



For Supervisor's use only

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90697



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA



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

Level 3 Chemistry, 2005

90697 Describe selected atomic, molecular and ionic properties

Credits: Three

9.30 am Wednesday 23 November 2005

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.

Show all working for all calculations.

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

A periodic table is provided on the Resource Sheet in your Level 3 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.

<i>For Assessor's use only</i>		Achievement Criteria	
Achievement	<input type="checkbox"/>	Achievement with Merit	Achievement with Excellence
Describe properties of atoms, molecules, ions and compounds.	<input type="checkbox"/>	Explain properties of atoms, molecules, ions and compounds.	<input type="checkbox"/>
		Analyse and interpret information about properties of atoms, molecules, ions and compounds.	<input type="checkbox"/>
Overall Level of Performance		<input type="checkbox"/>	

You are advised to spend 35 minutes answering the questions in this booklet.

QUESTION ONE: ATOMIC PROPERTIES

- (a) State the trend in atomic radius and in first ionisation energy (IE) down Group 2 from Be to Ca. Give an explanation for these trends.

Trend in atomic radius from Be to Ca: _____

Trend in first IE from Be to Ca: _____

Explanation:

- (b) (i) Write the electron configuration using *s,p,d* notation for

F _____

F⁻ _____

Na⁺ _____

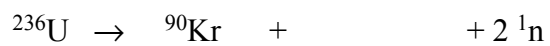
- (ii) Compare the relative sizes of the F atom and the F⁻ ion, and explain the difference in their radii.

- (iii) Compare the relative sizes of the F^- and Na^+ ions, and explain the difference in their radii.

QUESTION THREE: NUCLEAR REACTIONSAssessor's
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(a) (i) Write an equation for the decay of phosphorus-32 by emission of a β particle.

(ii) Complete the following equation for the decay of uranium-236.



(b) Carbon-14 is a β -emitter, and is used to date objects found in archaeological digs. The half-life of carbon-14 is 5 730 years.

Calculate the fraction of carbon-14 that would remain in a sample of wood 28 650 years old.

QUESTION FOUR: COLOURFUL CHEMICALS

- (a) Give the colour of the following ions

$\text{Mn}^{2+}(\text{aq})$ _____

$\text{MnO}_4^{2-}(\text{aq})$ _____

$\text{Cr}^{3+}(\text{aq})$ _____

- (b) Describe the **colour changes** that occur in the following reactions. **Link** the observations to the reactants and products, and write a balanced chemical equation for each reaction.

- (i) A solution of sodium thiocyanate, NaSCN, is added to a solution of iron(III) nitrate.

Equation:

- (ii) Concentrated hydrochloric acid is carefully added to a solution of copper(II) sulfate.

Equation:

