

Melting Points (3.2.2)

Li = 181, Na = 98, K = 64, Rb = 39, Cs = 29

Trend?

Why?

F₂ = -220, Cl₂ = -101, Br₂ = -7.2, I₂ = 114

Trend?

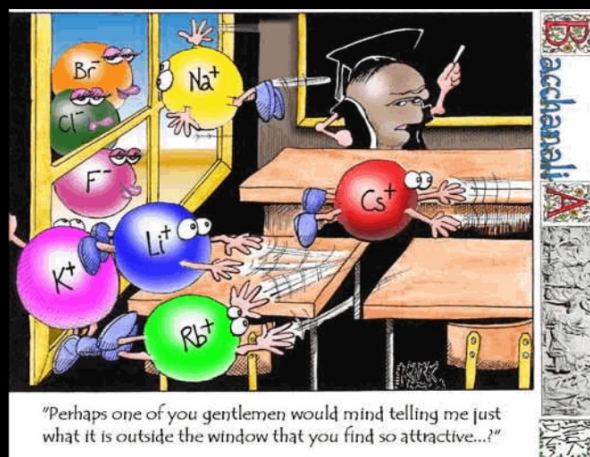
Why?

Elements in the same group have similar chemical properties (3.3.1):

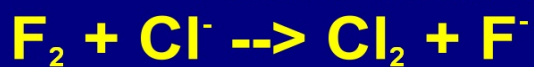
Group 1 - React with water - exothermic.



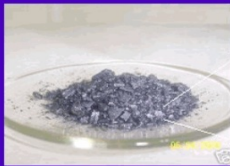
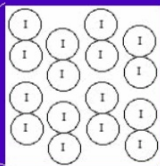
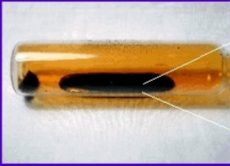
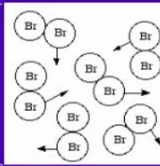

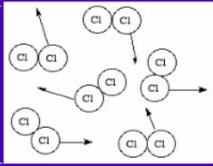
- React with halogens



**Group 17 - react with alkali metals (above)
- react with halide ions**



Reactivity of halogens decreases down the group.

iodine I_2	solid		
bromine Br_2	liquid		
chlorine Cl_2	gas		

Oxides - Third Period (3.3.2)

Na_2O - MgO - Al_2O_3 - SiO_2 - P_4O_{10} - SO_2 - Cl_2O

Ionic

covalent

basic

amphoteric

acidic

Reactions of oxides with water:

*Ionic Oxides form hydroxides:

*Covalent oxides form acids:

Examples: Write chemical reactions for the following oxides in water:

1. Na_2O

2. MgO

3. P_4O_{10}

4. SO_3

Chemical Properties of the Third Period:

***Na, Mg, Al are metals**

-shiny, conduct heat and electricity

-lose electrons to form compounds (easily oxidized)

-all have ionic oxides (white solids with high melting points that conduct electricity as liquids).

-Na and Mg form basic oxides (react with water to form bases)

-Al₂O₃ is amphoteric (can be either acidic or basic).

-NaCl and MgCl₂ are ionic (high melting points and conduct electricity as liquids).

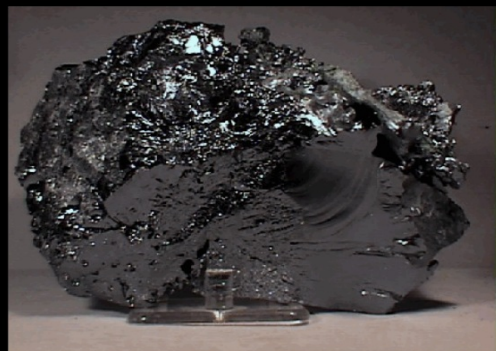
-AlCl₃ is covalent (forms Al₂O₆ in gaseous state)

***Si is a metalloid**

-semiconductor of electricity

-SiO₂ is acidic, has extremely high melting and boiling points, and does not conduct electricity in any state.

