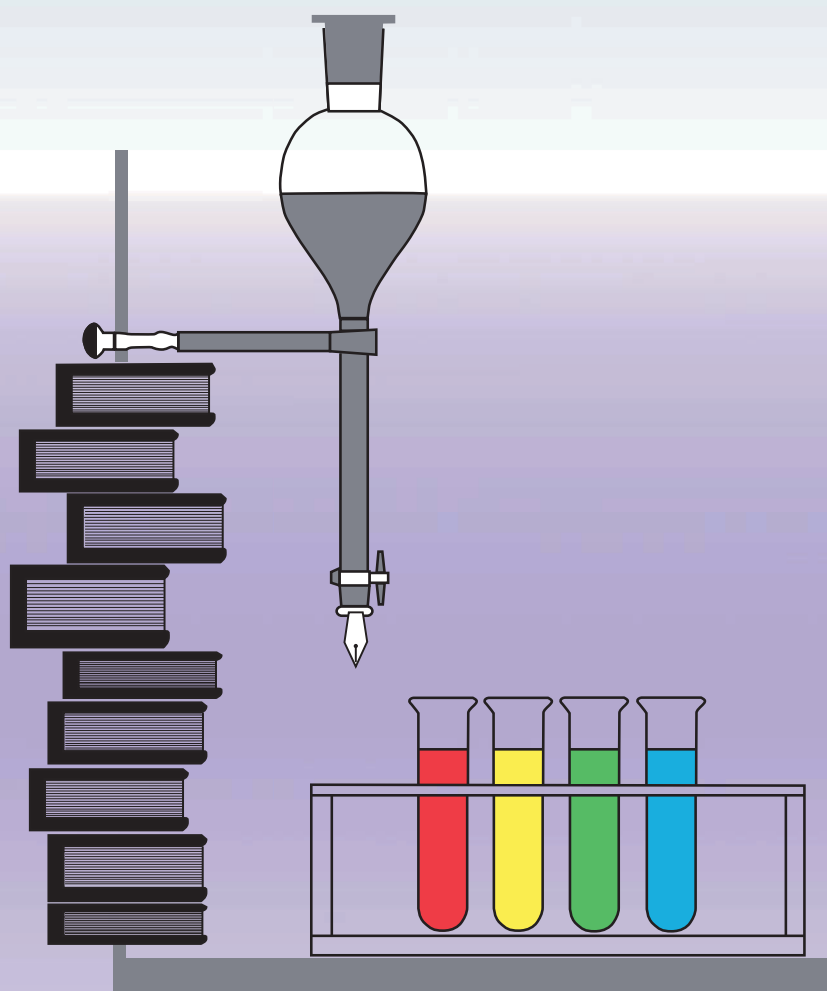


Writing with Chemistry Specific Genres

Teaching Guide ④

Comparison



True Light Middle
School of Hong Kong



Support Centre for Teachers
Using Chinese as the Medium of Instruction

Faculty of Education,
The University of Hong Kong

Science Education Section
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FOREWORD

What is Subject Specific Genre?

The organisation of a language is called "Genre". Every subject has its unique nature and content; the way of thinking as well as the form of expression is also different. These features are reflected on the style of language and therefore each of the subjects has a unique genre, which is called "Subject Specific Genre".¹

Different subject specific genres have different communicative functions which would in turn develop different features of genres. The process of using a genre to attain a specific communicative function is called genre structure. Having a good grasp of different genre structures can help students organise various writing materials more appropriately. Not only does every genre have its unique language structure, it also has its own language features. Language feature refers to the grammatical characteristics commonly found in that genre including the use of vocabulary, sentence patterns and others.¹

The relationship between genre, writing and learning

Language can help us construct knowledge and it plays an important role in learning and teaching. Students should have a sound language foundation so as to construct content knowledge efficiently and carry out critical thinking. Writing is the outcome of a series of procedures like knowledge input, processing and knowledge output. These procedures can help students clarify and consolidate the knowledge they acquired. Therefore, teaching students to use subject specific genre in writing chemistry essays can help them enhance their ability of expressing scientific concepts.¹

On the other hand, there are some suggested learning and teaching activities related to the NSS Chemistry and Combined Science (Chemistry Part) curricula; "reading and writing" is one of the examples. Chemistry teachers can take this opportunity to teach students to write with chemistry specific genre in order to improve students' ability of expressing chemistry knowledge. This can also arouse their interests in learning chemistry.

