

2025-DSE
CHEM

PAPER 1B

BHONG KONG EXAMINATIONS AND ASSESSMENT AUTHORITY
HONG KONG DIPLOMA OF SECONDARY EDUCATION EXAMINATION 2025**CHEMISTRY PAPER 1****SECTION B: Question-Answer Book B**

This paper must be answered in English

INSTRUCTIONS FOR SECTION B

- (1) After the announcement of the start of the examination, you should first write your Candidate Number in the space provided on Page 1 and stick barcode labels in the spaces provided on Pages 1, 3, 5, 7 and 9.
- (2) Refer to the general instructions on the cover of the Question Paper for Section A.
- (3) This section consists of **TWO** parts, Parts I and II.
- (4) Answer **ALL** questions in both Parts I and II. Write your answers in the spaces provided in this Question-Answer Book. Do not write in the margins. Answers written in the margins will not be marked.
- (5) An asterisk (*) has been put next to the questions where one mark will be awarded for effective communication.
- (6) Supplementary answer sheets will be provided on request. Write your candidate number, mark the question number box and stick a barcode label on each sheet, and fasten them with string **INSIDE** this Question-Answer Book.
- (7) No extra time will be given to candidates for sticking on the barcode labels or filling in the question number boxes after the 'Time is up' announcement.

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Candidate
Number

* A 1 4 0 E 0 1 B *

PART I

Answer **ALL** questions. Write your answers in the spaces provided.

1. Two experiments were carried out to estimate the mass of sodium chloride in the same sea water sample. Below shows the steps involved in the two experiments:

Experiment 1

- Step (1): Filter the sea water sample.
 Step (2): Weigh an evaporating basin.
 Step (3): Transfer the filtered sea water sample to the evaporating basin.
 Step (4): Heat the filtered sea water sample to dryness.
 Step (5): Weigh the evaporating basin and its contents.

Experiment 2

- Step (1): Filter the sea water sample.
 Step (2): Transfer the filtered sea water sample to a beaker.
 Step (3): Place a filter paper on top of the beaker.
 Step (4): Evaporate the filtered sea water sample slowly at room temperature.
 Step (5): Filter the salt crystals from the solution when the crystals stopped growing in size.
 Step (6): Weigh the crystals collected.

- (a) During Step (4) of Experiment 2, the filtered sea water sample becomes more and more concentrated and finally becomes saturated. Someone claims that a saturated solution must be a concentrated solution. Do you agree?

(1 mark)

- (b) Common salt crystals can also be obtained by slow cooling of saturated sea water.

- (i) However, the common salt crystals obtained in this way are often low in yield. Suggest a reason for this.
- (ii) This method of crystallization relies on the fact that the solubility of sodium chloride increases with temperature. Give an example of a substance of decreasing solubility with temperature.

(2 marks)

- (c) Before Step (6), what steps need to be carried out to ensure accurate weighing of the crystals?

(2 marks)

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1. (d) The purity of the common salt obtained by both experiments are different.
- (i) State which experiment yield common salt of higher purity.
- (ii) Suggest why the crystals in experiment 2 stopped growing in size after a few days.
- (iii) Explain whether the mass of sodium chloride crystals obtained in experiment 2 is an underestimation or an overestimation.

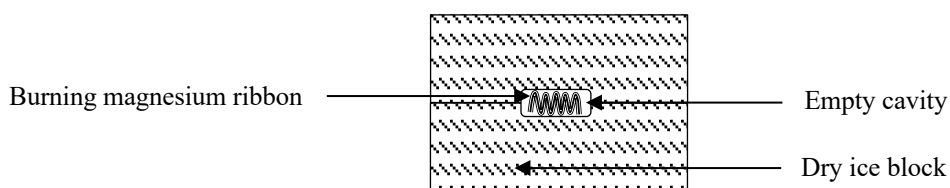
(3 marks)

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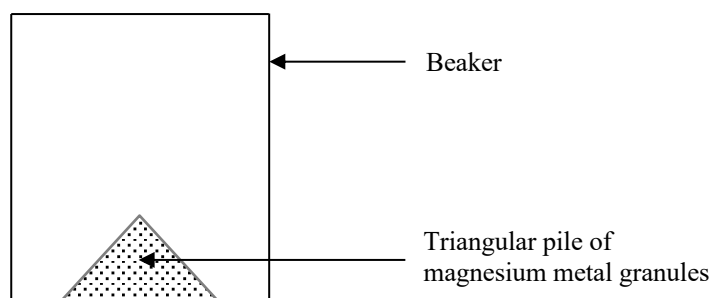
2. This question investigates the properties of magnesium. In the diagram below, a piece of burning magnesium ribbon is placed in an empty cavity in between two dry ice blocks.



- (a) The magnesium ribbon continued burning in the empty cavity with a bright white light.
- (i) Write a balanced chemical equation for the reaction occurring in the empty cavity.
- (ii) Explain whether carbon dioxide extinguishers should be used to put out magnesium fires.

(2 marks)

The properties of magnesium metal were further investigated by the following experimental set-up.



The triangular pile of magnesium metal is lit on fire. The pile first turns red hot, then burns with a bluish-green flame and cloudy white smoke. The pile stops burning after a while. The resultant pile is then split in half, the surface of the pile is covered with white solids, while the centre of the pile is filled with yellow solids.

- (b) The yellow solids are then sprayed with water. A gas which turns red litmus paper blue is given out.
- (i) Draw the electron diagram of the yellow solids.
- (ii) Hence, write a balanced chemical equation for the formation of the yellow solids from the burning of magnesium metal in air.

(2 marks)

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2. (c) To determine the mass of yellow solids produced, the following steps are proposed:
- Step (1): Add an excess amount of water to a conical flask containing the yellow solids.
Step (2): Absorb the gas evolved with a known volume and concentration of excess HCl(aq).
Step (3): Titrate the resultant solution against standard NaOH(aq).
- (i) Write the chemical equation for the reaction in Step (1).
- (ii) Suggest and outline the procedures of a step before Step (3) to make up the resultant solution to 250.0 cm³.
- (iii) Suppose the gas evolved is absorbed by 100.0 cm³ of 2.0 M HCl(aq) to form solution A. Solution A first undergoes the procedures in (c) (ii) to form solution B, then 25.0 cm³ aliquots of solution B is titrated against 0.1 M NaOH(aq). The reasonable average titre is 23.70 cm³. Calculate the mass of yellow solids produced.
- (iv) Explain whether an accurate estimation of the mass of yellow solids is obtained by the proposed steps. If not, is the mass of yellow solids calculated in (c) (iii) an underestimation or an overestimation? Assume the error induced by the spraying of the yellow solids to test for the pH of the gas given out is negligible.

(7 marks)

Answers written in the margins will not be marked.

3. (a) (i) Compare and explain the difference in melting points between *trans*-butenedioic acid and *cis*-butenedioic acid.

(ii) Compare and explain the difference in boiling points between *trans*-butenedioic acid and *cis*-butenedioic acid.

(4 marks)

(b) Sulfamic acid is an intermediate compound between sulphuric acid and sulfamide, with the formula H_3NSO_3 .

(i) Draw the three-dimensional structure of sulfamic acid.

(ii) Explain, with the aid of a structural diagram, whether the melting point of sulfamic acid or sulphuric acid is higher.

(4 marks)

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