AQA A-Level Chemistry

Period 3 elements mark scheme · goes with “Period 3 elements” · whiteboardchemistry.com/revision/aqa-a-level-chemistry/exam-questions

Mark schemes

Period 3 elements · 10 questions

Q1 · November 2021 · Paper 1 · Q3 · [12 marks]

(a) $2Na(s) + 2H_2O(l) \rightarrow 2NaOH(aq) + H_2(g)$

Allow ionic equations

Allow multiples

[1 mark]

Temperature will go up more or reactants can shoot out of the tube

Allow the mixture could explode or glass could shatter or hydrogen could ignite/is flammable

Ignore reaction is exothermic/vigorous

[1 mark]

(b) $P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$

Allow ionic equations

Do not allow equations from P_2O_5

[1 mark]

Allow –1 to + 1

[1 mark]

(c) M1 SiO_2 is macromolecular / giant covalent / giant molecule

Do not allow giant, giant atomic or giant ionic

[1 mark]

M2 Strong covalent bonds (between atoms) or covalent bonds need a lot of energy to be broken/overcome

[1 mark]

M3 P_4O_{10} is molecular or simple covalent molecule

[1 mark]

M4 Weak van der Waals forces between molecules or van der Waals forces between molecules break easily

[1 mark]

(d) Al_2O_3

[1 mark]

$Al_2O_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2O$

or $Al_2O_3 + 6H^+ \rightarrow 2Al^{3+} + 3H_2O$

[1 mark]

(e) $Mg(OH)_2$

[1 mark]

(f) Na / sodium

[1 mark]

Q2 · June 2022 · Paper 1 · Q5 · [15 marks]

(a) forms a solution with pH = 14 at 25°C

[1 mark]

(b) $Al_2O_3 + 3H_2SO_4 \rightarrow Al_2(SO_4)_3 + 3H_2O$

allow multiples

ignore state symbols

[1 mark]

(c) universal indicator

[1 mark]

SO_2(aq) orange-red

[1 mark]

SO_3(aq) red

[1 mark]

allow correct comparison of acidic colours (red, orange, yellow)

or

pH meter

SO_2(aq) pH 2-3

SO_3(aq) pH 0-1

allow correct comparison of acidic pH ignoring values

or

any named metal carbonate (or formula) or Mg or Ca or Zn

SO_2(aq) slower effervescence

SO_3(aq) faster effervescence

if reagent is incomplete lose M1 and mark on

allow observation

allow correct comparison

allow named oxidising agent eg (acidified) $KMnO_4$ or (acidified) $K_2Cr_2O_7$

SO_2(aq) correct colour acidified change

SO_3(aq) no visible change or NVC

allow (acidified) barium chloride solution

or allow (acidified) barium chloride solution

SO_2(aq) no visible change or NVC

SO_3(aq) white precipitate

(d) $^{31}P_4^+$

Allow P_4^+ = 1 mark

Allow ^{31}P = 1 mark

[2 marks]

(e) $P_4O_{10} + 12NaOH \rightarrow 4Na_3PO_4 + 6H_2O$

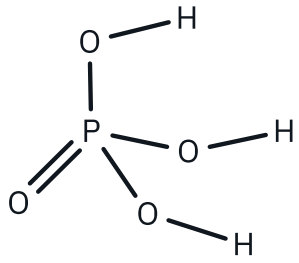
allow formation of acid salts

$P_4O_{10} + 4NaOH + 2H_2O \rightarrow 4NaH_2PO_4$

$P_4O_{10} + 8NaOH \rightarrow 4Na_2HPO_4 + 2H_2O$

[1 mark]

(f)



must show all bonds

[1 mark]

(g)

This question is marked using levels of response.