1 岑紹基、謝錫金、祁永華、鄺偉良、陳偉發、勞惠昌、陳曦圖、謝翰章 (2003)。《中學會考化學科專科語體資料冊》(第二版)。香港：香港大學教育學院母語教學教師支援中心。

The design and content of this book

In order to assist chemistry teachers to teach subject specific genres, and also help students express content knowledge with the use of subject specific genres and ultimately help them improve their writing skills in chemistry, the Science Education Section of Curriculum Development Institute has compiled *Writing with Chemistry Specific Genres-Teaching Guide* for teachers' reference and usage.

The teaching guide has a total of four booklets. Each booklet introduces one common type of chemistry specific genres:

Writing with Chemistry Specific Genres-Teaching Guide 1 – Descriptive Report
Writing with Chemistry Specific Genres-Teaching Guide 2 – Procedural Account
Writing with Chemistry Specific Genres-Teaching Guide 3 – Causal Explanation
Writing with Chemistry Specific Genres-Teaching Guide 4 – Comparison

The arrangement of contents for the above four booklets is similar. Each booklet has two chapters; they are "Instructional Design" and "Learning and Teaching Materials" for Chemistry Specific Genres. Chapter one "Instructional Design" provides two teaching schemes for the aforementioned genre. Each scheme consists of a series of teaching activities which is designed to help chemistry teachers teach chemistry specific genres in a systematic way. As for the worksheets and references adopted in the teaching schemes, they are all put in chapter two "Learning and Teaching Materials".

This book has already been uploaded onto the website "Writing with Chemistry Specific Genres" of the Education Bureau for teachers' reference.
(Website: <http://resources.edb.gov.hk/~science/genre/index-e.html>)

Chapter 1 Instructional Design for “Comparison”

“Comparison” is one of the commonly used chemistry specific genres. Its major function is to compare the similarities and differences between different items or concepts. When writing with “Comparison”, it is required to find out points of comparison among different items and concepts and then recount their similarities and differences in detail. This genre is characterised by its frequent use of words expressing difference or contrast.

1.1 Scheme 1

Level of Students: Secondary Five to Secondary Six

Genre: Comparison

Topic: NSS Chemistry Curriculum Topic XI “Chemistry of Carbon Compounds” and
NSS Combined Science (Chemistry Part) Curriculum Topic V “Fossil Fuels and
Carbon Compounds”

Implementation Period: Late phase of Secondary Five to initial phase of Secondary Six

Key Points	Teaching Activities	Learning and Teaching Materials	Estimated Time
<ul style="list-style-type: none">Teach students common vocabulary and sentence patterns of the writing topics, communicative function, genre structure and language features of “Comparison”	(I) Brief Notes on “Comparison” <ul style="list-style-type: none">Introduce the genre “Comparison”Use Question 4 of HKCEE 2003 Chemistry Paper I as a model essay and analyse the structure and features of “Comparison”	Brief Notes on Comparison (Section 2.1 of this booklet)	10 minutes
<ul style="list-style-type: none">Develop students’ ability of analysing questionsTeach students how to judge the most suitable genre for each questionLead students to make use of relevant chemical knowledge of “Chemistry of Carbon Compounds”	(II) Question Analysis <ul style="list-style-type: none">Finish Worksheet 1Discuss answers of Worksheet 1<ul style="list-style-type: none">Review common vocabulary and sentence patterns of “Comparison”Discuss important notes of relevant chemical knowledge when answering questions	Worksheet 1: Question Analysis (Section 2.2 of this booklet)	20 minutes