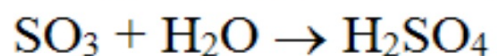
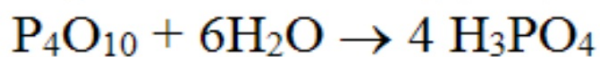
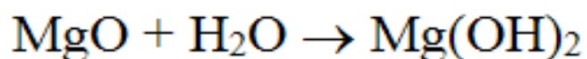
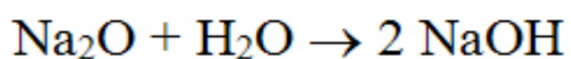
-SiCl₄ is molecular, with a low melting point and no electrical conductivity.



***P, S, Cl, Ar are nonmetals**
-do not conduct electricity
-covalent oxides and chlorides (very low melting and boiling points, and do not conduct electricity in any state)
-oxides form acidic solutions in water.
-no oxide or chloride of argon.

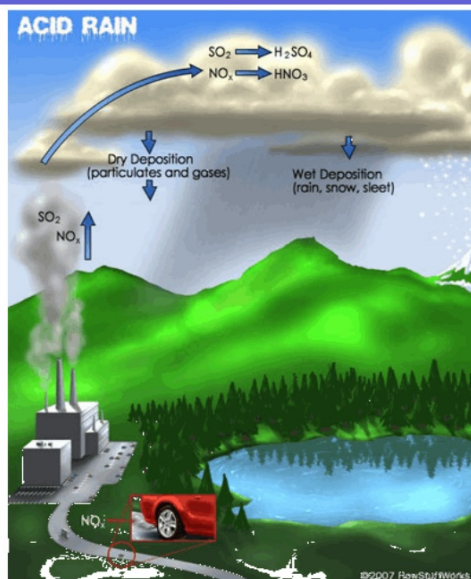
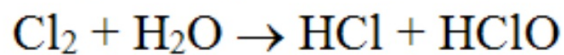
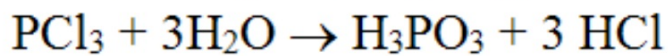
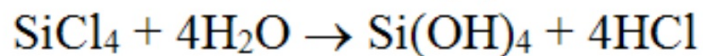


Oxides with water: **(13.1.1)**



Chlorides with water: **(13.1.2)**

NaCl and MgCl₂ simply dissolve in water



Property	Formula						
	Na ₂ O	MgO	Al ₂ O ₃	SiO ₂	P ₄ O ₁₀ (P ₄ O ₆)	SO ₃ (SO ₂)	Cl ₂ O ₇ (Cl ₂ O)
State at 25 °C	solid	solid	solid	solid	solid (solid)	liquid (gas)	liquid (gas)
Melting point / °C	1275	2852	2027	1610	24	17	-92
Boiling point / °C	-	3600	2980	2230	175	45	80
Electrical conductivity in molten state	good	good	good	very poor	none	none	none
Structure	ionic			covalent macro-molecular	simple covalent molecular		
Reaction with water	Forms Na(OH)(aq), an alkaline solution	Forms Mg(OH) ₂ , weakly alkaline	Does not react	Does not react	P ₄ O ₁₀ forms H ₃ PO ₄ , an acidic solution	SO ₃ forms H ₂ SO ₄ , a strong acid	Cl ₂ O ₇ forms HClO ₄ , an acidic solution
Nature of oxide	basic		amphoteric		acidic		

Property	Formula						
	NaCl	MgCl ₂	AlCl ₃ (Al ₂ Cl ₆)	SiCl ₄	PCl ₃ (PCl ₅)	(S ₂ Cl ₂)	Cl ₂
State at 25 °C	solid	solid	solid	liquid	liquid (solid)	liquid	gas
Melting point / °C	801	714	178 (sub- limes)	-70	-112	-80	-101
Boiling point / °C	1413	1412	-	58	76	136	-35
Electrical conductivity in molten state	good	good	poor	none	none	none	none
Structure	ionic		simple covalent molecular				
Reaction with water	dissolves easily		fumes of HCl produced				some reaction with water
Nature of solution	neutral	weakly acidic	acidic				