Periodicity Mark Scheme

1. (a) (i) *Equation* $Na_2O + H_2O \rightarrow 2NaOH$ **(1)**

pH 11–14 **(1)**

(ii) *Equation* $SO_2 + H_2O \rightarrow H_2SO_3$ **(1)**

pH 0-2 **(1)** 4

(b) Covalent oxides → acidic solutions **(1)**
ionic oxides → alkaline solutions **(1)** 2

[6]

2.

(i) Macromolecular/giant covalent/giant molecular 1

(ii) Silicon/Si 1

(iii) e.g. $CaO + SiO_2$ $CaSiO_3$ Base 1

Balanced 1

[4]

3. (a) (i) SO_2 1

+4 1

(ii) $4P + 5O_2 \rightarrow 2P_2O_5$ 1

or $P_4 + 5O_2 \rightarrow P_4O_{10}$

(b) (i) B 1

E 1

They have low melting points
or there are weak van der Waals forces between molecules 1

(ii) Add water or heat in a flame 1

Test pH check flame colour 1

13/14 yellow 1

[9]

4. (a) (i) *can form a solution with pH less than 3*: P_4O_{10} or SO_3 **(1)**

(ii) *can form a solution with with a pH greater than 12*: Na_2O **(1)** 2

penalise any wrong answer to zero

(b) (i) $MgO + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2O$ or an ionic equation **(1)**

i.e. $MgO + 2H^+ \rightarrow Mg^{2+} + H_2O$

not $O^{2-} + 2H^+ \rightarrow H_2O$

(ii) $2NaOH + SiO_2 \rightarrow Na_2SiO_3 + H_2O$ or ionic equation **(1)**

i.e. $SiO_2 + 2OH^- \rightarrow 2Na^+ + H_2O$

(iii) $3Na_2O + 2H_3PO_4 \rightarrow 2Na_3PO_4 + 3H_2O$ etc or ionic equation **(1)**

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i.e. $Na_2O + 2H^+ \rightarrow 2Na^+ + H_2O$

5. (a) (i) NaOH may be shown as ions. Balanced using H_2 or ½ H_2

$2Na + 2H_2O \rightarrow 2NaOH + H_2$ 1

(ii) silicon forms a giant covalent / atomic lattice / has a macromolecular structure / has diamond structure **(1)**

contains many covalent bonds / forms 4 bonds per atom / lattice is strong / the bonding is strong / bonds are strong / silicon is non-polar **(1)** 2

condone 'bond is strong'

(b) (i) SiO_2 / P_2O_5 / P_4O_{10} / P_2O_3 / P_4O_6 / SO_2 / SO_3 / Cl_2O / ClO_2 / Cl_2O_6 / Cl_2O_7 1

(ii) Na_2O / Na_2O_2 / MgO 1

(iii) Al_2O_3 must give formulae 1

(c) P_4O_{10} is a molecular (structure) or simple covalent **(1)**

Weak <u>intermolecular forces or van der Waals</u> forces (between molecules) **(1)**

SiO_2 is a macromolecule / giant covalent / giant molecule **(1)**

Not giant lattice

(Strong) <u>covalent</u> bonds (between atoms) must be broken **(1)** 4