



Rewarding Learning

**General Certificate of Secondary Education
2011**

Science: Chemistry

Paper 1
Higher Tier

[G1403]

FRIDAY 27 MAY, MORNING

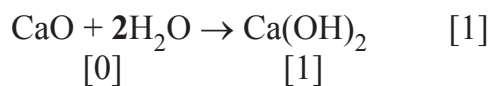
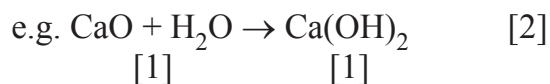
**MARK
SCHEME**

Guidelines for marking equations

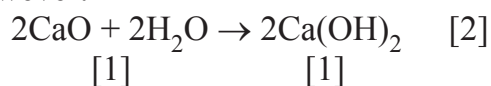
Equations where the stoichiometry is 1 gain [2] maximum

[1] for correct formula of reactant/s

[1] for correct formula of product/s



However:

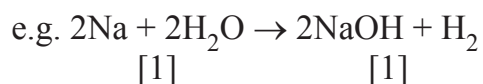


Equations where the stoichiometry is more than 1 gain [3]

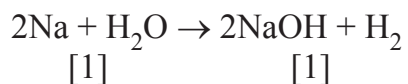
[1] for correct formula of reactant/s

[1] for correct formula of product/s

[1] for correct balancing



+ [1] for balancing = [3]



No balancing mark = [2]

- 1 (a) Chlorine [1] 7/VII [1]
 Nitrogen [1] 5/V [1] or argon [1] 0/8/VIII [1]
 Apply CM for group of incorrect element [4]

(b) (i)

Group number	Name of group	Number of electrons in the outer shell of an atom
I	alkali metals [1]	1 [1]
7/VII [1]	the halogens	7 [1]
8/0/VIII [1]	noble gases [1]	8

[6]

- (ii) bromine/Br/Br₂ [1]

(c)

Element	Metal	Non-metal	Semi-metal
Sodium	✓ [1]		
Silicon			✓ [1]
Bromine		✓ [1]	
Phosphorus		✓ [1]	

[4]

- (d) oxides [1]
 basic [1] [2]

- (e) (i) chlorine/Cl/Cl₂ [1]

- (ii) Colour: black [1] State: solid [1] [2]

- (iii) Name: astatide [1] Charge: -/-1/1- [1] [2]

- (iv) more shells (of electrons) [1]

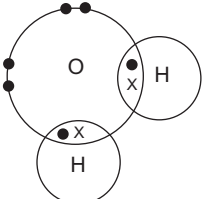
23

- 2 (a) (i) Label on left = nucleus [1]
Label on right = shell [1] [2]
- (ii) equal number [1]
of *protons and electrons* [1] [2]
- (iii) idea of full outer shell (of electrons) [1]

(iv)

Relative mass	Relative charge	Name of subatomic particle
1 [1]	0	neutron [1]
$\frac{1}{1840}$	-1	electron [1]
1	+1 [1]	proton [1]

[5]

- (b) (i)  [1] for correct sharing of electrons
[1] for 2 H each having 1 electron } depends on
[1] for 1 O having 6 electrons } the 1st mark [3]

- (ii) sharing of electrons [1]
idea of a pair of electrons [1] [2]

- (iii) water: molecular/simple [1]
diamond: giant/macromolecular [1] [2]

- (iv) strong(er) bonds in diamond [1]
weak(er) bonds **between molecules** in water [1]
lot of energy needed to break the bonds (in diamond) [1]
less/little energy needed to break bonds (in water) [1] [4]

- (c) bonds broken in hydrogen and oxygen [1]
energy required to break bonds/bond breaking is endothermic [1]
bonds formed in water [1]
energy released when bonds form/bond making is exothermic [1]
more energy released than required [1] [5]

Example: The energy required to break the bonds [1]
in hydrogen and oxygen [1]
is less than [1]
the energy released when the bonds are formed [1]
in water [1]

