**M1.**(a) any **one** from:

- protection / improve lifespan
- improve appearance.

**1**

(b) (i) Bleach

**1**

(ii) Hydrogen is less reactive than sodium

**1**

(iii) 1 bonding pair of electrons 6 unbonded electrons on Cl

*accept dot, cross or e or – or any combination*

**1**

(iv) Covalent

**1**

(v) Hydrogen chloride has a low boiling point.

**1**

Hydrogen chloride is made of simple molecules.

**1**

(c) (i) oxygen

*accept carbon dioxide*

**1**

(ii) aluminium ions are positive

**1**

so are attracted (to the negative electrode)

*allow opposites attract*

**1**

(iii) Reduction

**1**

(iv) slide

*allow move*

**1**

(d) (i) C

**1**

(ii) strong covalent bonds

**1**

**[14]**

**M2.**(a) (i) was well qualified

**1**

(ii) check the results of the experiment

**1**

(b) (i) cannot move

**1**

(ii) melt it / make it a liquid

*allow heat it*

*allow dissolve (in water) / make a solution*

**1**

(iii) they are positive

*allow opposites attract **or** opposite charges*

**1**

(iv) atoms

**1**

**[6]**

**M3.** (a) reduction

**1**

(b) carbon is less reactive than aluminium

**1**

(c) aluminium (ions) / they are positively charged

*they = aluminium ions*

*ignore particle names*

*accept aluminium (ions) / they are cations*

*allow aluminium (ions they have an opposite charge*

**1**

so they are attracted **or** they move towards the negative electrode

**OR**

aluminium (ions) / they need to gain electrons (1)

which come from the negative electrode (1)

*if no other marks awarded allow 'opposites attract' for **1** mark*

**1**

(d) aluminium has a low density

**1**

aluminium is resistant to corrosion

**1**

(e) **advantage** less carbon dioxide is produced

**1**

**disadvantage** used aluminium cans have to be collected and transported

**1**

**[8]**

**M4.** (a) (i) A

**1**

(ii) E

**1**

(b) (i) insoluble

precipitation

**2**

(ii) filtration

*accept decant **or** centrifuge*

**1**

(iii) hydrochloric acid

**1**

(c) (i) melt

*allow add to / dissolve in water*
*allow heat until liquid*
*allow turn it to liquid / make it molten*
*ignore heat*

**1**

(ii) they are positive

**or**

opposite charges **or** opposites attract

*do **not** accept electrodes attracting*
*do **not** accept positive electrons*

**1**

(iii) chlorine

*accept $Cl_2$*

*do **not** accept chloride*

**1**

**[9]**

**M5.** (a) (i) cryolite

**1**

(ii) lower the melting point of the aluminium oxide

**1**

(b) (i) opposite charges **or** oxide ions are negative

**1**

attract

**1**

(ii) carbon

**1**

(iii) <u>reacts</u> with oxygen **or** forms carbon dioxide

*accept burns*

**1**

(c) **Structure mark:**

**either** Al (atoms) in layers / rows

*accept Al (atoms) all the same size*
*allow Al (atoms) in lines*

**or** alloy (atoms) not in layers / rows

*accept different sizes of atoms in alloy*
*allow alloy (atoms) not in lines*

**1**

**Sliding mark:**

**either** so (Al layers) can slide

**or** so (alloy) layers cannot slide

**1**

**[8]**

**M6.** (a) cannot move

**1**

(b) water

**1**

(c) (i) a positive charge

**1**

(ii) atoms

**1**

**[4]**

**M7.** (a) covalent

**1**

(b) (i) liquid

**1**

(ii) fluorine

*accept F / $F_2$*

*do **not** accept fluoride*

**1**

(c) (i) should fluoride ions be added to drinking water?

**1**

(ii) any **one** from:

- not enough reliable/valid evidence
- may be other factors involved
- it is an opinion / choice / belief / ethics issue
- it can't be scientifically investigated

*allow can't do an experiment*

*ignore test*

*mark independently of (c) (i)*

**1**

**[5]**

**M8.** (a) (i) ionic

**1**

(ii) elements

**1**

(b) (i) chlorine (gas)

*allow $Cl_2$ / Cl / $Cl^2$*

*allow chloride*

**1**

(ii) hydrogen (gas)

*allow H / $H_2$ / $H^2$*

**1**

(iii) sodium hydroxide (solution)

*allow NaOH*

*allow sodium solution*

**1**

**[5]**