

Water Purification and Dissolving

Level: S.1

Subject: Science

Introduction

This set of ELA materials is designed to help students learn about water purification and dissolving in English. The focus of the materials is to help students use English to understand the teacher's explanations and to construct simple sentences related to the two topics. Some key concepts and related English terms will have been taught in previous lessons using Chinese as the medium of instruction. Additional subject content is introduced in this lesson using English as the medium of instruction.

Each of the ELA lessons lasts for about 40 minutes. They start with vocabulary revision. The English vocabulary and concepts learned in previous science lessons on Water Purification and Dissolving are reviewed through demonstrating an experiment along with questioning. The review session is then followed by gap-filling exercises which provide opportunities for students to practise writing the concepts and vocabulary items they have learned. The exercises progress from an easy to a difficult level. The easy items require students to fill in words only; while the more difficult ones require them to understand simple sentences and questions about the two topics. Some optional items are also provided to cater for students with higher English ability.

Lesson Plan - Water Purification

35 min/lesson

Description: This lesson is an extension of Section 5.1 (CDC syllabus). Students have studied three methods, namely sedimentation, filtration and distillation, of water purification using Chinese as the medium of instruction. The concept terms in English have been introduced during these CMI lessons. In this lesson, students will review the key features of the three methods with illustrations. Then, the learned vocabulary is reinforced. To enhance students' understanding and retention of these concept terms, a pattern of word formation (*keyword + ation*) is explicitly taught and application of these concepts in solving problems concerned with purification is presented.

Content After completing the activity, students should be able to:

- Objectives:**
- state the methods of water purification and their key features.
 - use appropriate methods of purification.

Language After completing the activity, students should be able to:

- Objectives:**
- understand and use the English vocabulary related to water purification methods (e.g., *impurity, micro-organism, distill, distillation, separate, suitable method purification methods, sedimentation, layer, sediment, filtration, filter, residue, soybean milk, a suitable method,*
 - understand word formation principles relating to water purification methods (i.e. *sediment and sedimentation, filter and filtration, and distill and distillation*)
 - understand and use the English expressions for discussing appropriate purification methods and their key features, e.g.,
 - *To discuss a suitable method to separate the red beans from water. A suitable method is sedimentation. The red beans settle at the bottom of the glass, forming a layer of sediment.*
 - *To discuss a suitable method to separate the rice from water. A suitable method is filtration. By passing the water with rice through a filter, the rice is separated out.*
 - *To discuss a suitable method to separate water from coffee. A suitable method is distillation. The coffee is boiled to produce steam. The steam then condenses into water upon cooling. The coffee is distilled once to separate water from it.*

- *To discuss a suitable method to separate the residue from soybean milk.
A suitable method is filtration. By passing the soybean milk with residue through a filter, the residue is separated out.*
- *To discuss a suitable method to separate water from soybean milk.
A suitable method is distillation. The soybean milk is boiled to produce steam. The steam then condenses into water upon cooling. The soybean milk is distilled once to separate water from it.*
- *To discuss a suitable method to separate tea leaves from tea.
A suitable method is sedimentation. The tea leaves settle at the bottom of the glass, forming a layer of sediment.*

- Materials:
- Slides of “water purification_summary.ppt” for revision;
 - Worksheet [Water Purification] (“water purification_student.ppt”) – a student version of slides for note taking, given to students in the previous lesson;
 - Worksheet [Purification Methods];
 - Computer connected to the internet, slide projector and screen.

Steps:

Revision and a Word Formation pattern (15 min) - This part should be conducted in Chinese

1. Display a beaker of muddy water /Show the first PowerPoint slide:
Ask students what can be found in this water that makes it different from our drinking water. Ask students what type of purification method they will use to make the water clean. Write students’ answers on the board in two columns, namely “不潔淨的水含有” and “淨化方法”.
2. Make use of the slides to review the methods of water purification. At the same time, introduce the (*keyword* + ation) pattern of word formation and ask students to complete the worksheet [Water Purification]. In reviewing sedimentation, highlight the two important terms: sedimentation and sediments. Then, introduce the pattern of word formation, “sedimentation” = “sediment + ation” , telling students that this can help them remember the terms more easily. In reviewing filtration and distillation, ask students to apply the pattern to form the names of the purification methods with the name of their key features (i.e. filter and distill).

