

Answer **all** the questions.

1. A student adds sodium hydroxide solution to a small sample of copper(II) chloride solution.

A precipitate is made.

What is the colour of the precipitate?

- A blue
- B green
- C orange
- D white

Your answer

[1]

2. A student is testing sodium carbonate solution.

She adds barium chloride solution followed by excess dilute hydrochloric acid.

Which of these observations would **not** be seen?

- A colourless solution at the end
- B gas bubbles when the dilute acid is added
- C white precipitate formed when the dilute acid is added
- D white precipitate formed when the barium chloride solution is added

Your answer

[1]

3(a). Chemical tests are used to identify gases, anions and cations.

Draw straight lines to match the **gas** to the correct **chemical test** used in analysis.

gas	chemical test
	relights a glowing splint
carbon dioxide	turns moist red litmus blue
chlorine	turns moist blue litmus red and then white
ammonia	turns acidified potassium manganate(VII) solution colourless
hydrogen	turns lime water milky
oxygen	burns with a squeaky pop
	turns moist pH paper green

[5]

(b). Fahmida uses the flame test to identify the cations in a solid.

Describe how Fahmida should do a flame test.

[3]

(c). Fahmida does three chemical tests on an unknown solution.

Look at her results.

Chemical test	Result
pH probe	pH value is 3
dilute hydrochloric acid followed by barium chloride solution	white precipitate
dilute nitric acid followed by silver nitrate solution	white precipitate

Which ions are present in the solution?

Choose from:

calcium

hydrogen

iron(II)

chloride

sulfate

Explain your answer.

[4]

5. Jed is testing potassium chloride and some unknown compounds.

He does some tests.

These are the tests that Jed does on solutions of the compounds:

- a flame test
- adding sodium hydroxide solution
- adding silver nitrate solution.

Look at his results.

Compound	Flame colour	Adding sodium hydroxide solution	Adding silver nitrate solution
potassium chloride	lilac	no reaction	white solid made
A	yellow	no reaction	white solid made
B	no colour	green solid made	cream solid made

Potassium chloride reacts with silver nitrate to make silver chloride and potassium nitrate.

Write a **word** equation for this reaction.

Identify the unknown compounds **A** and **B** and explain your answers.



The quality of written communication will be assessed in your answer to this question.

6. Chemical tests are used to identify gases, anions and cations.

Leila has an unknown solution.

She thinks that the solution contains copper(II) ions and bromide ions.

Describe the chemical tests she does to confirm the presence of these two ions in the solution.

[4]

7. Copper reacts with oxygen, O₂.

Copper oxide, CuO, is made.

Write a **balanced symbol** equation for this reaction.

[2]

8. Baking powder is used in cake mixes.

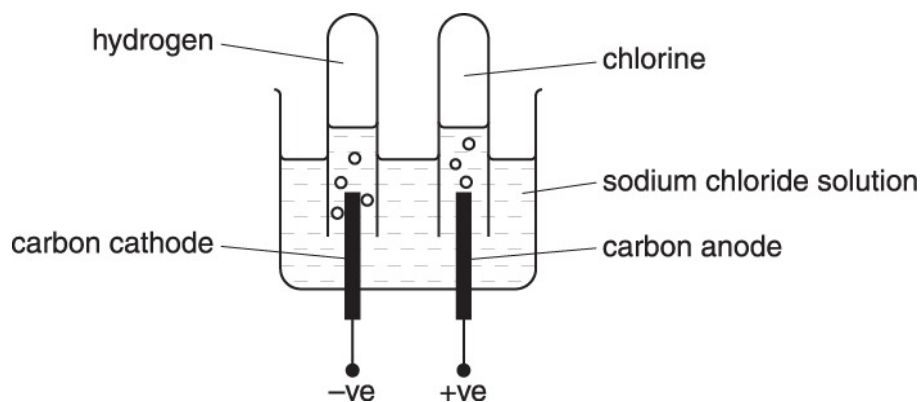
Baking powder makes carbon dioxide when heated.

Write about the chemical test for carbon dioxide.

[2]

9(a). Molly investigates passing an electric current through sodium chloride solution.

Look at the apparatus she uses.



Look at the list. It shows the particles in sodium chloride solution.



Which particle is a **molecule**?

Choose from the list.

answer

[1]

(b). Chlorine is made in this experiment.

What is the **test** for chlorine gas?

[2]

10. Oskar investigates the thermal decomposition of zinc carbonate.

zinc carbonate → zinc oxide + carbon dioxide

Oskar wants to check that carbon dioxide is made during the reaction.

