

Please write clearly in block capitals.

Centre number

Candidate number

Surname \_\_\_\_\_

Forename(s) \_\_\_\_\_

Candidate signature \_\_\_\_\_

I declare this is my own work.

# Level 3 Certificate/Extended Certificate

## APPLIED SCIENCE

Unit 1 Key Concepts in Science  
Section B – Chemistry

Time allowed: 1 hour 30 minutes.  
You are advised to spend approximately 30 minutes on this section.

**Materials**

For this paper you must have:

- a calculator
- the Formulae Sheet (enclosed)
- the Periodic Table (enclosed).

**Instructions**

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in each section.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

For Examiner's Use	
Question	Mark
1	
2	
<b>TOTAL</b>	

**Information**

- You will be provided with a copy of the Formulae Sheet and the Periodic Table.
- There are three sections in this paper:  
**Section A** – Biology      **Section B** – Chemistry      **Section C** – Physics.
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60 and the maximum mark for this section is 20.

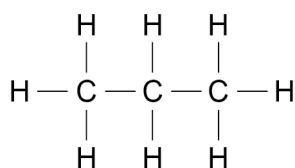
**Advice**

Read each question carefully.



**Section B – Chemistry**Answer **all** the questions in this section.**0 1**This question is about propane ( $C_3H_8$ ).

The carbon and hydrogen atoms in propane are joined by single covalent bonds.

**Figure 1** shows the displayed formula of propane.**Figure 1****0 1 . 1**

Name the type of structure in propane.

**[1 mark]**

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**0 1 . 2**

How is a covalent bond formed in propane?

**[2 marks]**

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**0 1 . 3**

Hydrocarbons with small molecules, such as propane, are volatile.

Define the term **volatile**.**[1 mark]**

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The enthalpy of formation of propane can be calculated using Hess's Law and enthalpies of combustion.

**0 1 . 4** Define the term **enthalpy of formation**.

**[2 marks]**

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**Question 1 continues on the next page**

**Turn over ►**



**0 1 . 5** Table 1 shows enthalpy of combustion data.

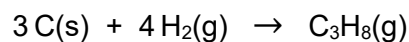
**Table 1**

	<b>C(s)</b>	<b>H<sub>2</sub>(g)</b>	<b>C<sub>3</sub>H<sub>8</sub>(g)</b>
<b>Enthalpy of combustion / kJ mol<sup>-1</sup></b>	-393.5	-285.8	-2220.7

Calculate the enthalpy of formation of propane.

Use the enthalpy changes of combustion shown in **Table 1** and Hess's Law to answer.

Draw a Hess's Law cycle in your answer.



**[4 marks]**

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Enthalpy of formation of propane = \_\_\_\_\_ kJ mol<sup>-1</sup>

**10**



**0 2**

This question is about calcium and calcium compounds.

**0 2 . 1**

Give the electron configuration of a calcium atom.

Use the Periodic Table.

**[1 mark]**

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**0 2 . 2**

Describe the metallic bonding in calcium.

**[2 marks]**

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**0 2 . 3**

Calcium metal reacts with dilute nitric acid to form calcium nitrate and one other product.

Identify the other product.

**[1 mark]**

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**0 2 . 4**The formula of the nitrate ion is  $\text{NO}_3^-$ 

What is the formula of calcium nitrate?

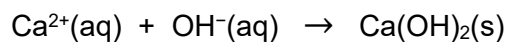
**[1 mark]**

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**Question 2 continues on the next page****Turn over ►**

**0 2 . 5** Metal ions in solution are often identified by adding sodium hydroxide solution.

The ionic equation for the reaction of calcium ions with hydroxide ions is:



What type of reaction is this?

**[1 mark]**

Tick (✓) **one** box.

Acid-base neutralisation

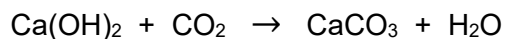
Acid-metal

Combustion

Precipitation

**0 2 . 6** Calcium hydroxide can react with carbon dioxide to form calcium carbonate.

The equation for the reaction is:



Calculate the number of moles of calcium carbonate formed from 200 kg of calcium hydroxide.

Use the Periodic Table.

**[4 marks]**

Number of moles of calcium carbonate = \_\_\_\_\_

**10**

**END OF QUESTIONS**



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1 2



2 2 6 A A S C 1 / C

IB/M/Jun22/ASC1/C