5.2 questions ms

1. (i) $2Na + 2H_2O \rightarrow 2NaOH + H_2$ **(1)**

(ii) $Na_2O + H_2O \rightarrow 2NaOH$ **(1)**

[2]

2. *Phosphorus (V) oxide* $P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$ **(1)**

Approximate pH O **(1)**

allow –1 to 0.5

Sulphur dioxide $SO_2 + H_2O \rightarrow H_2SO_3$ **(1)**

Approximate pH 3 **(1)**

allow 1 to 4

[4]

3. (i) $4Al + 3O_2 \rightarrow 2Al_2O_3$ **(1)** 1

(ii) aluminium is protected by an **oxide** layer **(1)** 1

(iii)

	Sodium oxide	Silicon dioxide	Phosphorus(V) oxide	Sulphur dioxide
Physical state at room temperature	solid	solid	solid	gas

allow abbreviations (s) and (g)

Type of bonding present	ionic	covalent	covalent	covalent

must give ionic/covalent but ignore additional information about structure

if 8 correct, give 4 marks
if 6 or 7, give 3
if 4 or 5, give 2
if 2 or 3, give 1 4

(iv) $Na_2O + H_2O \rightarrow 2NaOH$ **(1)**
accept ionic charges (if correct) for Na compounds 1

(v) $SO_2 + H_2O \rightarrow H_2SO_3$ **(1)**
do **not** accept SH_2O_3
accept ions on RHS 1

(vi) silicon dioxide 7 **(1)**

phosphorus(v) oxide 0 – 3 **(1)**

(must give values) 2

[10]

4. (a) ionic **(1)**

O^{2-} ion reacts with water **(1)**
forming OH– (or NaOH) **(1)** 3

(b) *General type* covalent **(1)** (or non–metal or molecular)
Formula SO_2 **(1)** etc 2

[5]

5. (a) $Mg + 2HCl \rightarrow MgCl_2 + H_2$ 1
$MgO + 2HCl \rightarrow MgCl_2 + H_2O$ 1
Allow ionic equations

(b) Hydrogen collection 1
Using a gas syringe or measuring cylinder/ graduated vessel over water
Allow if shown in a diagram

Measurements (i) P 1
(ii) T 1
(iii) V 1

Use ideal gas equation to calculate mol hydrogen or mass/*M*r 1
Mol H_2 = mol Mg (Mark consequentially to equation) 1

(c) $MgCl_2 + 2NaOH \rightarrow Mg(OH)_2 + 2NaCl$ Species 1
Balanced 1
Allow an ionic equation

$Mg(OH)_2 \rightarrow MgO + H_2O$ 1

(d) ***Allow 2 significant figures in these calculations and ignore additional figures***

EITHER

Mol MgO obtained stage 2 = mass MgO/*M*rMgO 1

= 6.41/ 40.(3) = 0.159 *Allow 0.16* 1

Allow method mark if formula of magnesium oxide or M_r incorrect

Moles of Mg = moles of H_2 hence

Mol original MgO = mol MgO from stage 2 - mol H_2 1

= 0.159 – 0.0528 = 0.106 *Allow 0.11* 1

Mark consequentially to moles of magnesium oxide determined above

OR

Mass MgO formed from Mg = 0.0528 × M_r MgO {or 40.(3)} **(1)**

= 2.13 g *Allow 2.1* **(1)**

Allow method mark if formula of magnesium oxide or Mr incorrect

Mass original MgO = total mass MgO - mass formed from Mg **(1)**

= 6.41 – 2.13 = 4.28 g *Allow 4.3* **(1)**

Mark consequentially mass of magnesium oxide determined above

[15]

6.

the trend is a decrease in pH (or from alkaline to acid) **(1)**(can be implied from separate values)
$Na_2O + H_2O \rightarrow 2NaOH$ product **(1)** equation **(1)**
(allow $Na^+ OH^-$, ignore state symbols)

Na_2O is ionic lattice **(1)**

(if lattice is not mentioned lose mark only once ie allow ionic for MgO, $A1_2O_3$)

$MgO + H_2O \rightarrow Mg(OH)_2$ product **(1)** equation **(1)**
(allow $Mg^{2+} + 2OH^-$)

MgO is ionic lattice **(1)**

MgO sparingly soluble **(1)**

$A1_2O_3$ is ionic lattice or covalent macromolecular **(1)**(if covalent not mentioned lose mark only once)
insoluble in water or no reaction **(1)**(if formula wrong lose one mark)

SiO_2 is covalent macromolecular **(1)**(if covalent not mentioned lose mark only once) insoluble in water or no reaction **(1)**(formula wrong lose 1 mark)

$P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$ product **(1)** equation **(1)**(allow P_2O_5, P_4O_6, P_2O_3)
H_3PO_4 is a strong acid or very acidic **(1)**

P_4O_{10} is covalent molecular **(1)**(if covalent or molecular not mentioned lose mark once only)

$SO_2 + H_2O \rightarrow H_2SO_3$ Product **(1)** equation **(1)** or $SO_3 + H_2O \rightarrow H_2SO_4$ Product **(1)** equation **(1)**

H_2SO_3 is a weak acid **(1)** H_2SO_4 is a strong acid or very acidic **(1)**

SO_2 is covalent molecular **(1)** SO_3 is covalent molecular **(1)**

(Choose the best of the above two answers if both given) max 19

[19]