Periodicity Map

Cambridge International AS & A Level Chemistry · Topic 9 The Periodic Table: chemical periodicity

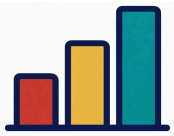
1 Elements with oxygen 9.2.1

- Na_2O, MgO, Al_2O_3
- P_4O_{10}, SO_2
- Na, Mg with water
- Dry Cl_2: chlorides



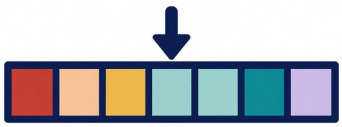
2 Oxidation numbers 9.2.2

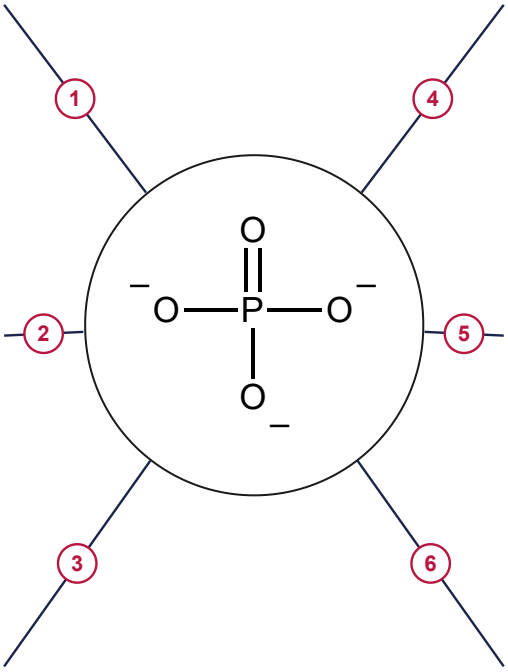
- +1 up to +5
- SO_2 +4, SO_3 +6
- **Outer electrons** used
- O −2, Cl −1



3 Oxides with water 9.2.3

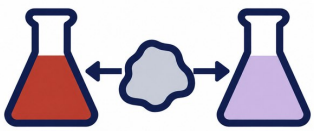
- Na_2O: pH 13–14
- MgO: pH 9–10
- Al_2O_3, SiO_2: pH 7
- P_4O_{10}, SO_3: pH 0–1





4 Amphoteric aluminium 9.2.4

- Reacts with **both**
- Al_2O_3 and $Al(OH)_3$
- $NaAl(OH)_4$ with NaOH
- Water alone: pH 7



5 Chlorides with water 9.2.5

- NaCl pH 7; $MgCl_2$ 6.5
- $AlCl_3$: pH 3
- $SiCl_4$, PCl_5: pH 2
- Fumes of HCl



6 Placing unknowns 9.3

- Find the **group**
- Use its Period 3 member
- Down: more metallic
- State the evidence



Chlorides with water equation and pH

Chloride	With water	pH
NaCl	Dissolves	7
$MgCl_2$	Dissolves, slight hydrolysis	6.5
$AlCl_3$	$AlCl_3 + 3H_2O \rightarrow Al(OH)_3 + 3HCl$	3
$SiCl_4$	$SiCl_4 + 2H_2O \rightarrow SiO_2 + 4HCl$	2
PCl_5	$PCl_5 + 4H_2O \rightarrow H_3PO_4 + 5HCl$	2

Worked examples

Oxidation number

- P_4O_{10}: 10 × −2 = −20
- +20 ÷ 4
- **+5**

Volume of H_2

- 0.46 g Na: 0.020 mol
- 0.010 mol H_2 × 24
- **0.24 dm³**

Neutralise the acid

- 0.00100 mol $SiCl_4$
- 0.00400 mol HCl
- **40.0 cm³ of 0.100 NaOH**

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