


## General Principles of Organic Chemistry - Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(a)	• balanced equation	(1) $I_2(s) + Cl_2(g) \rightarrow 2ICl(l)$	2
	• all states correct	(1) Accept multiples	

Question number	Answer	Additional guidance	Mark
(b)	• correct electronegativity values and correct dipole diagram	Cl = 3.0 and I = 2.5 $\delta^+ I - Cl \delta^-$ Do not award full charges	1

Question number	Answer	Additional guidance	Mark
(c)(i)	• 1 mark each correct formula		2
		Allow 1 mark for 2 correct non-skeletal formulae	

Question number	Answer	Additional guidance	Mark
(c)(ii)	An explanation that makes reference to the following points:		3
	• identification of correct isomer	(1) 2-chloro-1-iodopropane	
	• iodine is $\delta^+$ and is attacked by the $\pi$ electrons	(1)	
	• more stable secondary carbocation formed.	(1)	

Question number	Answer	Additional guidance	Mark
(d)(i)	An answer that makes reference to the following points:		2
	• carry out in fume cupboard	(1) Allow fume hood or similar description	
	• chlorine is toxic.	(1) Do not allow 'harmful'	

Question number	Answer	Additional guidance	Mark
(d)(ii)	• I in ICl = +1 I in ICl <sub>3</sub> = +3	Both needed for the mark	1

Question number	Answer	Additional guidance	Mark
(d)(iii)	<ul style="list-style-type: none"> <li>+5 and -1 to -1 (and -1) (1)</li> <li>not disproportionation because the chlorine has not undergone both oxidation and reduction (1)</li> </ul>		2

Question number	Answer	Additional guidance	Mark
(e)(i)	<ul style="list-style-type: none"> <li>correct method (1)</li> <li>answer with units (1)</li> </ul>	$\text{Cl}_2 = 2 \times 35.5 = 71$ $71 \div 24000$ $= 0.0029583 \text{ g cm}^{-3}$ $= 3 \text{ g dm}^{-3}$	2

Question number	Answer	Additional guidance	Mark
(e)(ii)	<p>An explanation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>chlorine (gas) is more dense than air (1)</li> <li>chlorine (gas) removed (from the equilibrium) (1)</li> <li>position of equilibrium moves to the LHS (more brown liquid/ICl). (1)</li> </ul>		3

Question number	Answer	Additional guidance	Mark
(f)	<ul style="list-style-type: none"> <li>calculation of mols of iodine and fluorine (1)</li> <li>calculation of whole number ratio and formula (1)</li> </ul>	<p>Mols of iodine = <math>0.64 \div 126.9 = 5.04 \times 10^{-3}</math></p> <p>Mols of fluorine = <math>(1.31 - 0.64) \div 19 = 3.53 \times 10^{-2}</math></p> <p>Ratio 1:7 therefore formula <math>\text{IF}_7</math></p>	2