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Level 1 Chemistry, 2019

90934 Demonstrate understanding of aspects of chemical reactions

9.30 a.m. Monday 18 November 2019
Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of chemical reactions.	Demonstrate in-depth understanding of aspects of chemical reactions.	Demonstrate comprehensive understanding of aspects of chemical reactions.

Check that the National Student Number (NSN) on your admission slip is the same as the number at the top of this page.

You should attempt ALL the questions in this booklet.

A periodic table and other reference material are provided in the Resource Booklet L1–CHEMR.

If you need more room for any answer, use the extra space provided at the back of this booklet and clearly number the question.

Check that this booklet has pages 2 – 11 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.

TOTAL

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QUESTION ONE

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You may use the solubility rules provided in the resource booklet.

(a) The following pairs of solutions are mixed together.

Complete the table below by identifying:

- whether a precipitate forms
- the name of any precipitate that may have formed.

Solutions being mixed	Precipitate forms? Yes / No	Name of precipitate (if formed)
calcium nitrate and sodium sulfate		
potassium nitrate and sodium hydroxide		

(b) Sodium hydroxide and copper(II) sulfate react to form a precipitate.

(i) Describe any observations that would be seen during this reaction, and link the observations to all reactants and products.

(ii) Write a balanced ionic equation showing the formation of the precipitate.

Balanced ionic equation:

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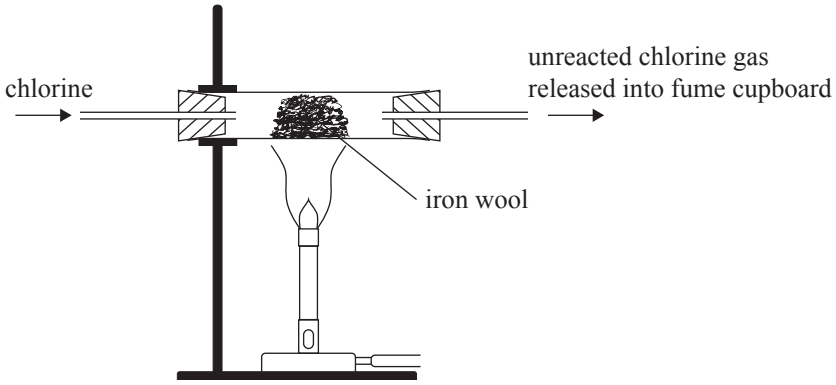
(c) When iron wool is heated in the presence of chlorine gas, a vigorous reaction occurs causing the iron wool to glow. When the reaction is complete, a reddish-brown solid of iron(III) chloride remains.



(i) What type of reaction is occurring?

Justify your answer.

(ii) Write a balanced symbol equation for the reaction.

Balanced symbol equation:

(iii) When the reddish-brown product has cooled, it can be dissolved in water in a clean beaker. A sample of this solution can then be tested with a few drops of silver nitrate solution.

What would be observed when the silver nitrate is added?

Explain your answer with reference to the type of reaction occurring, and the reactants and products involved.

QUESTION TWO

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(a) A teacher showed students digital recordings of three different reactions.

Reaction	Description of procedure
1	Hot sodium metal was plunged into a flask containing chlorine gas.
2	A piece of iron metal was added to a solution of lead nitrate.
3	A boiling tube containing solid copper hydroxide was strongly heated.

(i) What are the types of reactions occurring?

Reaction	Type of reaction occurring
1	
2	
3	

(ii) Complete the following equations for Reaction 1 and Reaction 2.

Reaction 1:

Word equation:

sodium + chlorine →

Reaction 2:

Balanced symbol equation:

$Fe + Pb(NO_3)_2$ →

(iii) What would be observed during Reaction 3?

Link the observations to the species involved and write a balanced symbol equation for Reaction 3.

Reaction 3:

Balanced symbol equation:

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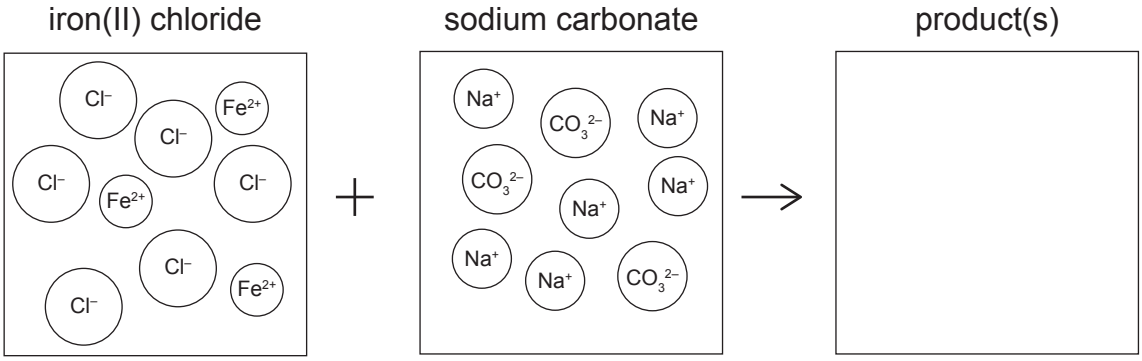
(b) A compound used in iron supplements to treat anaemia can be formed by reacting iron(II) chloride with sodium carbonate.

