1. (i) O goes from –2 to 0 ✓

Oxidation numbers may be seen with equation

N goes from +5 to +4 ✓

N is reduced **AND** O is oxidised ✓

Third mark is dependent upon seeing a reduction in oxidation number of N and an increase in oxidation number of O

ALLOW *ECF for third mark for N is oxidised* ***and*** *O is reduced if incorrect oxidation numbers support this*

IGNORE *references to strontium*
IGNORE *references to electron loss* ***OR*** *gain*

DO NOT ALLOW *'One increases and one decreases'*

3

(ii) Calculates correctly:

Mol of $Sr(NO_3)_2 = \frac{5.29}{211.6} = 0.0250$ ✓

ALLOW *0.025*

Calculates correctly:
Mol of gas = $5/2 \times 0.0250 = 0.0625$ ✓

ALLOW *ECF for first answer × 2.5 as calculator value or correct rounding to 2 significant figures or more but ignore trailing zeroes*

Calculates correctly:
Volume of gas = $24.0 \times 0.0625 = 1.50\ dm^3$ ✓

ALLOW *ECF for second answer × 24(.0) as calculator value or correct rounding to 2 significant figures or more but ignore trailing zeroes*

DO NOT ALLOW *ECF of first answer × 24(.0) (which gives 0.6(0) dm^3) as this has not measured the volume of any gas, simply 0.0250 mol of solid $Sr(NO_3)_2$ converted into a gas*

i.e. This answer would give ***one*** *mark*

ALLOW *1.5 dm^3*

ALLOW *ECF producing correct volume of NO_2 only*

i.e. 1.2(0) dm^3 would give ***two*** *marks*

OR

ALLOW *ECF producing correct volume of O_2 only*

i.e. 0.3(0) dm^3 would give ***two*** *marks*

3

[6]

2. (i) Mg ✓
oxidation number changes from 0 to (+)2
OR oxidation number increases by 2 ✓
ALLOW *correct oxidation numbers shown in equation*
2nd mark is dependent on identification of Mg
IGNORE *electrons*

2

(ii) Mg/solid dissolves **OR** Mg/solid disappears
OR (Mg/solid) forms a solution ✓

bubbles **OR** fizzes **OR** effervesces **OR** gas produced ✓
IGNORE *metal reacts*
IGNORE *temperature change*
IGNORE *steam produced*
DO NOT ALLOW *carbon dioxide gas produced*
DO NOT ALLOW *hydrogen produced without* ***gas***

2

[4]

3. (i) because Ca has changed from 0 to +2 **(1)**
and H has changed from +1 to 0 **(1)** 2

(ii) Calcium reacts with water producing
hydrogen/H_2/calcium/hydroxide/$Ca(OH)_2$ **(1)** (i.e. one product)
$Ca(s) + H_2O(l) \rightarrow Ca(OH)_2(aq) + H_2(g)$ **(1)** (i.e. full equation)
Equation would subsume both two marks 2

[4]

4. (a) (i) $12 \times 50/1000 = 0.600$ mol ✓ 1

(ii) 4 mol HC*l* → 1 mol Cl_2 / moles $Cl_2 = 0.15$ mol ✓
vol of $Cl_2 = 0.15 \times 24 = 3.60$ dm^3 ✓ 2
2nd mark is consequential on molar ratio given

(b) Evidence that the oxidation number of Mn has reduced
and one of the oxidation numbers correct (ie MnO_2: ox no of Mn = +4 or $MnCl_2$: ox no of Mn = +2 ✓
The **other** oxidation number of Mn is correct,
ie in MnO_2: ox no of Mn = +4
or in $MnCl_2$: ox no of Mn = +2 ✓ 2

[5]

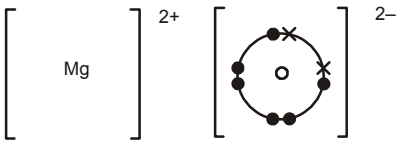
5. (i) loss (of electrons) ✓ 1

(ii) Ba ✓
$0 \rightarrow (+)2$ ✓ (accept 2+) 2

[3]

6. (i) Oxidation state goes from 0 in O_2 ✓
$\rightarrow -2$ in MgO ✓ 2

(ii)



or with Mg full shell.
correct dot and cross✓; correct charges✓ 2

[4]

7. (a) (i) Amount of substance that has the same number of particles as there are atoms in 12 g of ^{12}C/
6×10^{23}/ Avogadro's Number✓ 1

(ii) moles = $\frac{0.275 \times 120}{1000}$ = 0.0330 mol✓

moles Cl_2 = $\frac{0.0330}{2}$ = 0.0165 mol✓ 1

(iii) volume $Cl_2 = 0.0165 \times 24000 = 396\ cm^3$ ✓/ $0.396\ dm^3$
792 cm^3 worth 1 mark (no molar ratio)
1584 cm^3 worth 1 mark (x 2)
units needed. 2

(iv) bleach / disinfectant /sterilising /killing germs✓ 1

(b) $NaClO_3$✓ 1

[6]

8. (a) ……Ca(s) + …..2 ✓ HCl(aq) …….$CaCl_2$(aq) + .H_2(g). ✓ 2

(g) not required for H_2

(b) In Ca, oxidation state = 0 ✓ and 2
In $CaCl_2$, oxidation state = +2 ✓
Oxidation number increases from Ca to $CaCl_2$

[4]

9. (a) $RaCl_2$ ✓ 1

(b) Reduction is gain of electrons/decrease in oxidation number

✓

Ra^{2+} gains 2 electrons → Ra/
Oxidation state goes from +2 in $RaCl_2$ → 0 in Ra ✓ 2

[3]