(Remark: remind students the deletion of the letter “e” in the word “filter” in forming the name “filtration” and tell them this is an exception to the pattern)

3. The table in the last slide will summarize all the terms learned in Water Purification. The words in blue (or underlined) are not given. The words in red (or *italic*) are optional.

	中文	English	<i>Forming a word</i> <i>e.g. Keyword + ation</i>
1	雜質	<u>Impurity</u>	<i>Im + purity</i>
2	微生物	<u>Micro-organism</u>	<i>Micro + organism</i>
3	沉積物	<u>Sediment</u>	
4	沉積法	<u>Sedimentation</u>	<u>Sediment + ation</u>
5	過濾器	<u>Filter</u>	
6	過濾法	<u>Filtration</u>	<u>Filter + ation</u>
7	蒸餾	<u>Distill</u>	
8	蒸餾法	<u>Distillation</u>	<u>Distill + ation</u>

Ask students to try to fill in the column labelled “English”. While checking the answers, practise the pronunciation of the terms with students. Complete the last column with students.

Completing the worksheet (15 min) – in EMI

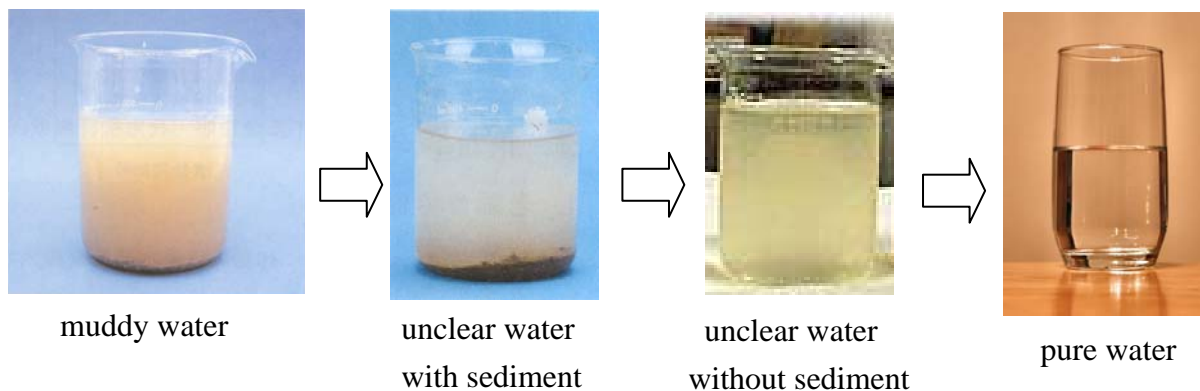
4. Distribute the worksheet [Purification methods] to the class.

Remark: Students are supposed to have completed a similar practice provided in the Chinese textbook.

5. Briefly go through the instruction for the worksheet with students highlighting and explaining any difficult words.
6. Answer Question 1 to 3 one by one together. Explain any difficult words if necessary.
7. Check the answers. If students find difficulty in understanding the English description of the methods, ask them to refer to the corresponding examples given in the worksheet [Water Purification].
8. Answer Question 4 together. Make sure students understand that in answering Questions 4 to 6 they are required to follow the sentence structures used in Questions 1 to 3.
9. Ask students to finish Questions 5 and 6 by themselves. Ask some students to write their answers on the board for discussion.

Rounding up (5 min) - This part should be conducted in English.

10. Summarise what has been taught in the lesson by doing the “Final Challenge”. Display the following series of pictures.



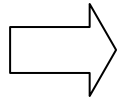
Ask students to select the most suitable method of purification to be used for A to become B, and then C and finally D. Student may give their ideas orally or write their answers on the board.

Remark: The task can become more interesting and challenging by asking students to choose any two pictures from above, link them with an arrow and suggest a suitable method of purification to make such change.

Purification Methods

Choose a suitable method to separate the following. Fill in the blanks or complete the sentences to briefly describe the method.

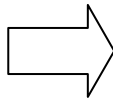
1. Separate the red beans from water



The most suitable method is _____.