(i) Complete the following word equation for the reaction.

iron(II) chloride + sodium carbonate →

(ii) The diagrams below show the ions in each of the solutions (water particles are not shown).

Complete the diagram by drawing and labelling the arrangement of the particles after the two solutions have reacted (you do **not** need to show the water particles in the solutions).



(iii) Write a balanced ionic equation for the reaction occurring.

Balanced ionic equation:

(iv) What type of reaction is occurring?

Explain your answer.

QUESTION THREE

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(a) Hard water contains excess Ca^{2+}. A water-softening process is needed to remove Ca^{2+} from water, and involves adding **sodium carbonate** to the water. **Calcium carbonate** is formed during this process.

(i) Why can **sodium carbonate** be used to remove Ca^{2+} from water?

Your explanation should include identification of the type of reaction occurring.

(ii) When **calcium carbonate** is strongly heated, it undergoes a reaction.

Elaborate on this reaction.

In your answer, you should:

- identify the type of reaction occurring and justify your answer
- describe any observations that would be made and link these to the substances involved
- write a balanced symbol equation for the reaction
- describe a test that could be used to confirm the presence of one of the products formed.

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Balanced symbol equation:

Question Three continues on the following page.

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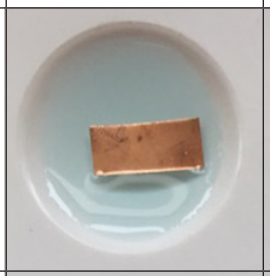
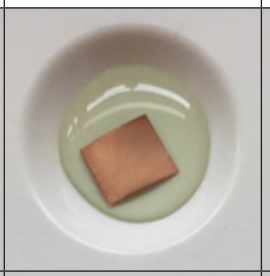
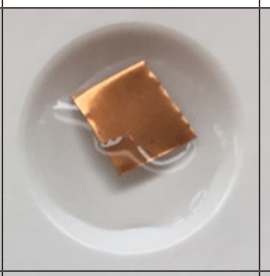
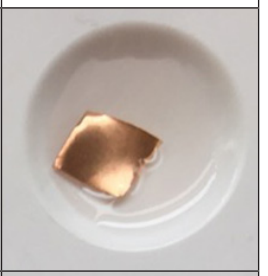
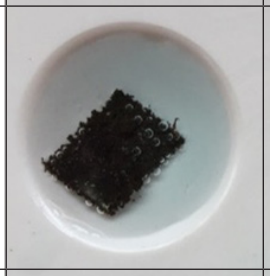
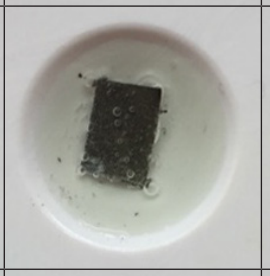
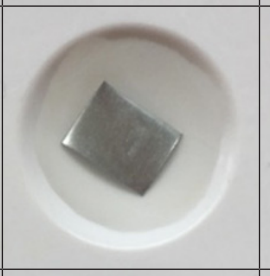
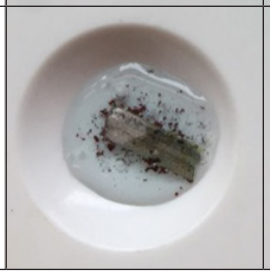
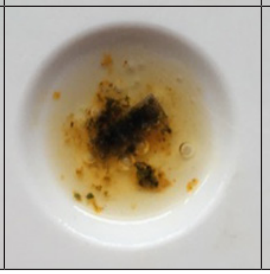
(b) Some pieces of copper, zinc, and magnesium were placed in the wells of a spotting tile.
Different sulfate solutions were added to the wells.
The table below shows the spotting tile after a few hours.

Metal	Sulfate solution			
	A	B	C	D
Copper				
Zinc				
Magnesium				

(i) Use the information in the table above to determine which sulfate solutions A, B, C, and D are.

Choose from magnesium sulfate, copper(II) sulfate, iron(II) sulfate, and zinc sulfate.

You may use the activity series provided in the resource booklet.

Solution	Sulfate solution
A	
B	
C	
D	

(ii) Elaborate on the reactions occurring in the wells.

In your answer, you should:

- identify the type of reaction occurring and explain what occurs during this type of reaction
- explain the observations in the wells with **zinc** metal.

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There is more space for this question on the following page.

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Extra paper if required.
Write the question number(s) if applicable.

QUESTION NUMBER

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