**1.** (a)

2-chloro-2-methylpropane (1)

No marks for primary or secondary halogenoalkane even if both formula and name are consistent Must be displayed

2

(b) (i) Hydrogen chloride

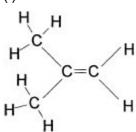
OR HCI

OR (concentrated) hydrochloric acid NOT dilute hydrochloric acid

OR sodium / potassium chloride and concentrated sulphuric acid/
phosphoric acid 1

(ii) Substitution (1) Nucleophilic (1) 2

(c) (i)



2-methylprop-1-ene

2

(ii) No because each carbon atom joined by the double bond has the same two groups attached to it/ OWTTE

1

(d) Reduction / addition hydrogenation (1) Oxidation / addition (1)

2

(e)

Must be consistent with (c)(i)
Must be displayed

l

[11]

2. a particle / species /group with an unpaired electron /OWTTE 1 (a) (i) 1 (ii) homolytic 1 (iii) B and C (b)  $C1_2$  +  $CH_4$   $\square$   $CH_3CI$  + HCI(c) 1 (i)  $+242 + 4 + -339 = -93 \text{ kJ mol}^{-1}$ (ii) (A + B+ F) OR  $+4 - 97 = -93 \text{ kJ mol}^{-1}$ (B + C)Method (1) 2 answer with units (1) -242 kJ mol<sup>-1</sup> (d) 1 (i) Exothermic because a bond has been formed. 1 (ii) (e) Less endothermic (1) the bond is weaker (1) 2 [11] 3. (a) (i) It would turn red. 1 (ii) White fumes 1 (iii) Sulphur dioxide / SO<sub>2</sub> 1 1 (b) A pale yellow / off-white / cream precipitate / solid (i) The precipitate would dissolve / disappear / the mixture goes clear (ii) Both AgCl and AgBr are soluble in concentrated ammonia 2 No more of the solid will dissolve (1) (c) 2 at that temperature (1) 100 g KBr and 25g KCl (1)

crystals only KBr (1)

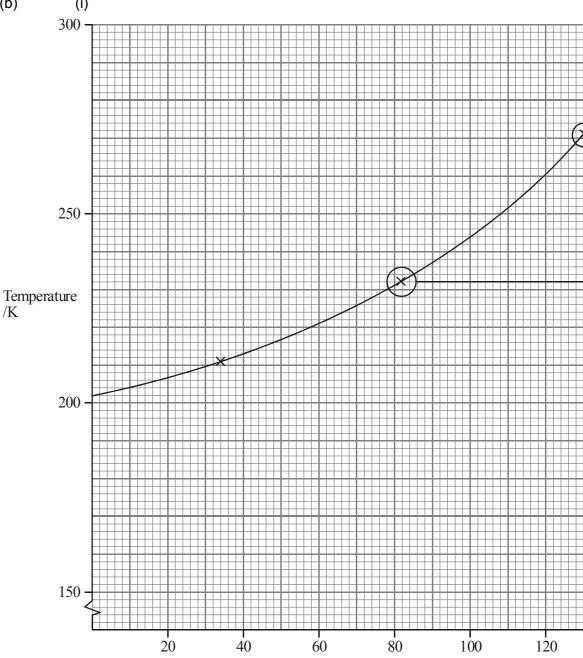
solution contains both KBr and KCI (1)

(ii)

3

[11]





correctly plotted points (1) smooth curve (1) 2

- As you go down the group the number of electrons increases. (1) (ii) so the strength of the van der Waals forces increase. (1)
- (c) (i) 204 - 210 K
  - (ii) Hydrogen/H- bonds

Mass of 1 mole / g

- (iii) Oxygen is more **electronegative** than the others (because the outer electrons are closer to the nucleus) 1
- ammonia (1) (iv) hydrogen fluoride (1) 2

2

(d)	Higher surface tension Comparison of density of water and ice ie ice is lighter than water	)		
	It expands on freezing	)		
	Higher enthalpy change of vaporization	) Any	/	
	two			
	Shape of snow flakes/ice crystals	)		
	Higher viscosity	)		
	Higher heat capacity	)	2	
				[12]
	H + C + N			
	(a) (i) <b>*</b>		1	
	(ii) 180° 1			
(b)	Increases the flow rate through the system			

