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1

90171

NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

National Certificate of Educational Achievement
TAUMATA MĀTAURANGA Ā-MOTU KUA TAEA

Level 1 Chemistry, 2003

90171 Classify reactions, complete word equations, and carry out chemical calculations

Credits: Five
9.30 am Monday 24 November 2003

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 answer ALL the questions in this booklet.

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

A metal activity series, solubility rules, a table of ions and a periodic table are provided in the Resource Booklet in your Level 1 Chemistry package.

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.

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Achievement Criteria		
Achievement	**Achievement with Merit**	**Achievement with Excellence**
Classify reactions, complete word equations and calculate relative molecular masses. ☐	Describe and interpret reactions, complete word and balanced chemical equations, and calculate relative molecular masses. ☐	Apply knowledge of reactions, write word and balanced chemical equations and carry out mass and mass-mass calculations. ☐
Overall Level of Performance ☐		

You are advised to spend 45 minutes answering the questions in this booklet.

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QUESTION ONE

Classify EACH of the reactions in the table below by writing the letter from the **Key List** in the space provided.

	Type of Reaction
sodium carbonate + sulfuric acid → sodium sulfate + carbon dioxide + water	(a)
lead nitrate + zinc → lead + zinc nitrate	(b)
$2\ NaHCO_3(s) \rightarrow Na_2CO_3(s) + CO_2(g) + H_2O(l)$	(c)
$2\ NaCl(aq) + Pb(NO_3)_2(aq) \rightarrow PbCl_2(s) + 2\ NaNO_3(aq)$	(d)
$MgO(s) + H_2SO_4(aq) \rightarrow MgSO_4(aq) + H_2O(l)$	(e)

Key List:		
	Neutralisation	N
	Oxidation–reduction	O
	Precipitation	P
	Thermal Decomposition	T

QUESTION TWO

The following pairs of solutions are mixed. Use the solubility rules to identify the **precipitate** (if any) that is formed. Write the **name of the precipitate** or, if there is none formed, write **no precipitate**.

Solutions that are mixed	Name of precipitate or no precipitate
barium nitrate and copper sulfate	(a)
magnesium nitrate and sodium hydroxide	(b)
potassium hydroxide and sodium carbonate	(c)

QUESTION THREE

Complete the following word equations.

(a) copper carbonate + _____ → copper chloride + water + carbon dioxide

(b) zinc + sulfuric acid → _____ + _____

(c) magnesium chloride + lead nitrate → _____ + _____

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QUESTION FOUR

Complete a balanced equation for EACH of the following reactions.

(a) H_2SO_4 + NaOH → Na_2SO_4 + _____

(b) Fe_3O_4 + CO → Fe + CO_2

(c) $MgCO_3$ + _____ → $MgSO_4$ + _____ + _____

(d) $Pb^{2+}(aq)$ + $OH^-(aq)$ → _____

QUESTION FIVE

The following reactions (a)–(c) are carried out in the laboratory.

For EACH reaction, describe TWO observations that you would expect to make. For EACH example, name at least one product and write a balanced equation for the reaction that occurs.

(a) A piece of magnesium metal is added to hydrochloric acid.

Observation 1: _____

Observation 2: _____

Product(s): _____

Balanced equation: _____

(b) A piece of magnesium metal is burned in oxygen.

Observation 1: _____

Observation 2: _____

Product(s): _____

Balanced equation: _____

(c) A sample of green copper carbonate is heated. A gas is given off and this gas is passed into lime water (calcium hydroxide solution).

Observation 1: _____

Observation 2: _____

Product(s): _____

Balanced equation (note: you are only required to write the equation for the heating of the copper carbonate):

_____

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QUESTION SIX

Write a balanced chemical equation to explain the following observations for EACH reaction below.

(a) A solution of chlorine (Cl_2) dissolved in water is added to a solution of potassium iodide. The colourless solution turns a yellow/brown colour.

(b) A colourless solution of zinc chloride is added to a colourless solution of sodium carbonate. A white precipitate is formed.

QUESTION SEVEN

Using the data given below, calculate the relative molecular masses for EACH of the following compounds (a)–(c) of iron, Fe.

M_r: O = 16.0 C = 12.0 Fe = 55.9 N = 14.0

(a) $FeCO_3$

(b) $Fe(NO_3)_3$

(c) Fe_2O_3

QUESTION EIGHT

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(a) Energy is obtained from respiration and can be represented by the following equation:

$$C_6H_{12}O_6(aq) + 6\ O_2(g) \rightarrow 6\ CO_2(g) + 6\ H_2O(g)$$

If 50.0 g of glucose, $C_6H_{12}O_6$, reacts according to this equation, calculate the mass of carbon dioxide, CO_2, that would be produced.

Relative atomic masses: C = 12.0, H= 1.0, O = 16.0

mass of CO_2 = _____

(b) Some microbes gain energy from anaerobic respiration. This can be represented by the following equation:

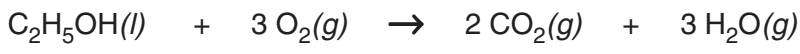
$$C_6H_{12}O_6(aq) \rightarrow 2\ CO_2(g) + 2\ C_2H_5OH(aq)$$

If 22.0 g of carbon dioxide is produced by this reaction, calculate the mass of ethanol that would also be produced.

Relative atomic masses: C = 12.0, H= 1.0, O = 16.0

mass of ethanol = _____

(c) The ethanol, C_2H_5OH, produced as a result of anaerobic respiration can be burned to produce energy. This can be represented by the following equation:



$$C_2H_5OH(l) + 3\,O_2(g) \rightarrow 2\,CO_2(g) + 3\,H_2O(g)$$

Calculate the mass of ethanol, C_2H_5OH, needed to produce 13.2 g of carbon dioxide, CO_2.

Relative atomic masses: C = 12.0, H = 1.0, O = 16.0

mass of C_2H_5OH = _____

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Extra paper for continuation of answers if required.
Clearly number the question.

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