The red beans settle at the bottom of the glass, forming a layer of _____.

2. Separate the rice from water



The most suitable method is _____.

By passing the water with rice through a _____, the rice is separated out.

The tool in Fig. _____ can be used as the _____.

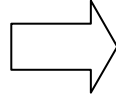


Fig. A.

Fig. B.

Fig. C.

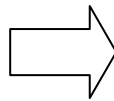
3. Separate water from coffee



The most suitable method is _____.

The coffee is boiled to produce steam. The steam then condenses into water upon cooling. The coffee is _____ once to separate water from it.

4. separate the residue (殘渣) from soybean milk



The most suitable method is _____.

By passing _____, _____
_____. The tool in Fig. _____.



Fig. A.

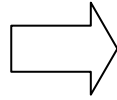


Fig. B.



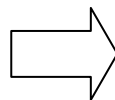
Fig. C.

5. Separate water from soybean milk



The most suitable method is _____ . _____ is boiled _____ . _____ to separate water from it.

6. Separate tea leaves from the tea



The most suitable method is _____ . _____ the glass, _____ .

Final Challenge

What is the suitable method of purification for each step?



A. muddy water



B. unclear water with sediment



C. unclear water without sediment

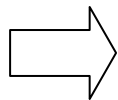


D. pure water

Purification Methods (Teacher's version)

Choose a suitable method to separate the following. Fill in the blanks or complete the sentences to briefly describe the method.

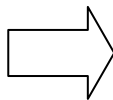
1. Separate the red beans from water



The most suitable method is sedimentation.

The red beans settle at the bottom of the glass, forming a layer of sediment.

2. Separate the rice from water



The most suitable method is filtration.

By passing the water with rice through a filter, the rice is separated out. The tool in Fig. B/C can be used as the filter.

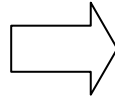


Fig. A.

Fig. B.

Fig. C.

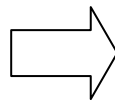
3. Separate water from coffee



The most suitable method is distillation.

The coffee is boiled to produce steam. The steam then condenses into water upon cooling. The coffee is distilled once to separate water from it.

4. separate the residue (殘渣) from soybean milk



The most suitable method is filtration. By passing the soybean milk with residue through a filter, the residue is separated out. The tool in Fig. B / C can be used as the filter.



Fig. A.

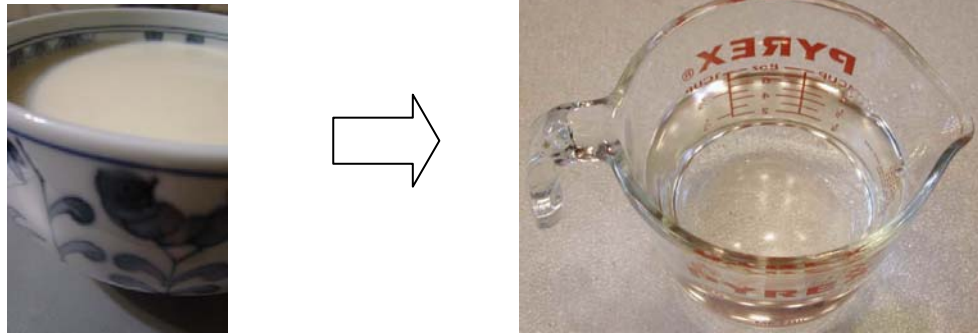


Fig. B.



Fig. C.

5. Separate water from soybean milk



The most suitable method is distillation. The soybean milk is boiled to produce steam. The steam then condenses into water upon cooling. The soybean milk is distilled once to separate water from it.

