

3(a)(iv)	B	1
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May/June 2017 9701/21 · Q3 (a)(iv)

3(d)(i)	M1 correct conversions of data to SI/consistent units $p = 404\,000$; $V = 20 \times 10^{-6}$; $T = 298$	1
	M2 calculation of n ($= pV/RT$) from M1 values $n = \frac{404000 \times 20 \times 10^{-6}}{8.31 \times 298} = 3.263 \times 10^{-3}$ mol of Cl_2	1
	M3 finding the mass of Cl_2 $= 3.263 \times 10^{-3} \times 71.0 = 0.23$ (g)	1

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Question	Answer	Marks
3(d)(iii)	M1 size / volume of molecule / particle becomes significant / non-negligible OR IMFs become significant / non-negligible	1
	M2 IMFs becomes significant / non-negligible / collisions are not elastic	1

Question	Answer	Marks
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May/June 2019 9701/21 · Q3 (d)(i), (d)(iii)

3(b)(ii)	$1.06 \times 29 = 30.7(4) \text{ dm}^3$	1
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March 2020 9701/22 · Q3 (b)(ii)

1(b)(i)	Any two from: - no VdW forces present / no forces of attraction between particles (ideal gas) particles have no / negligible volume (compared to container) - collisions between (ideal gas) particles / walls of container are perfectly elastic (ideal gas) particles behave as rigid spheres	2
1(b)(ii)	M1 : moles of krypton = $2.00 \div 83.8$ (= 0.0239 mol) M2 : conversion of value into consistent units for $pV = nRT$ M3 : $p = \frac{M1 \times 8.31 \times 393}{5.00 \times 10^{-3}} = 15600 \text{ Pa}$	3

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Question	Answer	Marks
1(b)(iii)	M1 : low pressure AND high temperature M2 : Either of: - volume of particles is negligible (compared to volume of container) - VdW forces are insignificant (owing to high kinetic energy of particles)	2

March 2021 9701/22 · Q1 (b)(i), (b)(ii), (b)(iii)

2(c)(i)	high temperature AND low pressure	1
2(c)(ii)	M1 CO is polar / has a permanent dipole OR N ₂ is non-polar	1
	M2 IMF in CO are (more) significant / larger OR IMF in N ₂ are smaller / less significant	1
	<i>Alternative answer</i> M1 (Size of) N ₂ smaller than CO OR volume of N ₂ molecules / particles smaller	
	<i>Alternative answer</i> M2 volume of N ₂ molecules / particles is more negligible ORA	

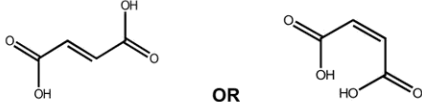
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Question	Answer	Marks
2(d)	M1 correct conversion to consistent units P = 101 000 V = 100 / 1 000 000 = (1 × 10 ⁻⁴) T = 293	1
	M2 use of all values from M1 in correct relationship, n = PV / RT	1
	M3 calculation = 4.15 × 10 ⁻³ mol	1

Question	Answer	Marks
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May/June 2021 9701/21 · Q2 (c)(i), (c)(ii), (d)

6(c)(iii)		1
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May/June 2022 9701/22 · Q6 (c)(iii)

2(d)	M1 value of n based on re-arranged equation for 'n' and substitution of correct values $n = \frac{3.23 \times 10^5 \cdot 250 \times 10^{-6}}{8.31 \cdot 500} = 0.0194(34416)$	1
	M2 calculated value of M _r based on M1 $M_r = 3.30 \div n = 170$	1
	M3 period 3 chloride which matches M _r in M2 (formula) SiCl ₄	1

Oct/Nov 2022 9701/22 · Q2 (d)

3(d)	M1 one portion of A1 : NaBH_4 AND $\rightarrow$ propan-1-ol / $\text{CH}_3(\text{CH}_2)_2\text{OH}$	1
	M2 second portion of A1 : acidified $\text{K}_2\text{Cr}_2\text{O}_7$ AND $\rightarrow$ propanoic acid / $\text{C}_2\text{H}_5\text{CO}_2\text{H}$	1
	M3 two products: <u>conc</u> (entrated mineral) acid / H^+ / H_2SO_4 (catalyst)	1

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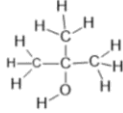
Oct/Nov 2022 9701/22 · Q3 (d)

5(c)(v)	methyl decanoate	1
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May/June 2023 9701/21 · Q5 (c)(v)

5(c)(iii)	 OR 	1
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5(d)(iv)	LiAlH ₄	1
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4(b)(iii)	atom / carbon with four different atoms / (functional) groups attached / bonded	1
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6(c)(iii)	$\text{CH}_3\text{CH}(\text{OH})\text{-R}$ where R is represented as H or any alkyl group	1
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6(c)(iii)	$\text{HOCH}_2\text{CH}_2\text{CN} + 2\text{H}_2\text{O} + \text{HCl} \rightarrow \text{HOCH}_2\text{CH}_2\text{COOH} + \text{NH}_4\text{Cl}$	1
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May/June 2025 9701/23 · Q6 (c)(iii)

6(b)	M1 convert temp to 373 K (and use) M2 correct rearrangement and use $7.15 = n \cdot 8.31(4) \times T$ to find n AND $M_r = 0.194 / n$ $M_r = 84.1$	2
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May/June 2025 9701/24 · Q6 (b)

4(c)(iii)	$([M+1]^+ / 34.7 \times 100 / 1.1 = 6)$ $[M+1]^+ = 2.29$	1
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Oct/Nov 2025 9701/21 · Q4 (c)(iii)

4(c)(iii)	$([M+1]^+ / 34.7 \times 100 / 1.1 = 6)$ $[M+1]^+ = 2.29$	1
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