

Period 3 Elements Knowledge organiser

1. Keywords

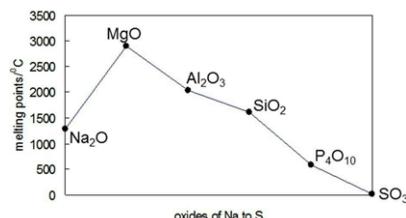
Amphoteric: able to react both as a base and as an acid.

4. Reactivity of Period 3 oxides with acids/bases

Na_2O	$\text{Na}_2\text{O}(s) + 2\text{HCl(aq)} \rightarrow 2\text{NaCl(aq)} + \text{H}_2\text{O(l)}$	Alkali
MgO	$\text{MgO}(s) + 2\text{HCl(aq)} \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2\text{O(l)}$	Alkali
Al_2O_3	$\text{Al}_2\text{O}_3(s) + 6\text{HCl(aq)} \rightarrow 2\text{AlCl}_3(\text{aq}) + 3\text{H}_2\text{O(l)}$	Amphoteric
	$\text{Al}_2\text{O}_3(s) + 2\text{NaOH(aq)} + 3\text{H}_2\text{O(l)} \rightarrow 2\text{NaAl(OH)}_4(\text{aq})$	
SiO_2	$\text{SiO}_2(s) + 2\text{NaOH(aq)} \rightarrow 2\text{Na}_2\text{SiO}_3(\text{aq}) + \text{H}_2\text{O(l)}$	Weak acid
P_4O_{10}	$\text{P}_4\text{O}_{10}(s) + 12\text{NaOH(aq)} \rightarrow 4\text{Na}_3\text{PO}_4(\text{aq}) + 6\text{H}_2\text{O(l)}$	Acid
SO_2	$\text{SO}_2(g) + 2\text{NaOH(aq)} \rightarrow \text{Na}_2\text{SO}_3(\text{aq}) + \text{H}_2\text{O(l)}$	Acid

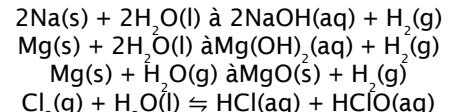
5. Reactivity of Period 3 oxides with water

Na_2O	$\text{Na}_2\text{O}(s) + \text{H}_2\text{O(l)} \rightarrow 2\text{NaOH(aq)}$	pH = 14
MgO	$\text{MgO}(s) + \text{H}_2\text{O(l)} \rightarrow \text{Mg(OH)}_2(\text{aq})$	pH = 9
Al_2O_3	Insoluble no reaction	pH = 7
SiO_2	Insoluble	pH = 7
P_4O_{10}	$\text{P}_4\text{O}_{10}(s) + 6\text{H}_2\text{O(l)} \rightarrow 4\text{H}_3\text{PO}_4(\text{aq})$	pH = 1-2
SO_2	$\text{SO}_2(g) + \text{H}_2\text{O(l)} \rightarrow \text{H}_2\text{SO}_3(\text{aq})$	pH = 2-3
SO_3	$\text{SO}_3(g) + \text{H}_2\text{O(l)} \rightarrow \text{H}_2\text{SO}_4(\text{aq})$	pH = 0-1



2. Reactivity

Reactivity with water (only Na, Mg, Cl₂):



Faster with steam

Reactivity with oxygen:

$4\text{Na}(s) + \text{O}_2(g) \rightarrow 2\text{Na}_2\text{O(s)}$	Bright yellow flame forming white sodium oxide
$2\text{Mg}(s) + \text{O}_2(g) \rightarrow 2\text{MgO(s)}$	Bright white flame forming white magnesium oxide.
$4\text{Al}(s) + 3\text{O}_2(g) \rightarrow 2\text{Al}_2\text{O}_3(s)$	Bright white flame in a gas jar forming white Al_2O_3 .
$\text{Si}(s) + \text{O}_2(g) \rightarrow \text{SiO}_2(s)$	Reacts only when heated.
$4\text{P}(s) + 5\text{O}_2(g) \rightarrow \text{P}_4\text{O}_{10}(s)$	Red P reacts when heated. White P reacts spontaneously + white smoke.
$\text{S}(s) + \text{O}_2(g) \rightarrow \text{SO}_2(g)$	Reacts when heated and lowered in a gas jar forming a colourless gas.

3. Period 3 oxides melting points

$\text{Na}_2\text{O}/1548\text{ K}$	Ionic structure = high melting points.
$\text{MgO}/3125\text{K}$	Ionic structure = high melting points. Smaller and more highly charged than Na giving a stronger attraction to the oxygen ions
$\text{Al}_2\text{O}_3/2345\text{K}$	Ionic structure with covalent character. Very high charge density on the small Al
$\text{SiO}_2/1883\text{K}$	Giant covalent structure. Strong covalent bonds Si-O.
$\text{P}_4\text{O}_{10}/573\text{K}$	Simple molecular compounds = low melting points.
$\text{SO}_3/290\text{K}$	Simple molecular compounds/weak intermolecular forces = low melting points
$\text{SO}_2/200\text{K}$	Simple molecular compounds/weak intermolecular forces = low melting points