Solutions

Each answer shows the steps, then the **result**.

2.1

- $2Na + 2H_2O \rightarrow 2NaOH + H_2$

2.2

(a)

- basic

(b)

- (strongly) acidic

3.1 C

- Al_2O_3 is amphoteric

3.2 C

- PCl_5 hydrolyses to an acidic solution and HCl fumes

3.3

(a)

- $SO_3 + H_2O \rightarrow H_2SO_4$; pH 0–1

(b)

- amphoteric = reacts with both acids and bases; $Al_2O_3 + 6HCl \rightarrow 2AlCl_3 + 3H_2O$

3.4

- NaCl is ionic, so it just dissolves to give ions and a neutral solution; $SiCl_4$ is covalent and is hydrolysed by water, releasing HCl which makes the solution acidic

3.5

(a)

- X: giant ionic (conducts when molten, so it has mobile ions), for example MgO
- Y: giant covalent (very high melting point, no ions), for example SiO_2
- Z: simple molecular covalent (low melting point, no ions), for example P_4O_{10}

(b)

- the electronegativity of the element increases across the period, so the difference from oxygen decreases
- with a small difference the electrons are shared rather than transferred, so the bonding becomes covalent

(c)

- melting Y breaks many strong covalent bonds throughout its giant lattice
- melting Z only overcomes weak intermolecular forces between molecules