

Mark schemes

Q1.

- (a) hydrogen 1
- (b) bubbles / fizzing / effervescence 1
- the magnesium gets smaller
allow magnesium disappears
allow metal for magnesium 1
- (c) MgCl_2 1
- (d) Ca^{2+} 1
- (e) total surface area = $2 \times 2 \times 6$ 1
- (f) increases 1
- (g) form of calcium 1
- (h) powder 1
- (i) bar chart 1
- [10]**

Q2.

- (a) (element)
nitrogen
allow N 1
- (reason)
any **one** from:
MP2 dependent on MP1 being awarded
- has an atomic number of 7
 - has 7 electrons
allow has an electronic structure of 2,5
 - has 7 protons 1
- (b) • 8 electrons on F **and** none on Na 1

- Na⁺ and F⁻

an answer of:



can be awarded **2** marks

allow any combination of dots, crosses, circles or e⁽⁻⁾ for electrons

- (c) (strong) electrostatic forces

of attraction

(between) oppositely charged ions

- (d) high melting point

1

1

1

1

1

[8]

Q3.

- (a) ZnO (s) + HCl (aq) → ZnCl₂ (aq) + H₂O (l)

allow 1 mark for 2/3 correct state symbols

2

- (b) any **one** from:

- warm / heat the mixture
- increase the concentration of the (hydrochloric) acid

ignore add a catalyst

ignore stir

ignore powder

ignore add more zinc oxide

*do **not** accept volume / amount of (hydrochloric) acid*

*do **not** accept increase the surface area*

1

- (c) zinc oxide remains

or

solid remains

ignore colour

allow zinc oxide is added until in excess

1

- (d) filtration / filter

1

- (e) heat

*do **not** accept heat to dryness*

1

- leave to crystallise / cool
allow leave to evaporate some water 1
- (f) (at start) value in range 12–14
must be in this order 1
- (at end) value in range 0–3 1
- (g) $2 \text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2 \text{H}_2\text{O}$
allow 1 mark for Na₂SO₄ and H₂O 2
- (h) 0.10 mol/dm^3 1
- [12]**

Q4.

- (a) $2 \text{Na} + \text{Cl}_2 \rightarrow 2 \text{NaCl}$ 1
- (b) (before)
 silver solid / liquid / metal
allow grey solid / metal
or
 green (gas)
allow yellow (gas) 1
- (during)
 yellow flame
allow orange / white flame
or
 white smoke
or
 green colour fades / disappears 1
- allow vigorous reaction*
- (after)
 white solid / powder 1
- (c) *allow converse for potassium*
- (sodium has) fewer energy levels / shells
allow diagrams of electron structure 1
- outer electron / shell is closer to nucleus
or
outer electron / shell is less shielded 1

(so) greater attraction between nucleus and outer electron / shell

1

(so) outer electron is less easily lost

allow (so) loses an / one electron less easily

allow (so) more energy needed to remove an / one electron

1

- (d) **Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted.

4-6

Level 1: Relevant features are identified and differences noted.

1-3

No relevant content

0

Indicative content

	sodium chloride	hydrogen chloride
differences in bonding	ionic	covalent
	metal & non-metal	two non -metals
	transferring electrons	sharing electrons
	ions (Na ⁺ and Cl ⁻)	molecules
	charged particles	neutral or no overall charge
differences in structure	giant structure or lattice	small / simple / discrete molecules
	electrostatic	intermolecular forces
	(electrostatic forces) are strong	(intermolecular forces) are weak
	act in all directions	random or between the molecules
	regular	irregular / random
similarities in bonding	full shells or stability	full shells or stability
	(transferring) electrons	(sharing) electrons
	strong bonds	strong (covalent) bonds
	act in all directions	random or between the molecules
similarities in structure	(electrostatic) forces	(intermolecular) forces

ignore properties eg melting points, conduct electricity

to access level 2 there must be a comparison of the structure **and** bonding **and** magnitude of both sodium chloride **and** hydrogen chloride.

[14]