

### Common acids and alkalis and the loop-card game

Level: S2

Topic: Common acids and alkalis used at home and the pH scale (Sections 10.1 &10.2 of Unit 10)

#### **Introduction:**

This set of ELA materials is designed to consolidate what students have learned about the acidity and the alkalinity of some common household substances. It consists of two ELAs. They are:

ELA1 Common Acidic, Alkaline and Neutral Substances

ELA2 The Loop-card Game

ELA3 is a revision game, which is included to give students speaking practice in a fun way. Students have to ask and answer questions about the acidity or alkalinity of the common household substances in the game.

ELA1 lasts for two periods, and ELA2 for one period.

## ELA1 Lesson Plan – Common Acidic, Alkaline and Neutral Substances

**Description:** This ELA is conducted after students have carried out a laboratory class to find out the pH values of some common household substances and laboratory acids and alkalis. The concepts about the pH scale, acidity and alkalinity were taught at the end of the laboratory class. The English terms related to the key concepts were introduced together with the Chinese terms when the subject content was taught in Chinese as the medium of instruction.

In this ELA, students have to classify a larger group of household substances than they did in the laboratory class into acidic, alkaline and neutral substances. Then they have to compare the acidity or alkalinity of the substances by filling out in a table with a pH scale. After that, they have to do some writing and speaking practices on comparing the acidity or alkalinity of the substances.

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

- classify the common household substances as acidic, alkaline and neutral substances
- use the pH scale to indicate the acidity or alkalinity of a substance
- state the approximate pH values of some common household substances

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

- name in English the following common household substances: *milk, vinegar, soft drink, lemon juice, coffee, toilet cleaner, glass cleaner, oven cleaner, toothpaste, antacid, egg white, drain cleaner, table salt and distilled water*
- understand and use the English terms related to this topic (e.g., *acid, acidic substance, alkali, alkaline substance, neutral substance, household substance, antacid, vinegar, pH values, compare the acidity, weakly acidic, strongly acidic, weakly alkaline, and strongly alkaline*);
- understand and use the correct English expressions for discussing the acidity or alkalinity of common household substances, e.g.,
  - *The pH value shows the acidity or alkalinity of a substance, i.e., how acidic or alkaline the substance is.*
  - *An acidic substance has a pH value smaller than 7.*

- *The lower the pH value of the substance, the more acidic it is.*
- *An alkaline substance has a pH value greater than 7.*
- *The higher the pH value of the substance, the more alkaline it is.*
- *A neutral substance has a pH value equal to 7.*
- *Oven cleaner is more alkaline than glass cleaner.*
- *Glass cleaner is less alkaline than oven cleaner.*
- *Glass cleaner is more alkaline than toothpaste.*
- *Toothpaste is less alkaline than glass cleaner.*
- *Vinegar is more acidic than coffee.*
- *Coffee is less acidic than vinegar.*
- *Lemon juice is more acidic than soft drink.*
- *Soft drink is less acidic than lemon juice.*

- Activities:
1. Classifying the common household substances – individual work (20 min)
  2. Comparing the acidity or alkalinity of the common household substances by completing a table with a pH scale – pair work (25 min)
  3. Writing practice on comparing the acidity or alkalinity of the common household substances – pair work (20 min)
  4. Speaking practice – pair work (15 min)

Materials: Worksheet; Slides which introduce the common acidic, alkaline and neutral household substances

Steps:

**Classifying the common household substances – individual work (20 min)**

1. Using questioning, the teacher reviews with the class the three groups of substances that can be classified using litmus paper.
2. With the aid of PowerPoint slides, the teacher reviews the examples of some common acidic, alkaline and neutral household substances.

Note: If the students are more capable, the slides can be shown after they have completed Question 1 of the worksheet instead.

3. At the end of the revision, the teacher should make sure that students can pronounce the key terms correctly: *acid, acidic substance, alkali, alkaline substance, neutral substance,*

and *household substance*.