1.1 Scheme 1

Key Points	Teaching Activities	Learning and Teaching Materials	Estimated Time
<ul style="list-style-type: none"> Teach students how to organise information by using Graphic Organiser With the aid of the paragraph formatting and vocabulary provided in the writing framework, help students recognise genre structure and vocabulary of "Comparison" 	(III) Guided Writing <ul style="list-style-type: none"> Review chemical knowledge related to the question Finish Worksheet 2 in groups Group presentation Finish homework: Worksheet 3 	Worksheet 2: Guided Writing-Graphic Organiser (Section 2.3 of this booklet) Worksheet 3: Guided Writing-Writing Framework (Section 2.3 of this booklet)	30 minutes
<ul style="list-style-type: none"> Review the genre structure and language features of "Comparison" with students Help students master the features of "Comparison" and express chemical knowledge in a clear and logical manner through writing "Comparison" 	(IV) Writing Assignments for "Comparison" <ul style="list-style-type: none"> Review the genre structure and common vocabulary of "Comparison" Apply the genre "Comparison" to write an essay related to "Chemistry of Carbon Compounds" Distribute Assessment Rubric to students and lead a more in-depth discussion with students 	Brief Notes on Comparison (Section 2.1 of this booklet) Suggested Writing Topics for NSS Chemistry Curriculum and NSS Combined Science (Chemistry Part) Curriculum-Comparison (Section 2.4.2 of this booklet) Assessment Rubric for Writing Assignment (Section 2.5 of this booklet)	40 minutes

1.2 Scheme 2

Level of Students: Secondary Five to Secondary Six

Genre: Comparison

Topic: NSS Chemistry Curriculum Topic XI "Chemistry of Carbon Compounds" and
NSS Combined Science (Chemistry Part) Curriculum Topic V "Fossil Fuels and
Carbon Compounds"

Implementation Period: Late phase of Secondary Five to initial phase of Secondary Six

Key Points	Teaching Activities	Learning and Teaching Materials	Estimated Time
<ul style="list-style-type: none"> Teach students common vocabulary and sentence patterns of the writing topics, communicative function, genre structure and language features of "Comparison" 	(I) Brief Notes on "Comparison" - Introduce the genre "Comparison" - Use Question 4 of HKCEE 2003 Chemistry Paper I as a model essay to analyse the structure and features of "Comparison"	Brief Notes on Comparison (Section 2.1 of this booklet)	10 minutes
<ul style="list-style-type: none"> Let students develop a deeper understanding about the genre structure "Comparison" 	(II) "Online Interactive Exercise" - Students should finish "Online Interactive Exercise: HKCEE 2003 Chemistry Paper I Question 4" by themselves at home or in school's computer room.	Online Interactive Exercise (Website: http://resources.edb.gov.hk/~science/genre/index-e.html)	20 minutes

1.2 Scheme 2

Key Points	Teaching Activities	Learning and Teaching Materials	Estimated Time
<ul style="list-style-type: none"> Review the genre structure and language features of "Comparison" with students Help students master the features of "Comparison" and express chemical knowledge in a clear and logical manner through writing "Comparison" 	(III) Writing Assignments for "Comparison" <ul style="list-style-type: none"> Review the genre structure and common vocabulary of "Comparison" Apply "Comparison" to write an essay related to "Chemistry of Carbon Compounds" Distribute Assessment Rubric to students and lead a more in-depth discussion with them 	Brief Notes on Comparison (Section 2.1 of this booklet) Suggested Writing Topics for NSS Chemistry Curriculum and NSS Combined Science (Chemistry Part) Curriculum-Comparison (Section 2.4.2 of this booklet) Assessment Rubric for Writing Assignment (Section 2.5 of this booklet)	40 minutes
<ul style="list-style-type: none"> Assess students' progress in applying "Comparison" in writing chemistry essays 	(IV) Assessment <ul style="list-style-type: none"> Incorporate questions with effective communication into tests or examinations and the required genre for these questions is "Comparison" Teachers may set questions on other topics 	Questions with Effective Communication in HKCEE Chemistry Paper I-Comparison (Section 2.4.1 of this booklet) Suggested Writing Topics for NSS Chemistry Curriculum and NSS Combined Science (Chemistry Part) Curriculum-Comparison (Section 2.4.2 of this booklet)	40 minutes

