90934

909340

1

SUPERVISOR'S USE ONLY

NZQA

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

QUALIFY FOR THE FUTURE WORLD
KIA NOHO TAKATŪ KI TŌ ĀMUA AO!

Level 1 Chemistry, 2016

90934 Demonstrate understanding of aspects of chemical reactions

2.00 p.m. Monday 21 November 2016
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 2–8 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.

Merit

TOTAL 15

ASSESSOR'S USE ONLY

QUESTION ONE

ASSESSOR'S USE ONLY

(a) Name the precipitate that is formed when the following solutions are mixed together.

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

(i) Zinc nitrate and sodium carbonate

$Zn(NO_3)_2$ Na_2CO_3

$ZnCO_3$ Zinc carbonate.

(ii) Barium chloride and sodium sulfate

$BaCl$ Na_2SO_4

$BaSO_4$ Barium sulfate.

(b) (i) Copper sulfate solution and sodium hydroxide solution react to form a precipitate.

$CuSO_4$ $NaOH$

Complete the following equation showing the formation of the precipitate.

$$Cu^{2+} + OH^- \rightarrow Cu(OH)_2$$

(ii) Why is this reaction classified as a precipitation reaction?

Because after two solution reacted ($CuSO_4$ and $NaOH$ solution) the solution turns cloudy ~~an insoluble solid product is made.~~ ($Cu(OH)_2$) This is because the force of attraction between Cu^{2+} ions and OH^- ions is bigger than the force of attraction within the two reactants. Therefore, an insoluble solid of $Cu(OH)_2$ is produced and is called a precipitate. which makes the mixed solution cloudy

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

A blue solution of copper sulfate is ~~the~~ mixed to a colourless solution of sodium hydroxide. ~~As time goes by, the blue colour fades and became a colourless solution of Na_2SO_4. A green solid~~ As time goes by, a blue percipitate ($Cu(OH)_2$) forms.

Zn Pb Fe NaCl NaCl

A solution is known to contain zinc ions OR lead ions.

How could a piece of iron metal, and a solution of sodium chloride, each be used to decide the identity of the metal?

In your answer, you should:

- for each test, write a method that could be carried out in a school laboratory
- describe any observations and link them to the reactants and products involved
- write balanced ionic equations for any reactions that occur.

ASSESSOR'S USE ONLY

Test 1: Iron metal could be used to test the lead ions. Put a piece of iron metal into the solution. As time goes by, the iron metal will decrease in length, a grey metal forms on the outside of the piece of iron metal. The grey metal that forms is lead. This is because due to the metal activity series, iron is more reactive than lead. Therefore, when we put the piece of iron into the solution, a metal displacement will happen to help us test the lead.

Test 2: The sodium chloride solution could be used to test the lead ions. Mix the sodium chloride solution and the known solution. As time goes by, a white precipitate will forms. The precipitate forms is $PbCl_2$ as due to the solubility rules, Cl^- is all soluble except for $PbCl_2$.

Zinc ions in solution cannot be tested or identified by using these two substance. Zinc is more reactive than iron, so there will be no metal displacement.

extra paper

Balanced ionic equations:

$$2Cl^-_{(l)} + Pb^{2+}_{(l)} \longrightarrow PbCl_{2(s)}$$

C

Q7

QUESTION TWO

(a) Iron can be reacted with sulfur when a mixture of powdered iron and powdered sulfur is heated in a test tube.

(i) What type of reaction occurs?

combination reaction

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

A green powder (Fe^{2+}) and a yellow powder (S^{2-}) are heated in a test tube. After a period of time, a white powder (FeS) formed of FeS forms.

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

$Fe^{2+}_{(s)} + S^{2-}_{(s)} \longrightarrow FeS_{(s)}$

(b) When magnesium is heated with oxygen, a bright light is produced and a white-grey solid forms (**Reaction 1**).

When magnesium metal is added to a solution of copper sulfate, the blue colour of the solution fades and a pinky-brown solid forms (**Reaction 2**).

What are the similarities and differences between **Reaction 1** and **Reaction 2**?

In your answer, you should include:

- the types of reactions occurring
- reference to electron transfer, where appropriate
- word equations for the reactions occurring.

