1. Lithium is an element in Group 1 of the Periodic Table.

Lithium reacts with fluorine gas to form lithium fluoride.

Lithium fluoride is an ionic compound.

Write a balanced symbol equation for this reaction.

Include the state symbols in your answer.

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[3]

2. Silver chloride is a salt that is used to make lenses that darken in bright light.

Silver chloride can be made from silver nitrate in a precipitation reaction.

This is the symbol equation for the reaction.

$$AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$$

(i) Explain how this equation shows that silver chloride forms as a precipitate.

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[1]

(ii) Write a word equation for the reaction.

[1]

3. Hydrogen gas reacts with lithium at high temperatures to make lithium hydride.

(i) At the high temperatures of the reaction, **lithium is a liquid** and **lithium hydride is a solid**.

The equation shows the reaction of lithium with hydrogen.

Fill in the missing **state symbols** and **balance** the equation for the reaction.

The state symbols should match the state of the chemicals at the **high temperatures of the reaction**.

lithium	+	hydrogen	→	lithium hydride
.....Li( )	+	H_2( )	→	..... LiH( )

[2]

(ii) The formula for lithium hydride is LiH.

Lithium ions have a charge of + 1.

What is the formula of a hydride ion?

Put a (ring) around the correct answer.

$H^{2?}$ $H^{?}$ $H_2^{?}$ H^{2+} H^{+} H_2^{+}

[1]

(iii) Another compound has the formula CaH_2.

What is the name of this compound?

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[1]

4. In the Haber Process, nitrogen and hydrogen react to make ammonia, NH_3.

Write a balanced symbol equation for this reaction.

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[2]

5. Sam works for a company that makes chemicals to kill fungi on plants.

One of the chemicals the company makes is copper sulfate.

Sam makes some copper sulfate by reacting copper oxide with an acid.

Complete the **word** and **symbol** equation for the reaction.

copper oxide + [ ] → copper sulfate + [ ]

CuO + [ ] → $CuSO_4$ + [ ]

[2]

6. Jane has a solution of compound **B**, sodium sulfate, Na_2SO_4.

She adds acidified barium chloride solution, $BaCl_2$, to a solution of compound **B**.

(i) What does she **see** when she does this?

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[1]

(ii) Write a **balanced chemical** equation for the reaction that occurs.

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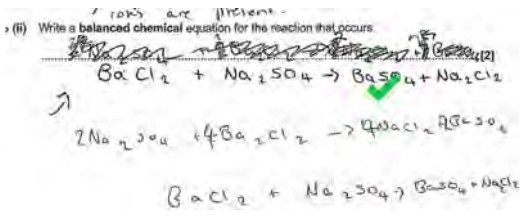
[2]

END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance
1			2Li(s) + F_2(g) ✓ → 2.LiF(s) state symbols ✓ chemical symbols ✓ balancing ✓	3	Allow: $Li(s) + {}^{1}/_{2}\ F_2(g) \rightarrow LiF(s)$
			Total	**3**	
2		i	(s) shows it is a solid / (s) is the state symbol / state symbol is a solid;	1	Must be linked to idea of state symbol **Ignore** 'it shows it's a solid' alone **Examiner's Comments** Most stated that 'a solid is formed'. This was not awarded a mark because it does not 'use the equation to show'. Some candidates did discuss the state symbol (s) linked to precipitate, but most failed to gain a mark.
		ii	silver nitrate + sodium chloride ? silver chloride + sodium nitrate	1	**Examiner's Comments** About half the candidates correctly wrote the word equation. Common incorrect answers included using incorrect names such as 'sodium chorine' or 'sodium nitrogen oxide'.
			Total	**2**	
3		i	**2Li (l)** + **H_2(g)** ? **2 LiH(s)** (l) (g) and (s) correct (1) 2 and 2 correct (1)	2	**do not accept** clear capital letters i.e. L and G **Examiner's Comments** Most candidates gained at least one mark, usually for correctly balancing the equation.

Question			Answer/Indicative content	Marks	Guidance
		ii	$H^{?}$	1	**Examiner's Comments** Most correctly identified the correct formula for the hydride ion.
		iii	calcium hydride	1	**Must be spelled correctly** **Examiner's Comments** This question was an interpretation question. Candidates were not expected to know the name of calcium hydride, but there was information in the question and from the Periodic Table that would enable them to deduce it. Most gave the correct name. Calcium hydroxide was a common incorrect answer
			Total	**4**	
4			$N_2 + 3H_2$? $2NH_3$ Formulae correct = 1 [Correct formulae] balanced = 1	2	equilibrium sign optional, accept ' = ' as alternative to ? accept multiples **Examiner's Comments** Almost all candidates copied out the formula of ammonia correctly, but often struggled with the formulae of nitrogen and hydrogen molecules. A very common answer was $N+H^3$? NH^3 Those who got the formulae correct were almost always able to balance the equation. The equilibrium sign was used in most cases.
			Total	**2**	

Question			Answer/Indicative content	Marks	Guidance
5			sulfuric acid AND H_2SO_4; (1) water AND H_2O;(1)	2	**Ignore** 'hydrogen sulfate' Examiner's Comments Candidates often knew one or other of the missing compounds. Those who knew the name of sulfuric acid did not always know the formula. Many thought hydrogen was the other product.
			Total	2	

Question			Answer/Indicative content	Marks	Guidance
6		i	White precipitate	1 (AO 1.2)	IGNORE cream
		ii	$BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + 2NaCl$ correct formula for one product $BaSO_4$/NaCl✓ fully correct equation with balancing ✓	2 (AO 2 × 1.2)	<u>Examiner's Comments</u> Most gave a correct formula for one of the products. **Misconception** Some candidates changed the formula of sodium chloride (which is very familiar to most candidates) in order to balance the equation. Exemplar 5  (ii) Write a balanced chemical equation for the reaction that occurs. $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + Na_2Cl_2$ $2Na_2SO_4 + 4BaCl_2 \rightarrow 4NaCl_2 + 4BaSO_4$ $BaCl_2 + Na_2SO_4 \rightarrow BaSO_4 + NaCl_2$ This answer gains one mark for a correct formula of a product ($BaSO_4$). However, the candidate has attempted to balance the equation by changing the formula of NaCl to Na_2Cl_2. This was a common error. Clearly the candidate knows the formula of sodium chloride, but is not sure how to show that there are two relative formula mass units in the equation.
			Total	3	