1.3 Teaching Tips



- When writing with "Comparison", students are required to find out points of comparison in the same unit or within several units by themselves and then compare and contrast the related items. Students should have accumulated a certain amount of chemistry knowledge and developed analytical skills before they can write with this genre. Therefore it is proposed that teachers may teach students "Comparison" during the later period of the learning and teaching process of NSS Chemistry Curriculum (that is the late phase of secondary five to initial phase of secondary six).
- Both teaching schemes 1 and 2 are comprised of four teaching activities. Teachers may choose either one of the schemes according to their preference.
- Teachers may adjust the weighting of assessment criteria in accordance with students' aptitude and other factors.
- Students solely following the genre structure of "Comparison" in writing essays can already attain specific communicative function for that genre. However, if students are more competent, teachers can advise students to pay more attention to the arrangement of paragraphs and transition. Teachers can also encourage them to summarise the main points or express their opinion in the closing paragraph in order to make the whole essay well-structured and more coherent.
- Teachers may incorporate questions with effective communication into tests or examinations in order to evaluate students' learning progress in applying "Comparison" in chemistry writing.
- Teachers can directly use worksheets provided in this booklet to teach chemistry specific genres. They can also consult the design of worksheets and tailor-make teaching materials for students on other topics.



Note

Chapter 2 Learning and Teaching Materials for “Comparison”

2.1 Brief Notes on Comparison

Common vocabulary and sentence patterns of the writing topics

- In regard to ... compare ...
- Point out the differences between ...
- Discuss the similarities and differences between ...

Communicative Function

- To compare the similarities and the differences between different items or concepts

Structure

Parts of the Structure	Contents and Functions
Points of comparison	- state clearly the scope of comparison among different items or concepts
Elaborations	- describe the similarities and the differences among different items or concepts according to the points of comparison

Language Features

Language Features	Examples
Use words expressing similarity	similarly, likewise, similar to, the same as, also, in common, common to, as ... as
Use words expressing difference or contrast	nevertheless, yet, in contrast, in spite of, despite, whereas, while, on the other hand, however, although, on the contrary

Sample Text

HKCEE 2003 Chemistry Paper I Question 4:

Discuss the similarities and differences in chemical properties of concentrated sulphuric acid and dilute sulphuric acid. Illustrate your answer using appropriate examples.

