

Unit 3 Aqueous solution 教材分析

資料來源	康軒版自然與生活科技 第五冊	設計者	鄭穎蔚	每週 教學節數	4
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教材分析	<p>【水溶液】 由實驗與操作，知道溶質溶於溶劑後，水溶液的重量會增加，並進一步探討水溶液的酸鹼性質及水溶液的導電性。 From the experiments and operations, we know that the weight of aqueous solution will increase after the solute is added to the solvent, and further investigate the acid-base properties of aqueous solution and the electrical conductivity of aqueous solution.</p> <p>1. Part1: Dissolution phenomenon 溶解現象 It is known that the weight of the aqueous solution increases when the solute is added to the solvent. (知道溶質溶於溶劑後，水溶液的重量會增加。)</p> <p>2. Part2: Acid-base property 水溶液的酸鹼性 Use homemade indicators to examine the acidic and alkaline properties of aqueous solutions in life. (利用自製指示劑檢驗生活中的水溶液酸鹼性質。)</p> <p>3. Part3: electrical conductivity 水溶液的導電性 Observe the electrical conductivity of the aqueous solution. (觀察水溶液的導電性。)</p>				
Part1: Dissolution phenomenon		Part2: Acid-base property		Part3: electrical conductivity	
主要學習內容					
tr-III-1 能將自己及他人所觀察、記錄的自然現象與習得的知識互相連結，察覺彼此間的關係，並提出自己的想法及知道與他人的差異。 po-III-2 能初步辨別適合科學探究的問題，並能依據觀察、蒐集資料、閱讀、思考、討論等，提出適宜探究之問題。 pc-III-2 能利用簡單形式的口語、文字、影像（例如：攝影、錄影）、繪圖或實物、科學名詞數學公式、模型等，表達探究之過程、發現或成果。 ai-III-1 透過科學探索了解現象發生的原因或機制，滿足好奇心。 ah-III-1 利用科學知識理解日常生活觀察到的現象。 an-III-2 發覺許多科學的主張與結論，會隨著新證據的出現而改變。		INa-III-2 物質各有不同性質，有些性質會隨溫度而改變。 INc-III-3 本量與改變量不同，由兩者的比例可評估變化的程度。 INc-III-4 對相同事物做多次測量，其結果間可能有差異，差異越大表示測量越不精確。 INe-III-5 常用酸鹼物質的特性，水溶液的酸鹼性質及其生活上的運用。 INf-III-3 自然界生物的特徵與原理在人類生活上的應用。		INa-III-2 物質各有不同性質，有些性質會隨溫度而改變。 INc-III-3 本量與改變量不同，由兩者的比例可評估變化的程度。 INc-III-4 對相同事物做多次測量，其結果間可能有差異，差異越大表示測量越不精確。 INe-III-5 常用酸鹼物質的特性，水溶液的酸鹼性質及其生活上的運用。 INf-III-3 自然界生物的特徵與原理在人類生活上的應用。	

主要學習表現

INa-III-2 物質各有不同性質，有些性質會隨溫度而改變。

INc-III-3 本量與改變量不同，由兩者的比例可評估變化的程度。

INc-III-4 對相同事物做多次測量，其結果間可能有差異，差異越大表示測量越不精確。

INe-III-5 常用酸鹼物質的特性，水溶液的酸鹼性質及其生活上的運用。

INf-III-3 自然界生物的特徵與原理在人類生活上的應用。

ti-III-1 能運用好奇心察覺日常生活現象的規律性會因為某些改變而產生差異，並能依據已知的科學知識科學方法想像可能發生的事情，以察覺不同的方法，也常能做出不同的成品。

tm-III-1 能經由提問、觀察及實驗等歷程，探索自然界現象之間的關係，建立簡單的概念模型，並理解到有不同模型的存在。

ai-III-1 透過科學探索了解現象發生的原因或機制，滿足好奇心。

pe-III-2 能正確安全操作適合學習階段的物品、器材儀器、科技設備及資源。能進行客觀的質性觀察或數值量測並詳實記錄。

pa-III-2 能從（所得的）資訊或數據，形成解釋、發現新知、獲知因果關係、解決問題或是發現新的問題。並能將自己的探究結果和他人的結果（例如：來自同學）比較對照，檢查相近探究是否有相近的結果。

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課程架構

水溶液(Aqueous solution)

活動一：溶解現象(Part1: Dissolution phenomenon)

1-1 物質的溶解現象(Dissolution of substances)

透過實驗發現物質溶解於水後，水溶液的重量會改變。(Through experiments, it was found that the weight of the aqueous solution would change after the substance was dissolved in water.)

