

Mark schemes

Q1.

- (a) each calcium atom loses two electrons 1
- (and) each chlorine atom gains one electron
*allow 1 mark for calcium atoms lose electrons **and** chlorine atoms gain electrons* 1
- (so) one calcium atom reacts with two chlorine atoms 1
- (to form) Ca^{2+} ions **and** Cl^- ions
or
 (to form) calcium ion(s) **and** chloride ion(s)
allow (to form) ions with full outer shells
allow energy level for shell 1
- (b) the ions cannot move
allow the ions are in fixed positions 1
- (c) hydrogen
allow H_2 1
- (d) $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2 \text{e}^-$ 1
- (e) Cu^{2+} / copper ions are blue
and
 CrO_4^{2-} / chromate ions are yellow
allow cathode for negative electrode
allow anode for positive electrode
allow attraction for movement 1
- (because) Cu^{2+} / copper ions move to the negative electrode 1
- (and also) CrO_4^{2-} / chromate ions move to the positive electrode 1
- [10]**

Q2.

- (a) $\text{Al}^{3+} + 3 \text{e}^- \rightarrow \text{Al}$
allow multiples 1
- (b) sodium is more reactive than aluminium 1
- (c) water (molecules) break down 1
- (to) produce (H^+ and) OH^- (ions) 1
- (so) OH^- (ions) are attracted / move to the positive electrode 1
- (where) OH^- (ions) are discharged / oxidised to give oxygen (molecules)
allow (where) OH^- (ions) lose electrons to give oxygen (molecules) 1
allow hydroxide ions for OH^- throughout
- (d) (change)
 use measuring cylinders (instead of test tubes)
allow (inverted) burettes for measuring cylinders
allow gas syringes for measuring cylinders 1
- (reason)
 because there is a scale (on the measuring cylinders)
allow measuring cylinder(s) measure volume 1
- (e) 10 cm^3 1

[9]

Q3.

- (a) $\text{Na}^+ + \text{e}^- \rightarrow \text{Na}$ 1
- (b) so the products do not react (to reform sodium chloride) 1
- (c) ion 1
- (d) hydrogen / H^+ (ions) 1
- hydroxide / OH^- (ions) 1
- (e) sodium hydroxide
allow NaOH 1
- (f) sodium ions and hydroxide ions are left (in solution) 1
- (because) hydrogen ions are discharged / reduced (at the negative electrode to form hydrogen)
allow (because) hydrogen ions gain electrons (at the negative electrode to form hydrogen)
allow (because at the negative electrode) $2 \text{H}^+ + 2 \text{e}^- \rightarrow \text{H}_2$ 1
- (and because) chloride ions are discharged / oxidised (at the positive electrode to form chlorine)
allow (and because) chloride ions lose electrons (at the positive electrode to form chlorine)
allow (and because at the positive electrode) $2 \text{Cl}^- \rightarrow \text{Cl}_2 + 2 \text{e}^-$ 1