Structure	Suggested Answer	Language Features
Points of comparison	There are several similarities and differences in chemical properties of concentrated sulphuric acid and dilute sulphuric acid. Their reactions with alkali (base) and carbonate (hydrogencarbonate) are <i>the same. However,</i> they have different chemical behaviours regarding oxidising power, dehydration and volatility.	<u>Use words expressing similarity</u>
Elaboration 1	Concentrated sulphuric acid and dilute sulphuric acid contain the same chemical – sulphuric acid H_2SO_4 . Hence, there are similarities in chemical properties. <i>Both</i> concentrated sulphuric acid and dilute sulphuric acid act as an acid. They ionise in water to give $\text{H}_3\text{O}^+(\text{aq})$ ion. For example, when they react with an alkali (base), only salt and water will be produced. $\text{H}_2\text{SO}_4 + 2\text{NaOH} \longrightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$ When they react with carbonate (hydrogencarbonate), carbon dioxide will be produced. $\text{H}_2\text{SO}_4 + \text{CO}_3^{2-} \longrightarrow \text{SO}_4^{2-} + \text{H}_2\text{O} + \text{CO}_2$ ($\text{H}_2\text{SO}_4 + 2\text{HCO}_3^- \longrightarrow \text{SO}_4^{2-} + 2\text{H}_2\text{O} + 2\text{CO}_2$)	<u>Use words expressing difference or contrast</u>
Elaboration 2	<i>Although</i> concentrated sulphuric acid and dilute sulphuric acid have the above similarities in chemical properties, they also have differences in the following chemical properties. Firstly, concentrated sulphuric acid is an oxidising agent <i>but</i> in dilute sulphuric acid is not. The oxidising power of concentrated sulphuric acid is much stronger than that of dilute sulphuric acid. For example, concentrated sulphuric acid can oxidise metals, non-metals and their compounds. In doing so, it is usually reduced to sulphur dioxide. $\text{Cu} + 2\text{H}_2\text{SO}_4 \longrightarrow \text{CuSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$ $\text{C} + 2\text{H}_2\text{SO}_4 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O} + 2\text{SO}_2$ $2\text{HBr} + \text{H}_2\text{SO}_4 \longrightarrow \text{Br}_2 + 2\text{H}_2\text{O} + \text{SO}_2$	

<p>Elaboration 3</p>	<p>In addition, concentrated sulphuric acid can act as a dehydrating agent but dilute sulphuric acid cannot. For example, concentrated sulphuric acid can dehydrate copper(II) sulphate crystal $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and sugar.</p> $\text{CuSO}_4 \cdot 5\text{H}_2\text{O} \xrightarrow{\text{Concentrated H}_2\text{SO}_4} \text{CuSO}_4 + 5\text{H}_2\text{O}$ $\text{C}_{12}\text{H}_{22}\text{O}_{11} \xrightarrow{\text{Concentrated H}_2\text{SO}_4} 12\text{C} + 11\text{H}_2\text{O}$	
<p>Elaboration 4</p>	<p>Finally, concentrated sulphuric acid is a non-volatile acid but dilute sulphuric acid is not. For example, concentrated sulphuric acid can be used in the preparation of hydrochloric acid and nitric acid.</p> $\text{H}_2\text{SO}_4 + \text{NaCl} \longrightarrow \text{NaHSO}_4 + \text{HCl}$ $\text{H}_2\text{SO}_4 + \text{NaNO}_3 \longrightarrow \text{NaHSO}_4 + \text{HNO}_3$	

2.2 Question Analysis

Worksheet 1

Read the following question carefully. Underline the keywords on the topic to determine the type of genres to be used, and put down the name of the genre in part (1). After that, find the relevant chemical knowledge from textbooks or other ways according to the prompt (a, b, c), and write down the important notes in part (2).

Question :

Discuss the similarities and differences between soapy detergents and soapless detergents with reference to their raw materials^a, structures^b and properties^c.

(HKCEE 2007 Chemistry Paper I Question 13)

(1) The writing genre required for the answer: _____

(Hint: descriptive report / procedural account / causal explanation / comparison)

(2) Relevant chemical knowledge:

a. _____

b. _____

c. _____

2.2 Question Analysis

Suggested Answer for Worksheet 1

Read the following question carefully. Underline the keywords on the topic to determine the type of genres to be used, and put down the name of the genre in part (1). After that, find the relevant chemical knowledge from textbooks or other ways according to the prompt (a, b, c), and write down the important notes in part (2).

Question :

Discuss the **similarities** and **differences** between soapy detergents and soapless detergents with reference to their raw materials^a, structures^b and properties^c.

(HKCEE 2007 Chemistry Paper I Question 13)

(1) The writing genre required for the answer: comparison

(Hint: descriptive report / procedural account / causal explanation / comparison)

(2) Relevant chemical knowledge:

- a. The raw materials of soapy detergents and soapless detergents are different.
- b. The structure of soapy detergents and soapless detergents are similar, but their chemical compositions are different.
- c. The hydrophilicity and hydrophobicity of soapy detergents and soapless detergents are similar, but their operations in hard water or acidic medium and their biodegradability are different.