活動二：水溶液的酸鹼性(Acid-base of aqueous solutions)

2-1 各種水溶液的酸鹼性(The acidity and alkalinity of various aqueous solutions)

利用石蕊試紙檢驗水溶液的酸鹼性。

(Use litmus paper to test the acidity of aqueous solutions.)

2-2 自製指示劑檢驗水溶液的酸鹼性(Homemade indicators to test the acidity of aqueous solutions)

運用紫色高麗菜汁檢驗水溶液的酸鹼性。。

(The acidity of the aqueous solution was examined by using purple cabbage juice.)

2-3 酸與鹼的作用(The role of acids and alkalis)

能說出酸與鹼作用在日常生活中的應用。。

(Be able to describe the application of acids and alkalis in daily life.)

活動三：水溶液的導電性(Conductivity of aqueous solutions)

3-1 測試水溶液的導電性(Testing the electrical conductivity of aqueous solutions)

透過實驗操作過程，了解有些水溶液具有導電的性質。

(To understand the conductive nature of some aqueous solutions through experimental procedures.)

Unit 3 Aqueous solution

應會認讀/聽懂的字彙

3-1

aqueous solution 水溶液	solute 溶質	solvent 溶劑
food 食物	medicine 藥品	detergent 洗潔劑

3-2

Baking soda(小蘇打水)	Vinegar	Salt water
Lime water(石灰水)	Soda	Sugar Water (糖水)

3-3

LED(發光二極體)	circuit(電路)	conduct electricity(導電)
Traffic sign(交通號誌)	Electric shock(觸電)	open circuit (斷路)

應聽懂/說出的科學概念

3-1

What does matter become when it dissolves into water?

When people are hungry, what are they used to eating?

What can be called water in an aqueous solution?

If we are sick, what do we need to eat?

When the floor is dirty, what do we use?

What is the dissolved substance in an aqueous solution called?

3-2

Acidic and yellowish in color with an unpleasant smell.

Neutral and clear solution, smells sweet.

Acidic, with bubbles in water, transparent and colorless.

Neutral clear solution, no smell.

Alkaline, transparent and colorless.

Alkaline, with a layer of white substance on the surface, clear solution.

3-3

The process of the experiment.

What the experiment wants to prove.

Something produced by the experiment.

About the name of this experiment.

Description based on the results.

Things needed for the experiment.

教學活動規劃

週	日期	活動名稱	各節次教學策略	節
11	11/7-11/13	溶解現象	加鹽溶解實驗 / 實驗操作 / 蒸乾實驗 / 溶液觀察	4
12	11/14-11/20	水溶液的酸鹼性	酸鹼實驗 / 試紙操作 /	4
13	11/21-11/27	水溶液的酸鹼性	自製指示劑 / 利用自製指示劑檢驗	4
14	11/28-12/4	水溶液的導電	酸鹼中和實驗 / 實驗操作 / 利用電池組測導電 / 實驗設計	4

教學活動設計

教學活動 Teaching activities		教學設備 /資源 Teaching aids/equip ment	時間 (分) Time
中文 In Chinese	英文 In English		
活動一 一、熱身活動 利用學習單前三題，複習單元中，水溶液的特性，以及之前實驗鹽溶於水的狀態。	Activity 1 1. Warm-up activity Use the first three questions of the study sheet to review the properties of aqueous solutions in the unit and the state of salt dissolved in water in the previous experiment.	單槍 學習單	10
二、主要活動 利用小組討論，填入正確的單字解釋。然後透過討論正確答案精熟學生對於水溶液的認識。	2. Main Activities Use group discussion to fill in the correct word explanation. Then discuss the correct answers to refine the students' knowledge of aqueous solutions.		15
三、延伸活動 觀看影片「 Salt Water Experiment 」，小組討論影片中的實驗主要是在	3. Extension Activity Watch the video "Salt Water Experiment" and discuss in small groups what		15