What is the chemical test for carbon dioxide?

----- [2]

11. The electrolysis of concentrated sodium chloride solution (brine) makes:

- hydrogen
- chlorine
- sodium hydroxide.

(i) Write down one **use** of **chlorine**.

----- [1]

(ii) Describe the chemical test for chlorine and write down what you would see.

----- [2]

END OF QUESTION PAPER

Mark Scheme

Question		Answer/Indicative content	Marks	Guidance
1		A	1	
		Total	1	
2		C	1	
		Total	1	
3	a	<p>gas</p> <p>chemical test</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>carbon dioxide</p> <p>chlorine</p> <p>ammonia</p> <p>hydrogen</p> <p>oxygen</p> </div> <div style="width: 45%;"> <p>relights a glowing splint</p> <p>turns moist red litmus blue</p> <p>turns moist blue litmus red and then white</p> <p>turns acidified potassium manganate(VII) solution colourless</p> <p>turns lime water milky</p> <p>burns with a squeaky pop</p> <p>turns moist pH paper green</p> </div> </div>	5	Each link = 1 mark
	b	<p>Use a flame test wire (1)</p> <p>Moisten wire and dip into sample (1)</p> <p>Introduce sample into blue flame of Bunsen burner (1)</p>	3	<p>ALLOW use a wooden splint</p> <p>ALLOW spray bottle</p> <p>ALLOW moisten wooden splint and dip into sample</p> <p>ALLOW have ions dissolved in the spray bottle</p>

Mark Scheme

Question		Answer/Indicative content	Marks	Guidance
	c	<p>Hydrogen, chloride and sulfate are present (1)</p> <p>Hydrogen ions because pH is 3 (1)</p> <p>Sulfate because white precipitate with barium chloride (1)</p> <p>Chloride because white precipitate with silver nitrate (1)</p>	4	<p>ALLOW H^+, Cl^- and SO_4^{2-}</p> <p>ALLOW (1) for the three correct ions</p> <p>ALLOW(1) for each correct explanation (must be linked to correct ion)</p>
		Total	12	

Mark Scheme

Question	Answer/Indicative content	Marks	Guidance
4	<p>Pete is right about A but wrong about B (no mark)</p> <p>A contains copper (ions) because it gives a blue (ppt) with sodium hydroxide (1)</p> <p>A contains sulfate (ions) because it gives a white (ppt) with barium chloride (1)</p> <p>B contains iron(III) (ions) because it gives a brown (ppt) with sodium hydroxide (1)</p> <p>B does not contain sulfate (ions) as it does not give a white (ppt) with barium chloride (1)</p>	4	<p>allow Pete is wrong not Pete is wrong about A for marks about A not Peter is correct for B for marks about B</p> <p>copper sulfate goes blue with sodium hydroxide is not sufficient</p> <p>copper sulfate goes white with barium chloride is not sufficient</p> <p>iron(III) sulfate goes brown with sodium hydroxide is not sufficient</p> <p>B is not iron(III) sulfate because it does not go white with barium chloride is not sufficient</p> <p>allow B does not contain sulfate as it does not give a ppt</p> <p>allow A and B both cannot be sulfates since they do not both go white with barium chloride (2)</p> <p>Examiner's Comments</p> <p>This question was common with the higher tier paper and was poorly answered. Most candidates had little knowledge or understanding of analytical tests and could not relate the colour of the precipitates formed on the addition of sodium hydroxide to the ions present. A common answer was to state that Pete was wrong because copper sulfate would give a brown precipitate with sodium hydroxide solution.</p>
	Total	4	

Mark Scheme

Question	Answer/Indicative content	Marks	Guidance
5	<p>[Level 3] Identifies compounds A and B, with explanations AND constructs the word equation Quality of written communication does not impede communication of the science at this level. (5 – 6 marks)</p> <p>[Level 2] Identifies either compound A or B, or the elements or ions present in either A or B AND constructs the word equation OR Identifies both compounds A and B, or the elements or ions present in both A or B, with explanations Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks)</p> <p>[Level 1] Identifies one element or ion present in either A or B OR constructs the word equation Quality of written communication impedes communication of the science at this level. (1 – 2 marks)</p> <p>[Level 0] Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	6	<p>This question is targeted at grades up to C</p> <p>Indicative scientific points may include:</p> <p>Word equation potassium chloride + silver nitrate ? silver chloride + potassium nitrate</p> <p>allow correct formulae or mix of words and formulae</p> <p>allow $KCl + AgNO_3 \rightarrow AgCl + KNO_3$</p> <p>Compound A</p> <ul style="list-style-type: none"> • compound A contains sodium (ions) • compound A contains chloride (ions) • compound A is sodium chloride <p>Reasons</p> <ul style="list-style-type: none"> • because sodium gives a yellow flame test colour • because chloride ions give a white ppt with silver nitrate <p>Compound B</p> <ul style="list-style-type: none"> • compound B contains iron(II) (ions) • compound B contains bromide (ions) • compound B is iron(II) bromide <p>Reasons</p> <ul style="list-style-type: none"> • iron(II) (ions) give a green ppt with sodium hydroxide • bromide (ions) give a cream ppt with silver nitrate <p>allow solid instead of ppt</p> <p>Use the L1, L2, L3 annotations in RM Assessor; do not use ticks.</p> <p>Examiner's Comments</p> <p>This 6 mark question was targeted up to grade C. To gain credit at level 3 (5 – 6</p>

