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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Chemistry 2023

90934 Demonstrate understanding of aspects of chemical reactions

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.

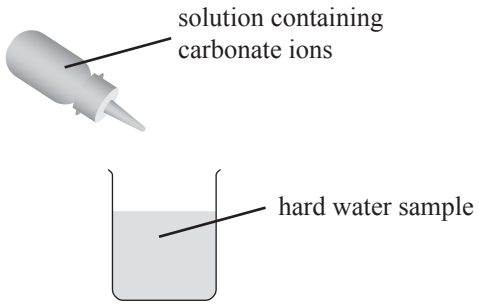
Check that this booklet has pages 2–12 in the correct order and that none of these pages is blank.

Do not write in any cross-hatched area (DO NOT WRITE IN THIS AREA DO NOT WRITE). This area will be cut off when the booklet is marked.

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

QUESTION ONE

Hard water is water that contains high amounts of calcium ions, $Ca^{2+}(aq)$, and magnesium ions, $Mg^{2+}(aq)$. Water softening can be carried out to remove these ions by adding a solution containing carbonate ions.



(a) (i) Name a solution containing carbonate ions that could be used for water softening.

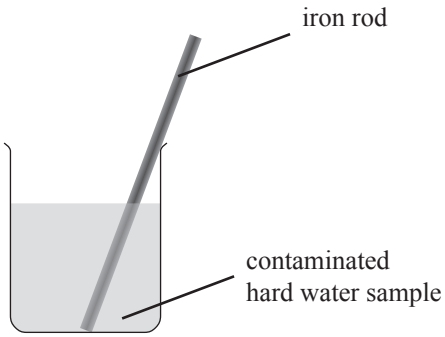
(ii) Identify the type of reaction occurring, and explain how it can be used to remove the $Ca^{2+}(aq)$ and $Mg^{2+}(aq)$ ions.

In your answer, you should link any observations made to the species involved.

(iii) Write a balanced **ionic** equation for the reaction occurring to remove **either** $Ca^{2+}(aq)$ or $Mg^{2+}(aq)$ ions.

Balanced ionic equation:

(b) Another sample of hard water containing $Ca^{2+}(aq)$ and $Mg^{2+}(aq)$ is known to be contaminated with lead ions, $Pb^{2+}(aq)$.



It is suggested that a method of removing these ions from solution would be to place an iron rod into the hard water sample.

Justify which ions, if any, would be removed from the solution if this method was used.

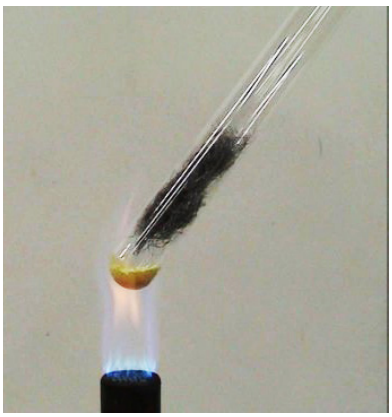
In your answer you should:

- consider whether or not a reaction will occur, and explain why
- consider any observation(s) that would be made, and link these to the species involved
- consider the type of any reaction that occurs, and whether this would be a suitable method of removing the lead ions
- give an equation(s) for any reaction that occurs.

Equation(s):

QUESTION TWO

A teacher demonstrates the reaction between iron wool and sulfur powder. They are placed in a test tube and heated.



Source: www.sciencemadness.org/whisper/files.php?pid=200864&aid=12897

(a) (i) What type of reaction occurs?

(ii) Explain any observations that you would make during this reaction, and link these to the reactants and products.

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

Balanced symbol equation:

(b) (i) An unknown powder was heated using a Bunsen burner.

The powder is known to be either copper carbonate or copper hydroxide.

- State the type of reaction that occurs.
- Explain any observations that may be made during this reaction.
- Explain the **chemical** tests you could carry out to confirm which compound the powder is.

Source: https://cgsscience.files.wordpress.com/2016/05/img_0380.jpg?w=770&h=&zoom=2

(ii) Write TWO balanced symbol equations for the reactions occurring.

Balanced symbol equations:

QUESTION THREE

Four different solutions (reagents) were mixed to give the following **four solids** as shown in the table:

	Solution A	**Solution B**
Solution C	lead carbonate	lead iodide
Solution D	silver carbonate	silver iodide

(a) (i) Complete the table to give an example of what the solutions/reagents **A–D** could be:

Solution	**Example**
A	
B	
C	
D	

(ii) Elaborate on the reactions occurring between reagents **A** and **C**, and **A** and **D**.

In your answer you should:

- state the type of reactions occurring
- explain the reaction type by referring to the ions involved and the solids formed
- describe any observations that would be made, and link them to all species involved
- include balanced ionic equations for the reactions.

Balanced ionic equation(s):

(b) A teacher shows a video clip of a piece of sodium metal being heated with a Bunsen burner, and then an inverted gas jar containing chlorine gas being placed over it. A spectacular reaction results, and an image of this is shown on the right.

Source: https://edu.rsc.org/exhibition-chemistry/the-reaction-between-sodium-and-chlorine/4015463.article

Analyse this reaction.

In your answer you should:

- include a balanced equation for the reaction
- state the type of reaction that occurs
- describe any observations made, and link these to all species involved
- explain any electron transfer occurring.

Balanced symbol equation:

There is more space for your answer on the following page.

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

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