<p>實驗什麼現象？並由老師帶領學生討論學習單的三個問題。</p>	<p>phenomenon is being experimented in the video. The teacher will lead the students to discuss the three questions in the study sheet.</p>		
<p>活動二 一、熱身活動 透過學習單的第一題，討論在分辨水溶液的過程中，我們可以透過哪些方式進行，順道提醒我們「不可以」用哪些方式進行。</p>	<p>Activity 2 I. Warm-up Activity In the first question of the study sheet, we will discuss the ways in which we can distinguish aqueous solutions, and remind us of the "no" ways.</p>	<p>單槍 學習單 石蕊試紙 廣用試紙 各式水溶液（檸檬汁、自來水、肥皂水、洗潔劑、疏通劑、酒精）</p>	<p>5</p>
<p>二、主要活動 透過學習單第二題，由老師帶領複習六種水溶液的特性，並藉由文字認識「酸」、「鹼」的單字。</p>	<p>2.Main Activities Through the second question of the study sheet, the teacher leads a review of the properties of the six aqueous solutions and introduces the words "acid" and "alkali" through words.</p>		<p>5</p>
<p>藉由小組討論完成「language」的六題填充，加深單元中的重要單字。</p>	<p>Complete the six questions of "language" through group discussion to deepen the important words in the unit.</p>		<p>10</p>
<p>三、延伸活動 利用最後一大題目將學習的酸鹼應用到生活中的溶液，並藉此更熟悉酸鹼的概念和測試方式。</p>	<p>3. Extension Activities Use the last major topic to apply the learned acids and bases to solutions in life and to become more familiar with the concept of acids and bases</p>		<p>20</p>

<p>活動三</p> <p>一、熱身活動</p> <p>由老師提問引導。透過學習單的熱身第一題，複習除了導電的特性外，溶液還有的其他特性。</p>	<p>and how to test them.</p> <p>Activity 3</p> <p>I. Warm-up activity</p> <p>Guided by questions from the teacher. Through the first question of the warm-up, review the other characteristics of the solution in addition to the electrical conductivity.</p>	<p>單槍 學習單</p>	<p>5</p>
<p>透過學習單的熱身第二題，複習在上課教學中，關於 LED 燈的相關知識。</p>	<p>In the second question of the warm-up, we will review the knowledge about LED lights in the previous lesson.</p>		<p>5</p>
<p>二、主要活動</p> <p>由小組討論「Language」的題目，藉由填空學習關於導電的相關英文單字。再由老師統一討論正確答案。</p>	<p>2. Main Activities</p> <p>The group will discuss the topic "Language" and fill in the blanks to learn the English words related to electrical conductivity. The teacher will then discuss the correct answers.</p>		<p>15</p>
<p>三、延伸活動</p> <p>探討實驗的流程，透過檢視每個實驗的步驟，認識實驗中的各個步驟的英文單字。並探討每個步驟的重要性。</p>	<p>3. Extension Activities</p> <p>Explore the flow of the experiment by examining the steps of each experiment and understanding the English words of each step in the experiment. Explore the importance of each step.</p>		<p>15</p>

