AQA GCSE Chemistry

Chemical changes mark scheme · goes with “Chemical changes · Higher tier” · whiteboardchemistry.com/revision/gcse-chemistry/exam-questions

# Mark schemes

Chemical changes · Higher tier · 5 questions

**Q1 · June 2024 · Paper 1 Foundation · Q8 · Paper 1 Higher · Q1 · [10 marks]**

**08.1**

copper sulfate

*allow $CuSO_4$*

water

*allow $H_2O$*

**[2 marks]**

**08.2**

*ignore references to colours*

solid remains (in the mixture)

*allow copper carbonate remains (in the mixture)*

**or**

no more effervescence / bubbles / fizzing

**[1 mark]**

**08.3**

to remove copper carbonate

*allow to remove excess (copper carbonate)*

**[1 mark]**

**08.4**

electric heater

**or**

water bath

*ignore Bunsen burner*

**[1 mark]**

**08.5**

$$92.8 = \frac{\text{mass produced}}{12.5} \times 100$$

*allow mass produced =*

$$\%\ yield \times \frac{max\ theoretical\ mass}{100}$$

$$(\text{mass produced}) = \frac{92.8}{100} \times 12.5$$

= 11.6 (g)

**[3 marks]**

**08.6**

(copper)

does not react with (sulfuric) acid

*allow is unreactive*

*allow will not displace hydrogen*

*allow is below hydrogen in the reactivity series*

*ignore is not reactive enough*

(sodium)

could explode

**or**

could get too hot

*allow (the reaction is) dangerous*

**[2 marks]**

---

**Q2 · June 2024 · Paper 1 Higher · Q5 · [10 marks]**

**05.1**

each calcium atom loses two electrons

(and) each chlorine atom gains one electron

*allow **1** mark for calcium atoms lose electrons **and** chlorine atoms gain electrons*

(so) one calcium atom reacts with two chlorine atoms

(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*

**[4 marks]**

**05.2**

the ions cannot move

*allow the ions are in fixed positions*

**[1 mark]**

**05.3**

hydrogen

*allow $H_2$*

**[1 mark]**

**05.4**

$2Cl^- \rightarrow Cl_2 + 2e^-$

**[1 mark]**

**05.5**

*allow cathode for negative electrode*

*allow anode for positive electrode*

*allow attraction for movement*

$Cu^{2+}$ / copper ions are blue

**and**

$CrO_4^{2-}$ / chromate ions are yellow

(because) $Cu^{2+}$ / copper ions move to the negative electrode

(and also) $CrO_4^{2-}$ / chromate ions move to the positive electrode

**[3 marks]**

---

**Q3 · June 2024 · Paper 1 Higher · Q9 · [12 marks]**

**09.1**

(an acid which) is partially ionised

*allow (an acid which) is partially dissociated*

in aqueous solution

*allow (when dissolved) in water*

*MP2 is dependent on the award of MP1*

**[2 marks]**

**09.2**

pH increases

(because) the concentration of hydrogen ions decreases

**[2 marks]**

**09.3**

use a (volumetric) pipette to add the alkali

*ignore beaker*

any **two** from:

- into a conical flask
- add an indicator (to the alkali)

*allow named indicator*

*do not accept add universal indicator*

- take the initial burette reading
- use a white tile (under a conical flask)

**[3 marks]**

**09.4**

(volume of HCl = $\frac{0.0045}{0.15}$ )

= 0.030 ($dm^3$)

(conversion 0.030 $dm^3$ =)

30 ($cm^3$)

*allow correct conversion of an incorrectly determined volume in $dm^3$*

alternative approach

(concentration = $\frac{0.15}{1000}$ =)

0.00015 ($mol/cm^3$) (1)

(volume = $\frac{0.0045}{0.00015}$ =)

30 ($cm^3$) (1)