2.3 Guided Writing

Worksheet 2

The writing genre required for the following question is "Comparison". Write down the answers briefly and organise them into the **Graphic Organiser**.

Question :

Discuss the similarities and differences between soapy detergents and soapless detergents with reference to their raw materials, structures and properties.

(HKCEE 2007 Chemistry Paper I Question 13)

Similarities	<u>Soapy detergents</u>	<u>Soapless detergents</u>
Structures		
Properties		

Differences	<u>Soapy detergents</u>	<u>Soapless detergents</u>
Raw materials		
Structures		
Properties		

2.3 Guided Writing

Suggested Answer for Worksheet 2

The writing genre required for the following question is "Comparison". Write down the answers briefly and organise them into the **Graphic Organiser**.

Question :

Discuss the similarities and differences between soapy detergents and soapless detergents with reference to their raw materials, structures and properties.

(HKCEE 2007 Chemistry Paper I Question 13)

Similarities	<u>Soapy detergents</u>	<u>Soapless detergents</u>
Structures	• have an ionic head and a long hydrocarbon tail	
Properties	<ul style="list-style-type: none"> • have both hydrophilic property and hydrophobic property • can act as wetting agents or emulsifying agents 	

Differences	<u>Soapy detergents</u>	<u>Soapless detergents</u>
Raw materials	• made from fat or oil	• made from petroleum
Structures	<ul style="list-style-type: none"> • have -COO^- group • cannot be tailor-made 	<ul style="list-style-type: none"> • have -SO_3^- group or -OSO_3^- group • can be tailor-made
Properties	<ul style="list-style-type: none"> • cannot function in hard water or acidic medium • usually biodegradable 	<ul style="list-style-type: none"> • can function in hard water or acidic medium • usually not biodegradable

2.3 Guided Writing

Worksheet 3

According to the information written in Worksheet 2, answer the question in the following **writing framework**. The framework indicates the paragraphs and the structure of the genre. The vocabulary suggested in the framework are the language features commonly used in "Comparison". Yet, similar wordings can be used instead.

Question :

Discuss the similarities and differences between soapy detergents and soapless detergents with reference to their raw materials, structures and properties.

(HKCEE 2007 Chemistry Paper I Question 13)

Paragraph	Structure	Answer
1	Points of comparison	<ul style="list-style-type: none"> - Words expressing similarity (examples: similarly, likewise, similar to, the same as, also, in common) - Words expressing difference or contrast (examples: however, in spite of, whereas, while, on the other hand, although, on the contrary)
2	Elaboration 1	<ul style="list-style-type: none"> - Words expressing similarity (examples: similarly, likewise, similar to, the same as, also, in common) - Words expressing difference or contrast (examples: however, in spite of, whereas, while, on the other hand, although, on the contrary)
3	Elaboration 2	<ul style="list-style-type: none"> - Words expressing similarity (examples: similarly, likewise, similar to, the same as, also, in common) - Words expressing difference or contrast (examples: however, in spite of, whereas, while, on the other hand, although, on the contrary)
4	Elaboration 3	<ul style="list-style-type: none"> - Words expressing similarity (examples: similarly, likewise, similar to, the same as, also, in common) - Words expressing difference or contrast (examples: however, in spite of, whereas, while, on the other hand, although, on the contrary)

2.3 Guided Writing

Suggested Answer for Worksheet 3

According to the information written in Worksheet 2, answer the question in the following **writing framework**. The framework indicates the paragraphs and the structure of the genre. The vocabulary suggested in the framework are the language features commonly used in "Comparison". Yet, similar wordings can be used instead.

Question :

Discuss the similarities and differences between soapy detergents and soapless detergents with reference to their raw materials, structures and properties.