<p>活動四</p> <p>一、熱身活動</p> <p>由老師將這單元所認識的英文單字書寫在黑板上，由學生舉手發表（鼓勵儘量用英文說明）。讓學生藉此複習本單元的相關知識。</p>	<p>Activity 4</p> <p>I. Warm-up activity</p> <p>The teacher will write down the English words they know in this unit on the blackboard and the students will raise their hands to express them (encourage them to use English as much as possible). Students will be able to review the knowledge of the module.</p>	<p>單槍 學習單</p>	<p>10</p>
<p>小組討論進行造句練習，經過三個單元的學習，嘗試利用單字進行造句的練習，由小組討論後上黑板書寫句子。</p>	<p>After three units of study, they will try to use single words to make sentences, and the group will discuss and write sentences on the board.</p>		<p>15</p>
<p>二、主要活動</p> <p>請學生完成學習單最後 KWL 的部分，多讓學生有時間進行思考和書寫，提醒學生可以想清楚這三部分的內容：K 是學習前就知道的內容。W 是學習後多增加的知識。L 是學習的過程中，覺得記憶最深刻的部分，或是教學需要改進或維持的部分。</p>	<p>2. Main Activities</p> <p>Ask students to complete the KWL section at the end of the learning sheet, giving them more time to think and write, reminding them that they can think clearly about the content of these three sections: K is what they knew before learning, W is what they added to their knowledge after learning, and L is the part of the learning process that they feel they remember the most, or the part of the lesson that needs to be improved or maintained.</p>		<p>15</p>

Aqueous solution- Dissolution phenomenon

Warmer

1. In daily life, which aqueous solutions do you see?
2. Why can't muddy water be called an aqueous solution?
3. What happens to the salt water after the salt is dissolved in the water?

Language

aqueous solution 水溶液	solute 溶質	solvent 溶劑
food 食物	medicine 藥品	detergent 洗潔劑

Sentence

	What does matter become when it dissolves into water?
	When people are hungry, what are they used to eating?
	What can be called water in an aqueous solution?
	If we are sick, what do we need to eat?
	When the floor is dirty, what do we use?
	What is the dissolved substance in an aqueous solution called?

Experiment

Watch a video of [Salt Water Experiment \(3:02\)](#) and to do it then discuss the following questions in a small group.

1. Why won't the paper fall off ?
2. Why the liquid exchange effect is different ?
3. What else can be substituted for salt ?

Aqueous solution- Acid-base property

Warmer

1. Which methods can we use to distinguish(區分) aqueous solutions ?

2. Fill in the correct solution

Baking soda(小蘇打水)	Vinegar	Salt water
Lime water(石灰水)	Soda	Sugar Water (糖水)

	Acidic and yellowish in color with an unpleasant smell.
	Neutral and clear solution, smells sweet.
	Acidic, with bubbles in water, transparent and colorless.
	Neutral clear solution, no smell.
	Alkaline, transparent and colorless.
	Alkaline, with a layer of white substance on the surface, clear solution.

Language

acidic 酸性	alkaline 鹼性	vinegar 醋
litmus paper 石蕊試紙	red	blue

- I add a little _____ to the dumplings(水餃).
- Litmus paper is _____ in acid solution.
- Lemon juice is _____.
- Litmus paper is _____ in alkaline solution.
- Soap is usually _____.
- _____ is a test for acidity and alkalinity.

Experiment

Please confirm the following properties and fill in the correct solution name.

	Lemon Juice (檸檬汁)	Tap water (自來水)	Soapy (肥皂水)	Detergent (洗潔劑)	Dredge (疏通劑)	Alcohol (酒精)
litmus paper	Blue:	Blue:	Blue:	Blue:	Blue:	Blue:
	Red:	Red:	Red:	Red:	Red:	Red:
universal test paper						
Acid-alkaline						

Aqueous solution- electrical conductivity

Warmer

1. In addition to conductivity, what other properties does the aqueous solution have ?
2. How can we use LED lights?

Language

LED(發光二極體)	circuit(電路)	conduct electricity(導電)
Traffic sign(交通號誌)	Electric shock(觸電)	open circuit (斷路)

1. Paper clips can _____.
2. Observe the _____, traffic will be smooth.
3. Turn off the switch to form an _____.
4. This _____ design is great.
5. Easy to get an _____ with wet hands.
6. Salt water is easy to _____.

Experiment

title	purpose	equipment
step	result	discuss

	The process of the experiment.
	What the experiment wants to prove.
	Something produced by the experiment.
	About the name of this experiment.
	Description based on the results.
	Things needed for the experiment.

Thinking

K(what I know)	W(What I want to know)	L(What I learned)