*allow correct use of an incorrectly determined concentration in $mol/cm^3$*

**[2 marks]**

**09.5**

*allow converse arguments in terms of magnesium*

*allow energy level for shell*

(calcium's) outer shell / electrons are further from the nucleus

*allow calcium has more shells*

*ignore calcium atoms are larger*

(so) the outer electrons are less strongly attracted to the nucleus

*allow (so) the outer electrons are more shielded from the nucleus*

(so) positive ions are formed more easily

*allow (so) electrons are more easily lost*

**[3 marks]**

**Q4 · June 2025 · Paper 1 Higher · Q6 · [11 marks]**

**06.1**

strong electrostatic forces

*allow strong forces of attraction*

*ignore strong ionic bonds*

between oppositely charged ions

*allow between (positive) aluminium ions and (negative) oxide ions*

*allow between $Al^{3+}$ (ions) and $O^{2-}$ (ions)*

(which) act in all directions (in the giant structure)

(so) need a lot of energy to break (the many strong bonds)

**[4 marks]**

**06.2**

cryolite

*allow $Na_3AlF_6$*

**[1 mark]**

**06.3**

the mixture has a lower melting point than aluminium oxide

*allow to lower the melting point (of the mixture)*

*allow to lower the energy demand (of the process)*

**[1 mark]**

**06.4**

$2O^{2-} \rightarrow O_2 + 4e^-$

*allow multiples*

*allow **1** mark for*

*$O^{2-} \rightarrow O_2 + e^-$*

*with no / incorrect balancing numbers*

**[2 marks]**

**06.5**

the (positive) electrode is made of carbon / graphite

(so) the carbon / graphite reacts with oxygen (produced in the electrolysis)

(which) produces carbon dioxide

**[3 marks]**

---

**Q5 · June 2025 · Paper 1 Higher · Q8 · [13 marks]**

**08.1**

$OH^-$

**[1 mark]**

**08.2**

any **two** from:

*1 mark for improvement, 1 mark for reason reason must be linked to the corresponding improvement*

(improvement)

use phenolphthalein (instead of universal indicator)

*allow methyl orange for phenolphthalein*

*allow any named single change indicator for phenolphthalein*

(reason)

so that the colour change is sharp

*allow universal indicator changes colour too gradually*

*allow universal indicator has too many colour changes*

*ignore specific colour changes*

**or**

(improvement)

use a pH probe

(reason)

so the pH probe shows a sharper endpoint (than universal indicator)

**OR**

(improvement)

add the sodium hydroxide solution drop by drop (near the end point)

*allow add the alkali drop by drop (near the end point)*

(reason)

the volume (of sodium hydroxide solution) used is more accurate

*allow so the end point is more accurate*

**OR**

(improvement)

read burette at eye level

*allow read (volume) at the bottom of the meniscus*

(reason)

the volume (of sodium hydroxide solution) used is more accurate

*allow to reduce parallax error*

**OR**

(improvement)

rinse burette with sodium hydroxide **and** pipette with acid

(reason)

remove contaminants

**[4 marks]**

**08.3**

24.70 ($cm^3$)

*allow 24.7 ($cm^3$)*

**[1 mark]**

**08.4**

(moles acid = (25.0 × 0.216)/(1000) =)

0.00540

(moles alkali = 0.00540 ×2 =)

0.0108

*allow correct use of incorrectly determined number of moles of acid*

(concentration =)

0.0108 × (1000)/(11.25)

*allow correct use of incorrectly determined number of moles of alkali*

= 0.960 ($mol/dm^3$)

*allow = 0.96 ($mol/dm^3$)*

alternative approach:

((moles acid)/(moles alkali) =)

(2)/(1) = (11.25 × conc)/(25.0 × 0.216) (2)

*allow inverted expression*

*allow **1** mark for the expression with an incorrect mole ratio*

(concentration =)

(2 × 25.0 × 0.216)/(11.25) (1)

*allow correct use of the expression with incorrect mole ratio*

= 0.960 ($mol/dm^3$) (1)

*allow = 0.96 ($mol/dm^3$)*

**[4 marks]**

**08.5**

the HCl is a more dilute and stronger acid than the HCN

**[1 mark]**

**08.6**

(HCl has a) higher concentration of hydrogen ions

*allow HCN has a lower concentration of hydrogen ions*

(because)

concentration of hydrogen ions in HCl is 0.1 ($mol/dm^3$)

**and**

concentration of hydrogen ions in HCN is 0.0002 ($mol/dm^3$)

**[2 marks]**

Source: AQA GCSE Chemistry past papers. Reproduced for revision at whiteboardchemistry.com.