(HKCEE 2007 Chemistry Paper I Question 13)

Paragraph	Structure	Answer
1	Points of comparison	There are several <u>similarities</u> and <u>differences</u> between soapy and soapless detergents. <u>Similarities</u> include their structures, and hydrophilic/hydrophobic properties, <u>while differences</u> include their chemical compositions, biodegradability, and functionality in hard water and acidic mediums.
2	Elaboration 1	In terms of raw materials, soapy detergents are made from fat <u>while</u> soapless detergents are made from petroleum.
3	Elaboration 2	In terms of structures, <u>both</u> detergents have an ionic head and a long hydrocarbon tail. <u>However</u> , their chemical compositions are different. Soapy detergents have -COO ⁻ group <u>while</u> soapless detergents have -SO ₃ ⁻ group. Moreover, the chemical structures of soapless detergents can be tailor-made, <u>whereas</u> soapy detergents cannot.
4	Elaboration 3	In terms of properties, <u>both</u> soapy and soapless detergents have hydrophilic and hydrophobic properties, hence, they can act as wetting agents or emulsifying agents. <u>However</u> , soapy detergents cannot function in hard water or acidic medium, <u>while</u> soapless detergents can. Furthermore, soapy detergents are usually biodegradable, <u>whereas</u> soapless detergents usually are not.

2.4 Suggested Topics of Writing Assignments

2.4.1 Questions with Effective Communication in HKCEE Chemistry Paper I – Comparison

Writing Topic		Curriculum Topic
CE 03 Question 4	Discuss the similarities and differences in chemical properties of concentrated sulphuric acid and dilute sulphuric acid. Illustrate your answer using appropriate examples.	Sulphuric Acid & Sulphur Dioxide
CE 07 Question 13	Discuss the similarities and differences between soapy detergents and soapless detergents with reference to their raw materials, structures and properties.	Detergents

Remark: *All questions from the Hong Kong Certificate of Education Examination papers are reproduced by permission of the Hong Kong Examinations and Assessment Authority.*

2.4.2 Suggested Writing Topics for NSS Chemistry Curriculum and NSS Combined Science (Chemistry Part) Curriculum – Comparison

Writing Topic	NSS Chemistry	NSS Combined Science (Chemistry Part)
Compare and contrast the use of the methods of "quenching" and "on-going" on rate studies of chemical reactions.	Topic IX Rate of Reaction	Topic IV Acids and Bases - Rate of chemical reaction
In regard to the change in concentration and temperature, compare their effects on the equilibrium position and equilibrium constant (K_c).	Topic X Chemical Equilibrium	---
Compare the similarities and differences between the chemical reactions of alkanes and alkenes.	Topic XI Chemistry of Carbon Compounds	Topic V Fossil Fuels and Carbon Compounds
Write an essay to compare and contrast the densities and the solubilities in water of elements from Li to Ar.	Topic XII Patterns in the Chemical World	---
Compare the importance of chloroalkali industry and methanol industry to our society.	Topic XIII Industrial Chemistry	---
Identify the advantages and disadvantages of using synthetic polymers and metals in the construction industry.	Topic XIV Materials Chemistry	---
Discuss the similarities and differences between distillation and liquid-liquid extraction regarding the types of mixtures to be separated and the underlying principles.	Topic XIV Materials Chemistry	---

2.5 Assessment Rubric for Writing Assignment

Teachers write scores and feedback in the appropriate boxes.

(1) Content knowledge (10 marks)

Excellent (9-10 marks)	Good (6-8 marks)	Average (3-5 marks)	Need to improve (0-2 marks)

(2) Structure (6 marks)

Excellent (5-6 marks)	Good (3-4 marks)	Average (2 marks)	Need to improve (0-1 mark)

(3) Use of Language (4 marks)

Excellent (4 marks)	Good (3 marks)	Average (2 marks)	Need to improve (0-1 mark)

(4) Feedback

--

Total Score of
Writing Assignment :

/20

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5. 香港大學教育學院母語教學教師支援中心網頁。
(<http://www.cmi.hku.hk/>)。



NOTE

