

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:

$$\text{Mol of Sr(NO}_3)_2 = \frac{5.29}{211.6} = 0.0250 \quad \checkmark$$

***ALLOW** 0.025*

Calculates correctly:

$$\text{Mol of gas} = 5/2 \times 0.0250 = 0.0625 \quad \checkmark$$

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

Calculates correctly:

$$\text{Volume of gas} = 24.0 \times 0.0625 = 1.50 \text{ dm}^3 \quad \checkmark$$

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

***DO NOT ALLOW** ECF of first answer  $\times 24(.0)$  (which gives  $0.6(0) \text{ dm}^3$ ) as this has not measured the volume of any gas, simply  $0.0250 \text{ mol}$  of solid  $\text{Sr(NO}_3)_2$  converted into a gas*

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

***ALLOW**  $1.5 \text{ dm}^3$*

***ALLOW** ECF producing correct volume of  $\text{NO}_2$  only*

*i.e.  $1.2(0) \text{ dm}^3$  would give **two** marks*

**OR**

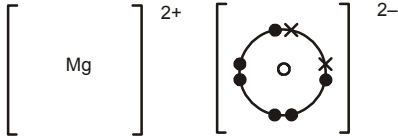
***ALLOW** ECF producing correct volume of  $\text{O}_2$  only*

*i.e.  $0.3(0) \text{ dm}^3$  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<sub>2</sub>/calcium/hydroxide/Ca(OH)<sub>2</sub> (1) (i.e. one product)  
 Ca(s) + H<sub>2</sub>O(l) → Ca(OH)<sub>2</sub>(aq) + H<sub>2</sub>(g) (1) (i.e. full equation)  
 Equation would subsume both two marks 2
- [4]
4. (a) (i)  $12 \times 50/1000 = 0.600 \text{ mol}$  ✓ 1
- (ii)  $4 \text{ mol HCl} \rightarrow 1 \text{ mol Cl}_2$  / moles  $\text{Cl}_2 = 0.15 \text{ mol}$  ✓  
 $\text{vol of Cl}_2 = 0.15 \times 24 = 3.60 \text{ dm}^3$  ✓ 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<sub>2</sub>: ox no  
 of Mn = +4 or MnCl<sub>2</sub>: ox no of Mn = +2 ✓  
 The **other** oxidation number of Mn is correct,  
 ie in MnO<sub>2</sub>: ox no of Mn = +4  
**or** in MnCl<sub>2</sub>: ox no of Mn = +2 ✓ 2
- [5]

5. (i) loss (of electrons) ✓ 1  
(ii) Ba ✓  
0 → (+)2 ✓ (accept 2+) 2 [3]
6. (i) Oxidation state goes from 0 in O<sub>2</sub> ✓  
→ -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 <sup>12</sup>C/  
6 × 10<sup>23</sup> / Avogadro's Number ✓ 1  
(ii) moles =  $\frac{0.275 \times 120}{1000} = 0.0330 \text{ mol}$  ✓  
moles Cl<sub>2</sub> =  $\frac{0.0330}{2} = 0.0165 \text{ mol}$  ✓ 1  
(iii) volume Cl<sub>2</sub> = 0.0165 × 24000 = 396 cm<sup>3</sup> ✓ / 0.396 dm<sup>3</sup>  
792 cm<sup>3</sup> worth 1 mark (no molar ratio)  
1584 cm<sup>3</sup> worth 1 mark (x 2)  
units needed. 2  
(iv) bleach / disinfectant /sterilising /killing germs ✓ 1
- (b) NaClO<sub>3</sub> ✓ 1 [6]
8. (a) .....Ca(s) + .....2 ✓ HCl(aq) .....CaCl<sub>2</sub>(aq) + .H<sub>2</sub>(g). ✓ 2  
(g) not required for H<sub>2</sub>

(b) In Ca, oxidation state = 0 ✓ and 2  
In  $\text{CaCl}_2$ , oxidation state = +2 ✓  
Oxidation number increases from Ca to  $\text{CaCl}_2$

[4]

9. (a)  $\text{RaCl}_2$  ✓ 1

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

✓

$\text{Ra}^{2+}$  gains 2 electrons  $\rightarrow \text{Ra}$ /

Oxidation state goes from +2 in  $\text{RaCl}_2 \rightarrow 0$  in Ra ✓ 2

[3]