4. The teacher distributes the worksheet and asks students to complete Question 1.
5. The teacher checks the answers. He/she may ask some students to read out the answers in order to check whether they can pronounce the names correctly.

**Comparing the acidity or alkalinity of the common household substances by completing a table with a pH scale – pair work (25 min)**

6. Using questioning and blackboard drawing, the teacher reviews with the class the pH scale and how it indicates different degrees of acidity and alkalinity. The following key points should be gone through:
  - The pH value shows the acidity or alkalinity of a substance.
  - An acidic substance has a pH value smaller than 7. The lower the pH value of the substance, the more acidic it is.
  - Substances with pH values equal to or lower than 2 are considered as strongly acidic; substances with pH values in between 4 to 6 as weakly acidic.
  - An alkaline substance has a pH value greater than 7. The higher the pH value of the substance, the more alkaline it is.
  - Substances with pH values equal to or higher than 12 are considered as strongly alkaline; substances with pH values in between 8 to 10 as weakly alkaline.
  - A neutral substance has a pH value equal to 7.
7. At the end of the revision, the teacher should make sure that students can pronounce the key terms correctly: *pH value*, *acidity*, *alkalinity*, *weakly acidic*, *strongly acidic*, *weakly alkaline*, and *strongly alkaline*.
8. Students complete Question 2 of the worksheet. They are encouraged to discuss with their partner for the relative acidity and alkalinity of the substances they need to fill out in the table.
9. The teacher checks the answers of Question 2 by drawing the table on the blackboard or displaying the table using a visualizer.

**Writing practice on comparing the acidity or alkalinity of the common household substances – pair work (20 min)**

10. With the table of Question 2 being displayed, the teacher asks some questions about the acidity and alkalinity of the household substances, similar—but not identical—to those question items in Question 3 of the worksheet. Some students are asked to give the answers orally.

11. After making sure that students can answer properly the questions related to the acidity and alkalinity of the household substances, the teacher asks them to complete Question 3 of the worksheet.
12. Students are asked to crosscheck each other's answers for any grammatical mistakes after they have completed Question 3.
13. The teacher checks the answers by asking some students to come out and write the answers on the blackboard.
14. The class is asked to judge whether each answer is acceptable in terms of content and grammar.

**Speaking practice – pair work (15 min)**

15. Students are put into pairs and take turns to read aloud to each other the household substances in the table of Question 2. Then they take turns to ask and answer the question items in Question 3.
16. The teacher monitors the class and provides guidance where necessary.
17. The teacher ends the activity by asking students questions related to the content of the worksheet and check if they can answer without looking at the worksheet.
18. The teacher tells the class that they are going to play a card game in the next lesson, which is based on the content of the worksheet, and thus they have to revise the content of the worksheet at home.

## Common Acidic, Alkaline and Neutral Substances 常見的酸性、鹼性和中性物品

### Vocabulary:

acid 酸	alkali 鹼	neutral substance 中性物質
acidic substance 酸性物質	alkaline substance 鹼性物質	household substance 家用物品

**Question 1** Our household substances can be divided into acidic, alkaline and neutral substances.

Label the following acidic, alkaline and neutral substances using the words provided:

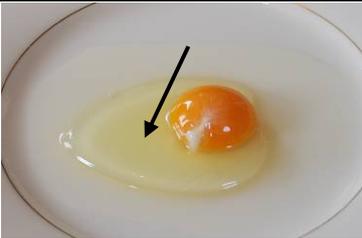
antacid	coffee	distilled water	drain cleaner	egg white
glass cleaner	lemon juice	milk	oven cleaner	soft drink
table salt	toilet cleaner	toothpaste	vinegar	

### Acidic household substances:

 <p>1.</p>	 <p>2.</p>	 <p>3.</p>
 <p>4.</p>	 <p>5.</p>	 <p>6.</p>

### Alkaline household substances:

 <p>7.</p>	 <p>8.</p>	 <p>9.</p>
---	---	---

 <p>10.</p>	 <p>11.</p>	 <p>12.</p>
<p><b>Neutral household substances:</b></p>		
 <p>13.</p>	 <p>14.</p>	