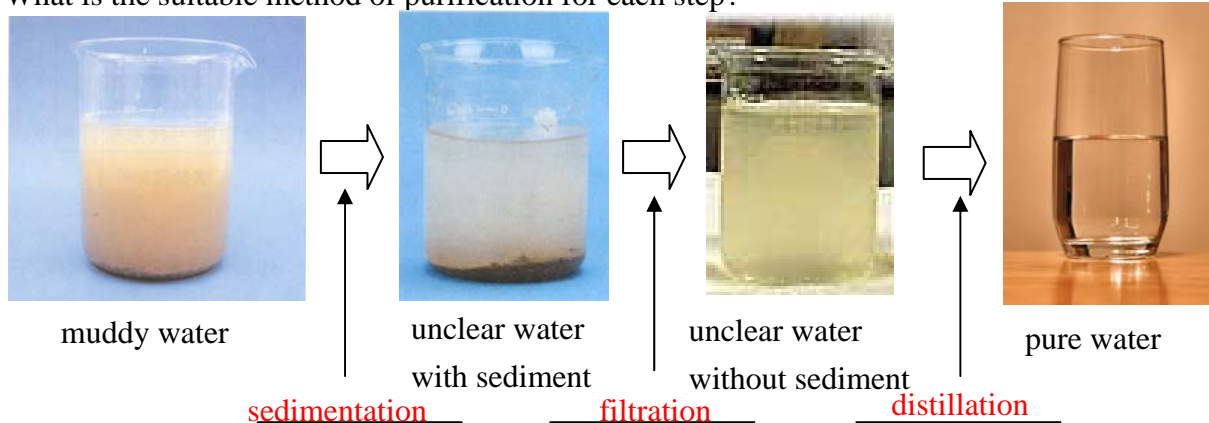
6. Separate tea leaves from the tea



The most suitable method is sedimentation. The tea leaves settle at the bottom of the glass, forming a layer of sediment.

Final Challenge

What is the suitable method of purification for each step?



Lesson Plan – Dissolving

Description	<p>This ELA lesson is an extension of Section 5.5 <i>Dissolving</i> in the CDC syllabus. The Section was taught in Chinese in previous lessons. Now the content is further elaborated in this lesson through the medium of English. The lesson starts with a review which consolidates the key concepts and English vocabulary related to the topic <i>Dissolving</i>. The second activity recycles the focused vocabulary through pictures and gap-filling exercise. The final task is to practise using the concept terms in an unfamiliar context and requiring students to express them in longer texts. Through tasks at progressively more difficult levels, students are given opportunities to use more complex English with the help of familiar subject knowledge.</p>
Content Objectives:	<p>After completing the activity, students should be able to:</p> <ul style="list-style-type: none">• understand the key concepts (<i>solute, solvent, solution, saturated solution, soluble and insoluble</i>); and• state the factors affecting dissolving rate.
Language Objectives:	<p>After completing the activity, students should be able to:</p> <ul style="list-style-type: none">• understand and use the English terms related to dissolving (e.g., <i>soluble, dissolve, insoluble, cannot dissolve, solute, solvent, solution, sugar solution, saturated solution, sugar powder, sugar cube, pepper, salt, iron, wood, sand, factors, affect, dissolving rate, stir, increase, decrease</i>);• understand and use the appropriate English expressions for discussing the key concepts related to dissolving, e.g.,<ul style="list-style-type: none">- <i>When sugar powder is put into water, it dissolves.</i>- <i>Sugar solution is a mixture of sugar and water. Water is a solvent and sugar is a solute.</i>- <i>Sugar cubes and salt are soluble while iron and wood are insoluble.</i>- <i>When sugar is continuously put into water, the solution will become saturated and sugar cannot dissolve.</i>• give daily examples of soluble things and insoluble things in English, e.g., <i>Iron, wood and sand are insoluble. Sugar powder, salt and pepper are soluble.</i>

- understand and use appropriate English expressions for discussing factors affecting the rate of dissolving, e.g.,
 - *When the solvent is stirred, the rate of dissolving increases.*
 - *When the solvent is cold, the rate of dissolving decreases.*
 - *When the solute is small (in small pieces), the rate of dissolving increases.*

- Material
- A glass of water and some sugar powder
 - PowerPoint slides of images showing the dissolving process
 - Gap-filling worksheet of slides (Task A)
 - Worksheet of Use of Vocabulary (Task B)
 - Computer connected to the internet, slide projector and screen

Steps

Review vocabulary in dissolving (10 mins)

This review session can be conducted in Chinese or English.

Display a glass of water.

Ask students the following questions to consolidate the concepts and vocabulary learned.

Ask students to give answers in English and write down their answers on the board.

