SUPERVISOR'S USE ONLY

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NZQA | Mana Tohu Mātauranga o Aotearoa
New Zealand Qualifications Authority

Level 1 Chemistry 2023

90933 Demonstrate understanding of aspects of selected elements

Credits: Four

Achievement	Achievement with Merit	Achievement with Excellence
Demonstrate understanding of aspects of selected elements.	Demonstrate in-depth understanding of aspects of selected elements.	Demonstrate comprehensive understanding of aspects of selected elements.

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.

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The assessment begins on the following page.

QUESTION ONE

Lithium, sodium, and potassium are all metals on the periodic table.

(a) (i) Write the electron configurations of each element in the table below.

Element	Electron configuration
Lithium	
Sodium	
Potassium	

(ii) Explain whether lithium, sodium, and potassium are found naturally in their elemental state.

In your answer you should refer to:

- their position on the periodic table
- atomic structure
- chemical reactivity.

(b) Magnesium is another metal found, along with sodium, in the third period of the periodic table. Images of these metals and their storage are shown below:

Magnesium ribbon in dry air

Source: https://rukminim1.flixcart.com/image/832/832/xif0q/electronic-hobby-kit/u/f/c/nkit-magnesium-ribbon-25gm-nortonkit-original-imaggtsdj5ckahvt.jpeg?q=70

Sodium stored in paraffin oil

Source: https://www.amazon.ca/Sodium-Element-Sample-Mineral-Labeled/dp/B07P78BL59

Magnesium can be stored safely in dry air. However, it would be very dangerous to store sodium in dry air (no water).

Compare and contrast the storage of these metals, with links to the species involved, and their periodic table positions.

Include appropriate equation(s) with your answer.

Equation(s):

(c) Calcium and potassium both react with water.

(i) Complete the equations below.

Word equation:

potassium + water →

Balanced symbol equation:

$Ca + \quad H_2O \rightarrow$

(ii) What would you observe when calcium and potassium are separately added to water? Explain your observations by linking to the products being formed.

QUESTION TWO

https://isorepublic.com/photo/coding-on-laptop/

Many metal elements and alloys are involved in the manufacture of a laptop computer.

Table A shows the purpose of some of these.

Table A

Metal / metal alloy	**Use in laptop computer**
Aluminium	Heat sinks*
Magnesium alloy	Laptop case
Copper	Wiring, circuit boards
Solder (tin / lead alloy)	Used to connect electrical components

* A heat sink is an object that absorbs and transfers away heat generated by the computer components.

Table B shows some of the physical properties of some of the selected metals.

Table B

Metal	**Physical Property**				
	Density / kg m^{-3}	**Melting Point / °C**	**Hardness (Brinell) / MPa**	**Electrical Conductivity / S m^{-1}**	**Thermal Conductivity W / mK**
Copper	8940	1084	874	6.0×10^7	413
Lead	11340	328	38	4.9×10^6	37
Aluminium	2712	660	245	3.5×10^7	237
Magnesium	1738	650	260	2.5×10^7	159
Zinc	7140	420	412	1.7×10^7	123
Tin	7265	232	50	9.2×10^6	73

(a) Why are copper, lead, and aluminium suitable for the purposes given in **Table A** above?

In your answer, you should use the information in **Table B** (data not required).

(b) Magnesium metal can be alloyed with other elements, such as aluminium, zinc, or other metals.

Why is magnesium alloy used, rather than pure magnesium metal, for laptop cases?
In your answer, you should refer to:

- what an alloy is, and its structure
- the relevant physical properties of magnesium, and the metals it may be alloyed with.

QUESTION THREE

Oxygen has two allotropes, oxygen, O_2, and ozone, O_3.

(a) (i) Describe what an allotrope is.

(ii) Ozone is formed in two steps:

- **Step 1:** An oxygen molecule breaks down into two atoms of oxygen.
- **Step 2:** The oxygen atoms react with oxygen molecules to form ozone.

Write the TWO balanced symbol equations for the reactions that form ozone.

Step 1: Balanced symbol equation:

Step 2: Balanced symbol equation:

(b) Chlorine and ozone can both be used to disinfect swimming pool water.

Evaluate the use of ozone and chlorine for disinfecting swimming pool water.

In your answer include explanations of:

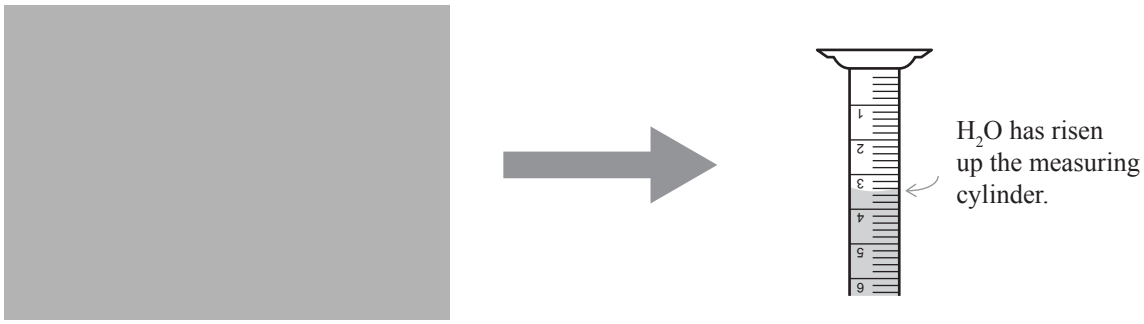
- how each chemical acts to disinfect water
- physical and chemical properties of each chemical
- advantages and disadvantages of using each chemical
- any relevant symbol equations.

Equation(s):

Question Three continues on the following page.

(c) Ammonia is another compound that can be used in water treatment.

If a measuring cylinder of ammonia is placed upside down in a container of cold water, the water is seen to move up the measuring cylinder, as shown below:



Source: www.chem.uiuc.edu/chem103/molar_mass/collecting.htm

(i) Explain why the water has moved up the measuring cylinder.

(ii) A piece of damp litmus paper is used to test the ammonia solution in the measuring cylinder.

Describe an observation that would be made and justify your reasoning for this observation.

Support your answer with a balanced symbol equation.

Balanced symbol equation:

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

QUESTION NUMBER

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

QUESTION NUMBER