

# Victorian Certificate of Education

## CHEMISTRY 2026 Unit 1

### SAC 2 AOS 2 Outcome 2

Reading time: 5 minutes

Writing time: 45 minutes

Directions to students

Student's Name: \_\_\_\_\_

Teacher: \_\_\_\_\_

#### Structure of booklet

Section	Question to be answered	Total marks
Short answer	7	45
	Total	45

#### Materials

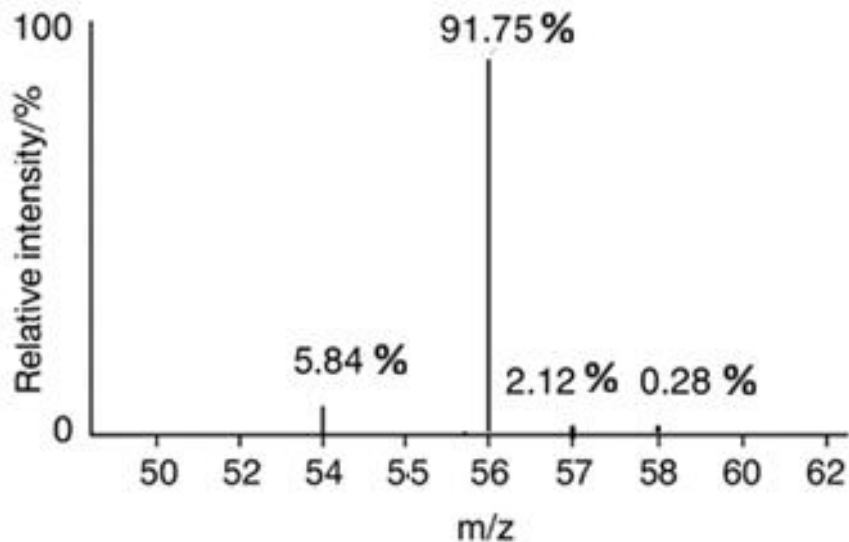
- Students are permitted to bring into the examination room: pencils, highlighters, erasers, sharpeners, rulers, and an approved scientific calculator.
- Students are NOT permitted to bring into the examination room: white out liquid/tape, phones or electronic devices, including smart watches.
- Students are provided with the following: Question and answer book of 16 pages and VCAA Data booklet.

#### The task

- Please ensure that you write your name and teacher's name on this booklet. This paper consists of short answer questions and 20 multiple choice questions.
- There are a total of 45 marks available.
- Be sure to include states with all chemical equations.
- All numerical answers need to be quoted to the correct number of significant figures.
- All working out must be shown in the space provided.

**Question 1** (5 marks)

A mass spectrum shows the percentage abundance of each isotope of an element. The mass spectrum of a sample of the element iron is shown below.



- a. State two conclusions you can draw from this spectrum. 2 marks

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- b. Use the percentage intensity values on the spectrum to determine the relative atomic mass of iron. 3 marks

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**Question 2** (4 marks)

The image below shows part of the label on a 3.00 kg bag of garden lime.



Lime is an ionic compound, calcium hydroxide,  $\text{Ca}(\text{OH})_2$ .

- a. Determine the relative formula mass of calcium hydroxide. 1 mark
- b. Determine the number of  $\text{Ca}^{2+}$  ions in 200 grams of lime. 2 marks
- c. Determine the percentage by mass of oxygen in lime. 1 mark
- d. Determine the mass of hydrogen in a 3.00 kg bag of lime. 1 mark

**Question 3** (5 marks)

Ammonium sulfate is another common fertilizer.

Its chemical formula is  $(\text{NH}_4)_2\text{SO}_4$  and its molar mass is  $132 \text{ g mol}^{-1}$ .



a. Determine the percentage composition of  $(\text{NH}_4)_2\text{SO}_4$  2 marks

b. In a 500 g sample of ammonium sulfate,  
i. determine the mass of sulfate ions 1 mark

ii. number of mole of ions present 1 mark

iii. determine the mass, in grams, of sulphur 1 mark

**Question 4** (8 marks)

The mass of carbon in a 4.80 g sample of a hydrocarbon is found to be 4.11 g.

a. Determine the mass of hydrogen in the sample. 1 mark

b. Determine the empirical formula of the compound. 2 marks

c. The molar mass of the compound is  $56 \text{ g mol}^{-1}$ .  
Determine the molecular formula of the compound. 1 mark

d. Draw and name two structures with the molecular formula determined in part c. 4 marks



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\_\_\_\_\_

**Question 5** (6 marks)

a. Draw the structural formulas of the following:

3 marks

i. 2-methylpentane



ii. 3,4-dichlorohex-3-ene



iii. 2-chloropropanoic acid



b. Write the semi-structural formula of 3,3-dichlorobutan-1-ol.