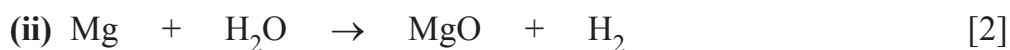
- Quality of Written Communication** [2]



(b) (i) magnesium in boiling tube or suitable container } max [2] for
 mineral wool soaked in water } all 3 labels
 heat }

delivery tube [1] } [1] for connection

collection vessel [1] } [2] for collection
 collection over water [1] } [5]



(iii) (silvery) grey [1] metal changes to white [1]
 solid/powder/ash [1] white light [1] max [2]

(iv) zinc/aluminium/iron [1]



(ii) bubbles/ gas given off [1]
 heat released [1]
 colourless solution [1]
 magnesium disappears [1] max [3]

(d) (i) potassium [1] carbonate/hydrogen carbonate [1] [2]
 K_2CO_3 or KHCO_3 (apply CM from name) [1]

(ii) aluminium/ Al^{3+} /zinc/ Zn^{2+} [1]

(iii) (bubble gas through) limewater [1]
 (colourless solution) changes to milky [1] [2]

(iv) cation: Ca^{2+} [1]
 anion: I^- [1] [2]

correct ion formula, incorrectly allocated = 1

AVAILABLE
MARKS

27

- 4 (a) (i) water which does not lather readily with soap [2]
 water which does not lather with soap [1] [2]
- (ii) caves/stalactites/stalagmites/limestone pavements
any two [2]
- (iii) add soap [1]
 shake [1]
 no (immediate) lather/scum forms/a lot of soap needed to form
 a lather/correct comparison [3]
- (iv) wastes soap/limescale/furring inside (hot water) pipes [1]
- (b) (i) calcium nitrate/calcium chloride/calcium sulphate [1]
- (ii) good for teeth and bones/tastes better/reduce heart disease/tanning
 leather [1]
- (c) (i) washing soda [1]
- (ii) idea of solid [1] appearing when two solutions are mixed [1] [2]
- (iii) white [1]
- (iv) $\text{Ca}^{2+} + \text{CO}_3^{2-} \rightarrow \text{CaCO}_3$ [2]
- (v) ion exchange [1]

AVAILABLE
MARKS

17

- 5 (a) (i) $\text{moles} = \frac{3.71}{106} [1] = 0.035 [1]$ [2]
- (ii) $\text{concentration} = \frac{0.035}{250} \times 1000 [1] = 0.14 [1] \text{ mol/dm}^3$ [2]
- (b) (i) pipette [1]
- (ii) colourless [1] to pink [1]
(wrong way round award [1]) [2]
- (iii) rinse with (deionised) water [1]
rinse with sodium carbonate/solution [1]
fill with sodium carbonate/solution [1]
ensure jet is filled/no air bubbles
allow bottom of meniscus to fall to 0/read volume at
bottom of meniscus [1] max [4]
- (iv) $\text{moles} = \frac{31.25 \times 0.16}{1000} [1] = 0.005 [1]$ [2]
- (v) mole ratio $\text{Na}_2\text{CO}_3:\text{H}_2\text{SO}_4 = 1:1 [1]$
moles of $\text{H}_2\text{SO}_4 = 0.005 [1]$ [2]
- (vi) $\text{concentration} = \frac{0.005}{25} \times 1000 [1] = 0.2 [1] \text{ mol/dm}^3$ [2]
- (c) (i) $\text{moles NaHCO}_3 = \frac{3.36}{84} [1] = 0.04 [1]$
- $\text{moles Na}_2\text{CO}_3 = \frac{0.04}{2} = 0.02 [1]$
- $\text{mass of Na}_2\text{CO}_3 = 0.02 \times 106 [1] = 2.12 [1] \text{ g}$ [5]
- (ii) moles of $\text{CO}_2 = 0.02 [1]$
volume of $\text{CO}_2 = 0.02 \times 24 = 0.48 [1] \text{ dm}^3 [1]$
(or $0.02 \times 24000 = 480 [1] \text{ cm}^3 [1]$) [3]

Total

AVAILABLE
MARKS

25

120