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
					marks) candidates needed to write the word equation for the reaction and to identify compounds A and B with explanations. Most candidates were unable to interpret the results to identify compounds A and B and only gained credit at Level 1 for the word equation.
			Total	6	
6			<p>Copper(II) ions – add aqueous sodium hydroxide (1)</p> <p>Gives a blue precipitate (1)</p> <p>Bromide ion – add aqueous silver nitrate followed by dilute nitric acid (1)</p> <p>Gives a cream precipitate (1)</p>	4	<p>ALLOW any soluble metal hydroxide / aqueous ammonia</p> <p>ALLOW blue solid / blue solid that redissolves into dark blue solution if ammonia is used</p>
			Total	4	
7			<p>$2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$</p> <p>formulae (1)</p> <p>balancing (1)</p>	2	<p>balancing mark is conditional on correct formulae</p> <p>allow any correct multiple e.g. $4\text{Cu} + 2\text{O}_2 \rightarrow 4\text{CuO}$</p> <p>allow = or ? for arrow</p> <p>not 'and' or & for +</p> <p>allow one mark for correct balanced equation with incorrect use of upper case, lower case and subscript</p> <p>e.g. $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$ (1)</p> <p>Examiner's Comments</p> <p>The equation was often correct in terms of formulae but some candidates did not attempt to balance the equation. A common misconception was to have the formula for copper oxide as CuO_2. Candidates also need to be careful to insure that they use the correct case when writing the symbol for Cu and avoid writing CU</p>
			Total	2	

Mark Scheme

Question		Answer/Indicative content	Marks	Guidance
8		(bubble through) lime-water / calcium hydroxide (solution) (1) goes milky / goes cloudy / white precipitate / goes white (1)	2	ignore method focus on reagent second marking point is dependent on correct reagent Examiner's Comments The test for carbon dioxide was known by some candidates although some referred to a test with a burning splint. A significant proportion of the candidates did not attempt this question.
		Total	2	
9	a	H ₂ O (1)	1	allow other ways of indicating correct response eg ringing or ticking the correct answer but answer on answer line takes precedence Examiner's Comments Some candidates identified water as a molecule from the list but few candidates.
	b	(moist) litmus paper / pH paper (1) bleaches / (goes red) then white (1)	2	allow indicator paper for litmus Examiner's Comments Few candidates knew how to test for chlorine.
		Total	3	
10		lime water / calcium hydroxide (solution) (1) goes milky / gives a white precipitate (1)	2	allow Ca(OH) ₂ allow goes white / misty / cloudy / creamy Examiner's Comments The test for carbon dioxide was not well known. Some candidates described carbon dioxide putting out a flame. Many candidates described the test for hydrogen.
		Total	2	

Mark Scheme

Question			Answer/Indicative content	Marks	Guidance
11		i	to sterilise (water) / to make solvents / (to make household) bleach / to make plastics (1)	1	<p>allow swimming pools</p> <p>cleans water or cleaning pools is not sufficient</p> <p>Examiner's Comments</p> <p>Most candidates could recall that chlorine was used in swimming pools although most candidates did not explain why. Candidates did not often refer to chlorine sterilising water and often referred to cleaning water instead.</p>
		ii	<p>(moist) litmus paper (1)</p> <p>bleaches (1) This mark is dependent on the correct reagent</p>	2	<p>allow (damp) litmus paper</p> <p>allow (moist Universal) indicator paper / (damp Universal) indicator paper</p> <p>allow removes colour / turns white</p> <p>Examiner's Comments</p> <p>The chemical test for chlorine was not well known. The use of litmus or other indicators was not recalled by candidates. Candidates often gave tests for other gases such as lime- water or a glowing splint.</p>
			Total	3	