- a) What will happen to the sugar powder/cube when it is put into the water?
- b) What is the term used to describe the liquid now?
- c) If I put a lot of sugar into the water, what will happen?
- d) Now you see the sugar in the water. What do you call this liquid now?

Go through their answers on the board. Read them aloud with class once.

Recycle vocabulary - Task A (10mins)

Distribute Task A (slides handouts)

Show slides one by one and ask students to fill in the gaps.

Check answers

Use of vocabulary - Task B (20 mins)

Go through the vocabulary list by asking student(s) to read aloud the vocabulary in the table. Remind them of the meanings of the words if necessary. Correct any mistakes in pronunciation.

Ask students to complete Items 1 to 4 by choosing the correct words to fill in the blanks.

Check answers by asking students to read aloud their answers in complete sentences.

Ask students to work in pairs to answer Questions 5 to 9. Remind students that they can refer to the answers in Task A for help if needed.

Questions 7 to 9 may require a little explanation if students' English ability is not high. The questions may also be treated as challenging/optional questions to cater for better able students.

Check answers by asking students to read aloud their answers in complete sentences.

Round up (5 mins)

Summarize the key concepts and vocabulary in the topic Dissolving.

Dissolving

Task A: Recycle Vocabulary (10 mins)

Click the following files:

- [TaskA S final.ppt](#) (Students' version)
- [TaskA T final.ppt](#) (Teacher's version)

Task B: Use of vocabulary (20 mins)

Vocabulary

soluble	solute	sugar powder
insoluble	solvent	sugar cube
cannot dissolve	solution	pepper
dissolve(s)	sugar solution	salt
	saturated solution	iron
		wood
		sand

In each of the following sentences, choose the correct word to fill in the blank.

1. When sugar powder is put into water, it _____. (dissolves / solves / solution)
2. Sugar solution is a mixture of _____ and water. Water is a _____ and sugar is a _____. (solvent / soluble / solute / sugar / salt / pepper)
3. Sugar cubes and salt are _____ while iron and wood are _____. (saturated / soluble / solution / dissolve / insoluble)
4. When sugar is continuously put into water, the solution will become _____ and sugar cannot _____. (saturated / soluble / insoluble / solution / dissolve / iron)

Answer the following questions.

5. Give three examples of insoluble things.

6. Give three examples of soluble things.

7. What factors affect the rate of dissolving?

a) When _____, the rate of dissolving **increases**.

b) When _____, the rate of dissolving **decreases**.

c) When _____, the rate of dissolving **increases**.

8. Can sugar cubes dissolve in cold drinks?

9. Which dissolves faster in water, sugar cubes or sugar powder? Why?

_____ because

Dissolving (Teacher's version)

Task B Key: Use of vocabulary

Vocabulary

soluble	solute	sugar powder
insoluble	solvent	sugar cube
cannot dissolve	solution	pepper
dissolve(s)	sugar solution	salt
	saturated solution	iron
		wood
		sand

In each of the following sentence, choose the correct word to fill in the blank.

- When sugar powder is put into water, it dissolves. (dissolves / solves / solution)
- Sugar solution is a mixture of sugar and water. Water is a solvent and sugar is a solute. (solvent / soluble / solute / sugar / salt / pepper)
- Sugar cubes and salt are soluble while iron and wood are insoluble. (saturated / soluble / solution / dissolve / insoluble)
- When sugar is continuously put into water, the solution will become saturated and sugar cannot dissolve. (saturated / soluble / insoluble / solution / dissolve / iron)

Answer the following questions. You can refer to Task A answers for help.

- Give three examples of insoluble things.

Iron, wood and sand (or any other insoluble substances)

- Give three examples of soluble things.

Sugar powder, salt and pepper (or any other soluble substances)

7. What factors affect the rate of dissolving?

a) When the solvent is stirred, the rate of dissolving **increases**.

b) When the solvent is cold, the rate of dissolving **decreases**.

c) When the solute is small (in small pieces), the rate of dissolving **increases**.

8. Can sugar cubes dissolve in cold drinks?

Yes

10. Which dissolves faster in water, sugar cubes or sugar powder? Why?

Sugar powder (dissolves faster) because sugar cubes are bigger than sugar powder (in size).