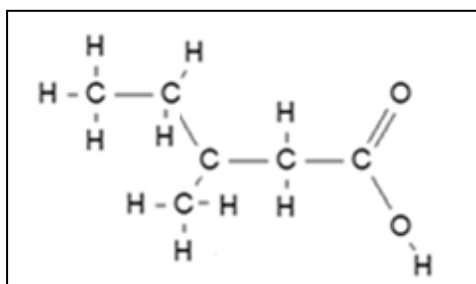
1 mark

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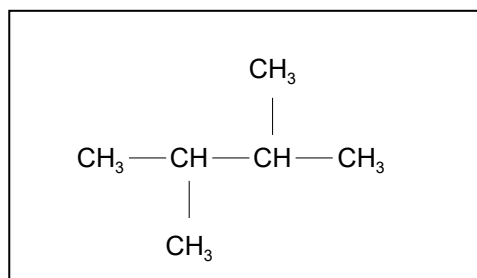
c. Write the systematic names of the following compounds

2 marks

i.



ii.



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**Question 6** (6 marks)

a. Hydrocarbons can be classified as saturated or unsaturated compounds. Give an example of a saturated compound and an unsaturated compound and use your examples to explain what the term saturated means. 2 marks

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b. Some carbon compounds are members of a homologous series. Use carboxylic acids as an example to explain what a homologous series is. 2 marks

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c. Rank the following organic molecules in order of boiling point: propan-1-ol, propanoic acid and 1-chloropropane. Justify your answer.

3 marks

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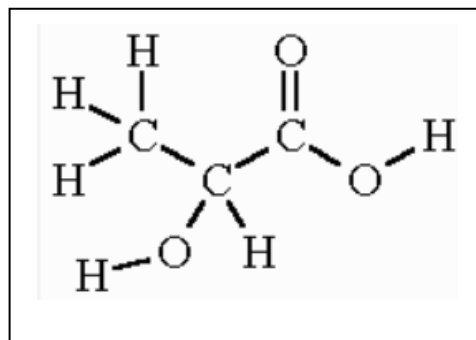
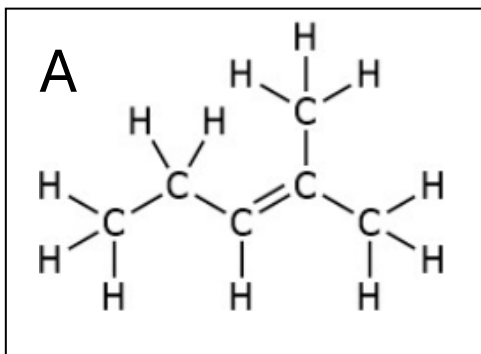
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7. Consider the following molecules. These molecules act as monomers for polymerisation reactions. ( 9 marks)



a. What type of reaction takes place to form a polymer from molecule A?

\_\_\_\_\_ 1 mark

b. What type of reaction takes place to form a polymer from molecule B?

\_\_\_\_\_ 1 mark

c. Draw a repeating section of the polymer formed by two molecules of monomer A in the box below

2 marks

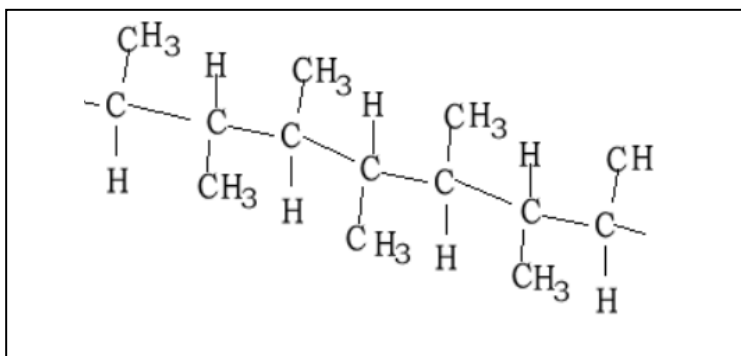


d. Draw a section of the polymer formed by two molecules of monomer B in the box below and clearly label and name the functional group that links the two monomers

2 marks



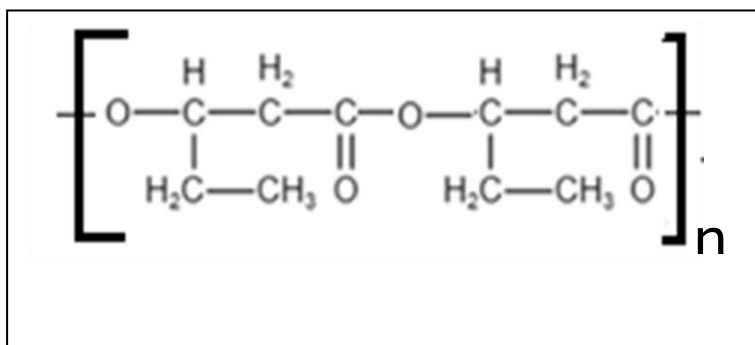
e. Consider the small section of a polymer shown below.



Draw the structural formula, in the box below, of the monomer that formed this polymer. 1 mark



f. Consider the small section of a polymer shown below.



Name the monomer and write its semi-structural formula in the box below

2 marks