**Question 2** The table below shows the pH values of some household substances.

Complete the table using the household substances listed in Question 1.

pH values	Household substances
14	(a)
13	oven cleaner
12	
11	(b)
10	antacid
9	(c)
8	egg white
7	(d)
	table salt
6	(e)
5	coffee
4	(f)
3	vinegar
2	(g)
1	toilet cleaner
0	

### Vocabulary and key points:

pH value    pH 值	acidity 酸度	weakly acidic 弱酸性	strongly acidic 強酸性
	alkalinity 鹼度	weakly alkaline 弱鹼性	strongly alkaline 強鹼性

The pH value shows the acidity or alkalinity of a substance, i.e., how acidic or alkaline the substance is.

- An acidic substance has a pH value smaller than 7. The lower the pH value of the substance, the more acidic it is.
- An alkaline substance has a pH value greater than 7. The higher the pH value of the substance, the more alkaline it is.
- A neutral substance has a pH value equal to 7.

**Question 3**    *Answer the following questions in complete sentences using the table in Question 2.*

1. Which household substance is the most alkaline?

\_\_\_\_\_

2. Which household substance is the most acidic?

\_\_\_\_\_

3. Which three household substances are weakly acidic?

\_\_\_\_\_

4. Which two household substances are strongly alkaline?

\_\_\_\_\_

5. Write a sentence to compare the alkalinity of

(a) antacid and egg white;

*For example: Antacid is more alkaline than egg white.*

(b) glass cleaner and oven cleaner;

\_\_\_\_\_

(c) glass cleaner and toothpaste.

\_\_\_\_\_

6. Write a sentence to compare the acidity of

(a) vinegar and coffee;

\_\_\_\_\_

(b) soft drink and lemon juice

\_\_\_\_\_

**Common Acidic, Alkaline and Neutral Substances** 常見的酸性、鹼性和中性物品

**Vocabulary:**

acid 酸	alkali 鹼	neutral substance 中性物質
acidic substance 酸性物質	alkaline substance 鹼性物質	household substance 家用物品

**Question 1** Our household substances can be divided into acidic, alkaline and neutral substances.

Label the following acidic, alkaline and neutral substances using the words provided:

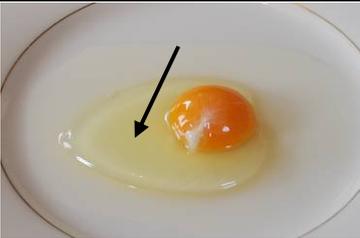
antacid	coffee	distilled water	drain cleaner	egg white
glass cleaner	lemon juice	milk	oven cleaner	soft drink
table salt	toilet cleaner	toothpaste	vinegar	

**Acidic household substances:**

 <p>1. <i>milk</i></p>	 <p>2. <i>vinegar</i></p>	 <p>3. <i>soft drink</i></p>
 <p>4. <i>lemon juice</i></p>	 <p>5. <i>coffee</i></p>	 <p>6. <i>toilet cleaner</i></p>

**Alkaline household substances:**

 <p>7. <i>glass cleaner</i></p>	 <p>8. <i>oven cleaner</i></p>	 <p>9. <i>toothpaste</i></p>
--	---	---

 <p>10. <i>antacid</i></p>	 <p>11. <i>egg white</i></p>	 <p>12. <i>drain cleaner</i></p>
<p><b>Neutral household substances:</b></p>		
 <p>13. <i>table salt</i></p>	 <p>14. <i>distilled water</i></p>	

**Question 2** The table below shows the pH values of some household substances. Complete the table using the household substances listed in Question 1.

pH values	Household substances
14	(a) <i>drain cleaner</i>
13	oven cleaner
12	
11	(b) <i>glass cleaner</i>
10	antacid
9	(c) <i>toothpaste</i>
8	egg white
7	(d) <i>distilled water</i>
	table salt
6	(e) <i>milk</i>
5	coffee
4	(f) <i>soft drink</i>
3	vinegar
2	(g) <i>lemon juice</i>
1	toilet cleaner
0	

### Vocabulary and key points:

pH value	pH 值	acidity 酸度	weakly acidic 弱酸性	strongly acidic 強酸性
		alkalinity 鹼度	weakly alkaline 弱鹼性	strongly alkaline 強鹼性

The pH scale shows the acidity or alkalinity of a substance, i.e., how acidic or alkaline the substance is.

