Captivate
EDUCATION

SAMPLE QUESTIONS
One question from each section of this exam, with its marking scheme, so teachers can see what the full paper is like. Full exam and solutions: captivateeducation.com.au/trial-exams

Chemistry

Question and Answer Book

Practice examination 1 – 2027

- Reading time is 15 minutes
- Writing time is 2 hours 30 minutes

Approved materials

- One scientific calculator

Materials supplied

- Question and Answer Book
- Data Book
- Multiple-Choice Answer Sheet

Instructions

- Follow the instructions on your Multiple-Choice Answer Sheet.
- At the end of the examination, place your Multiple-Choice Answer Sheet inside the front cover of this book.

Students are not permitted to bring mobile phones and/or any unauthorised electronic devices into the examination room.

Contents

Section A (30 questions, 30 marks)

Section B (8 questions, 90 marks)

Practice material in the layout of the 2025 VCAA paper – generated 2027. Not a VCAA examination.

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Section A – Multiple-choice questions

Instructions

- Answer **all** questions in pencil on your Multiple-Choice Answer Sheet.
- Choose the response that is correct or that best answers the question.
- A correct answer scores 1; an incorrect answer scores 0.
- Marks will not be deducted for incorrect answers.
- No marks will be given if more than one answer is completed for any question.
- Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Sample – Question 1 of the 30 questions in this section.

Question 1

Which one of the following correctly identifies a fuel, its classification and its main combustible component?

A.

Fuel	Classification	Main combustible component
biogas	biofuel	methane

B.

Fuel	Classification	Main combustible component
natural gas	biofuel	methane

C.

Fuel	Classification	Main combustible component
biodiesel	fossil fuel	methyl esters of fatty acids

D.

Fuel	Classification	Main combustible component
bioethanol	biofuel	glucose

End of Section A

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Section B

Instructions

- Answer **all** questions in the spaces provided.
- Write your responses in English.
- Give simplified answers to all numerical questions, with an appropriate number of significant figures; unsimplified answers will not be given full marks.
- Show all working in your answers to numerical questions; no marks will be given for an incorrect answer unless it is accompanied by details of the working.
- Ensure that chemical equations are balanced and that the formulas for individual substances include an indication of state, for example, H2(g), NaCl(s).

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- Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Sample – Question 1 of the 8 questions in this section; Question 1 is shown to part c of its 6 parts.

Question 1 (6 marks)

Harriet is comparing liquid fuels for a portable camping burner. She burned bioethanol, C_2H_5OH, produced from sugar cane waste, beneath a steel pot containing 500.0 g of water and recorded the following results.

Measurement	Value
mass of water in pot (g)	500.0
initial temperature of water (°C)	18.2
final temperature of water (°C)	42.8
mass of bioethanol burned (g)	3.20

a. Write a balanced thermochemical equation for the complete combustion of ethanol. Use item 12 of the Data Book. 2 marks

b. Calculate the energy absorbed by the water in the pot, in kJ. 2 marks

c. Calculate the energy released by the complete combustion of 3.20 g of bioethanol. 2 marks

End of sample questions

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Marking scheme for the sample questions

Section A

Question	Key	Question	Why
1	**A**	Which one of the following correctly identifies a fuel, its classification and its main combustible component?	Biogas is produced by the anaerobic digestion of organic waste (renewable, so a biofuel) and is mostly methane with CO_2. B: natural gas is a fossil fuel. C: biodiesel is a biofuel (methyl esters are its component). D: bioethanol is a biofuel but its combustible component is ethanol; glucose is the feedstock.

Section B

Question 1a. (2 marks)

Write a balanced thermochemical equation for the complete combustion of ethanol. Use item 12 of the Data Book.

To be awarded full marks, students were required to:

$C_2H_5OH(l) + 3O_2(g) \rightarrow 2CO_2(g) + 3H_2O(l) \quad \Delta H = -1367 \text{ kJ mol}^{-1}$

Mark allocation:

- The first mark was awarded for the correctly balanced equation with all states shown (liquid water, as item 12 specifies).
- The second mark was awarded for $\Delta H = -1367 \text{ kJ mol}^{-1}$ with the negative sign and units.

Common errors: Writing $H_2O(g)$; omitting the sign of ΔH; giving ΔH in kJ without mol^{-1} for an equation written for one mole of fuel.

Question 1b. (2 marks)

Calculate the energy absorbed by the water in the pot, in kJ.

To be awarded full marks, students were required to:

$q = mc\Delta T = 500.0 \times 4.18 \times (42.8 - 18.2) = 500.0 \times 4.18 \times 24.6 = 51\,414 \text{ J} = 51.4 \text{ kJ}$

Mark allocation:

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- The first mark was awarded for the correct substitution into q = mcΔT with ΔT = 24.6 °C.
- The second mark was awarded for 51.4 kJ (3 significant figures) with the conversion from J to kJ.

Common errors: Using the mass of fuel instead of the mass of water; leaving the answer in joules when kJ was asked for.

Question 1c. (2 marks)

Calculate the energy released by the complete combustion of 3.20 g of bioethanol.

To be awarded full marks, students were required to:

$n(C_2H_5OH) = 3.20 \div 46.0 = 0.0696$ mol

$E = 0.0696 \times 1367 = 95.1$ kJ

Mark allocation:

- The first mark was awarded for n(ethanol) = 0.0696 mol.
- The second mark was awarded for 95.1 kJ.

Common errors: Using the heat of combustion of bioethanol in kJ g^{-1} from item 14 (29.7 × 3.20 = 95.0 kJ) was accepted; using the molar enthalpy without converting mass to moles was not.

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