

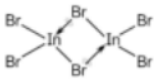
# 9. The Periodic Table: Chemical Periodicity

## 9.3 Chemical periodicity of other elements

### Paper 2

Question Paper

## Q1.

(c)	<p><b>M1</b> density of <math>{}_{13}\text{Al}</math>: value within range 2.5–5.0 (<math>\text{g cm}^{-3}</math>)</p> <p><b>M2</b> cationic radius of <math>{}_{31}\text{Ga}</math>: value within range 0.055–0.075 (nm)</p> <p><b>M3</b> boiling point of <math>{}_{49}\text{In}</math>: value within range 1500–2300 (K)</p>	<b>3</b>
(d)(i)	$\text{InCl}_3$	<b>1</b>
(d)(ii)	$\text{In}_2\text{O}_3 + 2\text{NaOH} + 3\text{H}_2\text{O} \rightarrow 2\text{NaIn}(\text{OH})_4$	<b>1</b>
(d)(iii)	 <p><b>M1</b> correct connectivity of <math>\text{In}_2\text{Br}_6</math></p> <p><b>M2</b> showing the two correct dative covalent bonds</p>	<b>2</b>

## Q2.

(c)(i)	<p><math>4\text{Ga} + 3\text{O}_2 \rightarrow 2\text{Ga}_2\text{O}_3</math></p> <p><b>M1</b> correct formula of <math>\text{Ga}_2\text{O}_3</math></p> <p><b>M2</b> correctly balanced equation based on <math>\text{Ga} + \text{O}_2</math> and formula of gallium oxide in M1</p>	<b>2</b>
(c)(ii)	amphoteric	<b>1</b>

## Q3.

(e)(i)	$\text{Ga}_2\text{O}_3 + 6\text{HCl} \rightarrow 2\text{GaCl}_3 + 3\text{H}_2\text{O}$	<b>1</b>
(e)(ii)	<p><b>M1</b> <i>Identity of correct gallium containing product</i>  <math>\text{NaGa}(\text{OH})_4</math> OR <math>\text{NaGaO}_2</math></p> <p><b>M2</b> <i>correctly balanced equation for reaction of <math>\text{Ga}_2\text{O}_3</math> with <math>\text{NaOH}(\text{aq})</math></i>  <b>EITHER</b>  <math>\text{Ga}_2\text{O}_3 + 2\text{NaOH} + 3\text{H}_2\text{O} \rightarrow 2\text{NaGa}(\text{OH})_4</math>  <b>OR</b>  <math>\text{Ga}_2\text{O}_3 + 2\text{NaOH} \rightarrow 2\text{NaGaO}_2 + \text{H}_2\text{O}</math></p>	<b>2</b>

## Q4.

(b)(i)	Similarities (any two from the following list) (both have) $+2$ ion / $(+2)$ same oxidation state / same stoichiometry of oxide / carbonates decompose (on heating)	<b>2</b>
	Difference (X) forms coloured compounds/oxides/ carbonates <b>OR</b> Group 2 elements form white compounds/oxides/carbonates	<b>1</b>
(b)(ii)	XO	<b>1</b>
(b)(iii)	$\text{XCO}_3 \rightarrow \text{XO} + \text{CO}_2$	<b>1</b>