Level 3 5-6 marks	**All stages are covered and the description of each stage is generally correct and virtually complete. Answer is communicated coherently and shows a logical progression from stage 1 to stage 2 and stage 3.**
Level 2 3-4 marks	All stages are covered but the description of each stage may be incomplete or may contain inaccuracies OR two stages are covered and the explanations are generally correct and virtually complete. Answer is mainly coherent and shows progression from stage 1 to stage 2 and/or stage 3.
Level 1 1-2 marks	Two stages are covered but the description of each stage may be incomplete or may contain inaccuracies, OR only one stage is covered but the explanation is generally correct and virtually complete. Answer includes isolated statements and these are presented in a logical order.
0 marks	Insufficient correct chemistry to gain a mark.

indicative chemistry content

contradictions negate statements

Stage 1 **structure**

1a NaCl ionic lattice or giant ionic

1b Cl_2 and HCl molecular (covalent)

or

Cl_2 and HCl are (simple) molecules

Stage 2 **forces responsible for melting point**

2a NaCl attractions between + and – ions

2b Cl_2 vdw forces

2c HCl dipole dipole forces

Stage 3 **comparison of melting point**

3a ionic bonds stronger than IMF

3b chlorine/Cl_2 is a bigger (molecule) than HCl

or

chlorine/Cl_2 has more electrons than HCl

3c more/stronger forces between molecules in Cl_2 than those in HCl

or

more/stronger IMF in Cl_2 than those in HCl

or

vdw between molecules in Cl_2 > dipole dipole between molecules in HCl

Q3 · June 2018 · Paper 3 · Q25 · [1 mark]

Answer: **A**

Q4 · June 2025 · Paper 3 · Q11 · [1 mark]

Answer: **A**

A Na_2O MgO Al_2O_3 SiO_2 P_4O_{10} SO_3

Q5 · June 2025 · Paper 3 · Q19 · [1 mark]

Answer: **D**

SO_3

Q6 · June 2025 · Paper 3 · Q26 · [1 mark]

Answer: **C**

A solution of hydrochloric acid containing 6 mol of HCl reacts completely with 1 mol of Al_2O_3

Q7 · June 2025 · Paper 3 · Q30 · [1 mark]

Answer: **D**

sodium magnesium chlorine

Q8 · June 2025 · Paper 3 · Q31 · [1 mark]

Answer: **C**

tetrahedral pyramidal

Q9 · November 2020 · Paper 3 · Q2 · [5 marks]

(a) M1 (oxide ions react with water to) form/produce hydroxide ions

M1 $O^{2-} + H_2O \rightarrow 2OH^-$

Ignore all non-ionic equations

[1 mark]

M2 sodium hydroxide more soluble than magnesium hydroxide

M2 ideas that more sodium hydroxide dissolves / dissociates

Allow sodium oxide more soluble / dissociates more than magnesium oxide NOT 'molecules' or 'atoms'

[1 mark]

(b) $P_4O_{10} + 6H_2O \rightarrow 4H_3PO_4$

Allow multiples and fractions

Allow ionic products

NOT P_2O_5

[1 mark]

(c) M1 $V_2O_5 + SO_2 \rightarrow V_2O_4 + SO_3$

Allow 1 mark if both equations correct, but in wrong order

[1 mark]

M2 $V_2O_4 + ½O_2 \rightarrow V_2O_5$

ALLOW multiples

[1 mark]

Q10 · June 2023 · Paper 1 · Q3 · [6 marks]

(a) $P_4 + 5O_2 \rightarrow P_4O_{10}$

Allow $4P + 5O_2 \rightarrow P_4O_{10}$

[1 mark]

(b) $SO_2 + H_2O \rightarrow H_2SO_3$

Or

$SO_2 + H_2O \rightarrow 2H^+ + SO_3^{2-}$

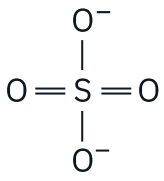
Or

$SO_2 + H_2O \rightarrow H^+ + HSO_3^-$

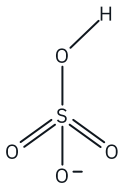
Do not accept H_2SO_4

[1 mark]

(c)



Allow



[1 mark]

(d) M1 $Mg + H_2O \rightarrow MgO + H_2$

M2 White solid/white powder

OR (Bright) white light/white flame

Do not accept white ppt

Do not accept effervescence

[2 marks]

(e) $3MgO + 2H_3PO_4 \rightarrow Mg_3(PO_4)_2 + 3H_2O$

Allow

$3MgO + 2H_3PO_4 \rightarrow 3Mg^{2+} + 2PO_4^{3-} + 3H_2O$

[1 mark]

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