Reaction 1 is a combination reaction. During the combination reaction between a metal (magnesium) and an non-metal (oxygen), the electrons are transfered. The Mg^{2+} ions gain 2 electrons to form Mg and the O^{2-} ions lose 2 electrons to form O. Therefore they finally form MgO which the O^{2-} loses. Thus finally

they form MgO.

Reaction 2 is metal displacement reaction. During this reaction, as Mg is more reactive than Cu, the Mg metal displaces Cu metal to gain the 2 electrons released by SO_4^{2-}.

ASSESSOR'S USE ONLY

N

Word equation for Reaction 1: Magnesium + Oxygen → Magnesium monoxide

~~$Mg^{2+}_{(s)} + O^{2-}_{(g)} \longrightarrow MgO_{(s)}$~~

Word equation for Reaction 2: Magnesium + Copper Sulfate → Copper + magnesium ~~sulfate~~ sulfate.

~~$Mg^{2+}_{(s)} + CuSO_{4(l)} \longrightarrow Cu^{2+}_{(s)} + MgSO_{4(l)}$~~

A2

MO_2 $2H_2O_2 \xrightarrow{MO_2} 2H_2 + 2O_2$

QUESTION THREE

ASSESSOR USE ONLY

(a) A small amount of solid manganese dioxide is added to a test tube of freshly prepared hydrogen peroxide solution. H_2O_2

(i) What observations would be made?

Explain your answer by linking any observations to the reactants and products involved.

A grey solid (~~MnO_2~~ MgO_2) is added to a colourless solution of hydrogen peroxide.

(ii) What type of reaction is occurring?

Explain your answer.

This type of reaction is called catalystic decomposition. Because it is one compound being decomposed into more than one products with the use of catalyst.

(b) Three white solids are known to be lead hydroxide, sodium hydrogen carbonate, and calcium carbonate.

How could the three solids be identified using decomposition reactions?

Support your answer with balanced symbol equations.

Lead hydroxide: When white solid of lead hydroxide is heated in a test tube, a white ~~grey~~ powder ~~solid~~ of lead oxide will forms. Some colourless liquid of H_2O will ~~formed~~ be produced on the inner glassware of the test tube.

Sodium hydrogen Carbonate: When a white solid of sodium hydrogen carbonate is heated in a test tube, a white ~~grey~~ powder ~~solid~~ of sodium oxide will be produced. Some colourless liquid of H_2O will be produced on the inner glassware of the testube. A colourless gas of CO_2 will be produced and be accessed to lime water through

another tube. There will be white percipitate forming in lime water.

ASSESSOR'S USE ONLY

Calcium Carbonate: When a white solid of calcium carbonate is heated, a white powder of calcium oxide is produced, a colourless gas (CO_2) is produced and access to lime water. There will be white percipitate forming in lime water.

Balanced symbol equations:

$Pb(OH)_2 \longrightarrow PbO + H_2O$

$4NaHCO_3 \longrightarrow 2Na_2O + 2H_2O + 4CO_2$

$CaCO_3 \longrightarrow CaO + CO_2$

M5

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

QUESTION NUMBER

ASSESSOR'S USE ONLY

Q1(c) between zinc and iron after we put the iron ~~piece~~ metal in the solution. ~~As~~ And as sodium chlorides is all soluble except AgCl and $PbCl_2$, there will be no percipitation that ~~identifies~~ could help us to identify the zinc ions.

90934

Annotated Exemplar Template

Merit Exemplar 2016

Subject:	Chemistry	Standard:	90934	Total score:	15

Q	Grade score	Annotation
1	E7	The candidate correctly identified the precipitates, but did not balance the equation in part (b)(i). Although the precipitate definition was correctly answered, the candidate failed to mention the formation of the colourless Na_2SO_4. This prevented the response from gaining Excellence. The candidate did give a thorough explanation of both reactions in part (c), but did not provide both equations, only one.
2	A3	The candidate gave incorrect colours to a reactant and a product in part (a). The correct product formula was given, but ionic formulae for the reactants were given. In part (b), the candidate correctly identified the reaction type, but failed to explain why it was that reaction type. Also an incorrect account of electron transfer was given, even though both word equations were correct.
3	M5	In part (a)(i), the candidate correctly identified the type of reaction occurring, but gave incorrect observations. The candidate omitted to explain about the catalyst function. In part (b), the candidate identifies one of the three powders correctly and gives two correct equations. No mention of the test for water formation kept the grade score below Excellence.