethanol is the only product	allow this is an addition reaction allow there are no unwanted products / no waste produced / no by-products allow all atoms from reactants in product allow mass of reactants = mass of desired product ignore it is a balanced equation ignore same number of atoms on each side of the equation reject no gas given off	(1) AO2-1
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B)

10(b)(ii)	An explanation linking - find use for {carbon dioxide / waste product} (1) - so carbon dioxide becomes a useful product / increase mass of useful product (1)	allow a named use of carbon dioxide e.g in fizzy drinks allow sell the {carbon dioxide / waste product}	(2) AO2-1
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