

<b>M1.</b>	(a)	decreases	1
		number of shells increases/ shielding increases /atomic size increases	
		weaker attraction (by nucleus) on bonding electrons / weaker attraction (by nucleus)	1
		on electron pair in a covalent bond	1
	(b)	(i) increases	1
		(ii) concentrated sulphuric acid	1
	(c)	white ppt	1
		soluble in ammonia	1
		cream ppt	1
		partially soluble /insoluble in ammonia	1
	(d)	$\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$	1
		bleach	1
		disinfectant /steriliser/kills bacteria	1

[12]

**M2.** (a) (i)  $\text{HNO}_3$  or  $\text{CH}_3\text{COOH}$  **(1)**  
*CE in (a) if incorrect acid given*

(ii)  $2\text{HNO}_3 + \text{Na}_2\text{CO}_3 \rightarrow 2\text{NaNO}_3 + \text{CO}_2 + \text{H}_2\text{O}$  **(1)**  
OR  $2\text{H}^+ + \text{CO}_3^{2-} \rightarrow \text{H}_2\text{O} + \text{CO}_2$   
Not  $\text{H}_2\text{CO}_3$  2

(b) (i)  $\text{I}^-$  or  $\text{At}^-$  not elements, atoms or molecules **(1)**

(ii)  $\text{F}^-$  not elements, atoms or molecules **(1)** 2

(c) (i)  $\text{Cl}^-$  **(1)**  
*Allow AgCl Not element, atoms or molecules*

(ii)  $\text{Br}^-$  **(1)**  
*Allow AgBr Not element, atoms or molecules* 2

**[6]**

**M3.(a)** increases from fluorine to iodine **(1)**

sizes of molecules increase **(1)**  
(or molecules have more electrons or mass of molecules increases)  
*QoL mark*

Magnitude of intermolecular forces or vdW forces increase **(1)** (or more vdW forces)

More energy required to separate molecules (or particles) **(1)**  
(or more energy to break intermolecular forces)  
or intermolecular forces difficult to break 4

(b) with NaCl white ppt **(1)**  
soluble in ammonia **(1)**

*note, if ppt clearly refers to wrong substance  
e.g. NaCl then C.E = 0*

with NaBr            cream (or off white or biege) ppt **(1)**  
                         partially soluble (or insoluble) in ammonia **(1)**

*ignore references to conc ammonia*

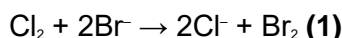
*if obviously added silver nitrate mixed with ammonia allow:*

*NaCl: no change **(2)***

*NaBr: cream ppt **(2)***

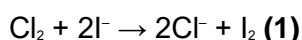
4

(c) oxidising ability decreases from chlorine to iodine (or down the Group) **(1)**



*allow use of NaBr, HBr etc*

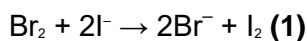
Br<sub>2</sub> red brown (or yellow or orange) liquid (or solution but not solid) **(1)**



*allow use of NaBr etc, penalise HI once only*

I<sub>2</sub> brown solution / black solid **(1)**

*do not allow any reference to purple*



Yellow/orange/red-brown/brown solution goes brown/darker  
brown solution/black solid **(1)**

7

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**M4.** (a) decreases;

1

increase in shielding ;

1

*(or atomic radius)*

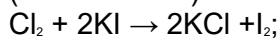
*less attraction for bonding (or shared) electrons;*

1

(b) brown solution;

1

*(or black solid)*

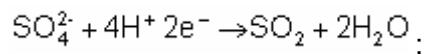


(or ionic equation)

1

(c)  $\text{SO}_2$ ;

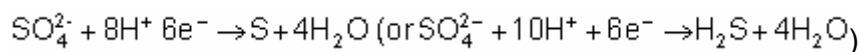
1



1

S (also  $\text{H}_2\text{S}$ );

1



1

(d)  $\text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaCl} + \text{NaOCl} + \text{H}_2\text{O}$ ;

1

sodium chloride;

1

-1;

1

sodium chlorate(I) (or bleach etc);

1

+1;

1

[14]

**M5.(a)** Increase

1

Van der Waal's forces between molecules

1

Increase with size (or  $M$ , or surface area etc)

1

More energy needed to break (overcome) these forces

*(Note max 2 from last three marks if no mention of molecules or 'molecular')*

1

- (b) (i) Brown solution (or yellow or orange) 1
- $\text{Cl}_2 + 2\text{Br}^- \rightarrow 2\text{Cl}^- + \text{Br}_2$  1
- (ii) cream precipitate 1
- $\text{Br}^- + \text{Ag}^+ \rightarrow \text{AgBr}$  1
- Precipitate dissolves 1
- (iii) orange (brown) fumes (gas), White fumes (or misty fumes),  
choking gas (any 2) 2
- (c)  $2\text{H}^+ + \text{H}_2\text{SO}_4 + 2\text{Br}^- \rightarrow \text{SO}_2 + \text{Br}_2 + 2\text{H}_2\text{O}$  ( $\text{SO}_2$  and  $\text{Br}_2$  (1),  
equation (1)) 2

[13]