OR

*Increasing pressure increases the rate of the reaction* (1) 3.5 moles of gas on LHS but 4 moles of gas on the RHS therefore increased pressure will favour the reactants (1)

2

(c)

5.

$$\begin{array}{c|c} H & CH_3 \\ \hline -C & C \\ H & CO_2CH_3 \end{array} (n)$$

(d) Gold from 0 to (+)I 1

(ii) Oxygen from 0 to -2

1

(e) Key points

> Examiners will need to consider each answer for (i) key points and (ii) quality of written communication. Candidates should have recorded their word total at the end of their answer, and this should be checked.

Up to 105 words: no penalty

106 - 115 words: -1

116 - 125 words: -2

126 - 135 words: **-3** 

and at a rate of -1 penalty for every 5 words in excess thereafter, up to a maximum penalty equal to the number of key points included in the answer.

Note that words appearing in the title to the summary do not count in the word total. Normally hyphenated words and numbers count as one word. The question does not ask for equations in the summary, but if included they should be counted in the word total.

If units given = 1 word

HCN = 2 words

90 % = 2 words

HCN(g) = 3 words

KCN(aq) = 3 words

 $1200 - 1300 \, ^{\circ}\text{C} = 4 \, \text{words}$ 

Eqn 1 = 8 words

Eqn 2 = 6 words

Eqn 3 = 6 words

7

## Marking for key points

One mark should be awarded for every key point clearly identified in an answer, up to a maximum of 6 marks. A tick should be made in the script at which the examiner decided to award each mark eg  $^3\checkmark$ . The total marks for key points should be placed in the body of the script at the end of the answer, out of 6. To gain the mark for a key point the wording used by the candidate must make clear the essential chemistry of the point.

1	In the <b>Andrussov</b> process <b>ammonia</b> is reacted / mixed with <b>methane</b> ) (or <b>hydrocarbons</b> ) and <b>oxygen</b> / <b>oxygenated</b>	)	(1)
2	and (passed over) a precious <i>OR</i> specified metal catalyst e.g. Pt <b>and</b> Rh <i>OR</i> Pt <b>and</b> Ir four	) ) A	Any
	NOT Pt on its own	)	(1)
3	at a slightly elevated pressure and high temperatures.	)	(1)
4	In the <b>Degussa</b> process a <b>simpler</b> / <b>platinum catalyst</b> system is used <b>without oxygen</b>	)	(1)
5	To prevent polymerisation stabilisers of strong acids are used (1)		
6	Hydrogen cyanide is used to make other compounds such as /methyl methacrylate / Perspex / pharmaceuticals NOT "speciality chemicals" on its own (1)		
7	Sodium cyanide used to extract <b>gold and silver from their ores</b> ACCEPT extract gold from gold beating rock one of (1)	) ) Any	
	Potassium cyanide used in electroplating / dyestuffs these	)	
	Sodium hexacyanoferrate(II) is used to prevent table salt caking three	)	
	MAX 6		
Qual	ity of Written Communication (2)		
recor a res	e should be impression marked on a scale 2–1–0, and the mark out of 2 should be impression marked on a scale 2–1–0, and the mark out of 2 should be determined in the body of the script at the end of the answer. This mark can not be ult of a word penalty. Ididates are expected to:		
□ sh	now clarity of expression		
□ со	enstruct and present coherent argument		
□ de	emonstrate effective use of grammar punctuation and spelling.		

The aspects to be considered are:		
use of technical terms; the answer should convey a correct understanding by the writer of the technical terms used in the passage which are involved in the key points		
<ul> <li>articulate expression; the answer should be well-organised in clear, concise English, without ambiguity. It should read fluently, with the links between key points in the original maintained.</li> </ul>		
□ legible handwriting; the reader should be able to read the answer without difficulty at normal reading pace, with only the occasional difficulty with a word.		
□ points must be in a logical order.		
Good style and use of English, with only infrequent minor faults (2)		
Frequent minor or a few major faults in style and use of English (1)		
Very poor style and use of English (0)		

[15]