- An acidic substance has a pH value smaller than 7. The lower the pH value of the substance, the more acidic it is.
- An alkaline substance has a pH value greater than 7. The higher the pH value of the substance, the more alkaline it is.
- A neutral substance has a pH value equal to 7.

**Question 3** Answer the following questions in complete sentences using the table in Question 2.

1. Which household substance is the most alkaline?

Drain cleaner is the most alkaline.

2. Which household substance is the most acidic?

Toilet cleaner is the most acidic.

3. Which three household substances are weakly acidic?

Milk, coffee and soft drink are weakly acidic.

4. Which two household substances are strongly alkaline?

Drain cleaner and oven cleaner are strongly alkaline.

5. Write a sentence to compare the alkalinity of

(a) antacid and egg white;

For example: Antacid is more alkaline than egg white.

(b) glass cleaner and oven cleaner;

Oven cleaner is more alkaline than glass cleaner./ Glass cleaner is less alkaline than oven cleaner.

(c) glass cleaner and toothpaste.

Glass cleaner is more alkaline than toothpaste./ Toothpaste is less alkaline than glass cleaner.

6. Write a sentence to compare the acidity of

(a) vinegar and coffee;

Vinegar is more acidic than coffee./ Coffee is less acidic than vinegar.

(b) soft drink and lemon juice

Lemon juice is more acidic than soft drink./ Soft drink is less acidic than lemon juice.

## ELA2 Lesson Plan – The Loop Card Game

**Description:** ELA2 is a revision activity based on what students have learned in ELA1. It is a game in which students are required to ask and answer questions related to the pH scale and the common household substances. The game is called the loop-card game.

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

- classify the common household substances as acidic, alkaline and neutral substances
- state the approximate pH values of some common household substances
- give some examples of household substances that are weakly acidic, strongly acidic, weakly alkaline or strongly alkaline.

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

- understand and use correct English expressions for asking and answering questions orally related to the acidity and alkalinity of household substances, e.g.,
  - *What is the pH value of milk?*
  - *Which one is more acidic: soft drink or vinegar?*
  - *What is the pH value of toothpaste?*
  - *Which one is more alkaline: glass cleaner or toothpaste?*
  - *What is the pH value of a neutral substance?*
  - *Name one household substance that is strongly alkaline.*
  - *Is toilet cleaner acidic or alkaline?*
  - *Name one household substance that is weakly alkaline.*
  - *What are the pH values of all alkaline substances?*
  - *Name one household substance that is strongly acidic.*
  - *Name one neutral household substance.*
  - *Name one household substance that is weakly acidic.*

**Activities:**

1. Revision and introduction for the game – whole-class activity (10 min)
2. Demonstration for the game – whole-class activity (10 minutes)
3. Playing the loop-card game – group activity (20 minutes)

Materials:                    Game cards for the loop-card game

Steps:

**Revision and introduction for the game – whole-class activity (10 min)**

1. Using questioning, the teacher reviews the content of the worksheet, Common Acidic, Alkaline and Neutral Substances.
2. The teacher tells the class that they are going to play a card game, the loop-card game, during which they need to ask and answer questions about the acidity and alkalinity of the common household substances they have learned.
3. The teacher shows some game cards in front of the class and points out that there is an answer on the upper half and a question on the lower half of each card. The question on one card relates to the answer on a different card. Students have to check for the other cards for the answer to the question printed on a particular card.

**Demonstration for the game – whole-class activity (10 minutes)**

4. The teacher divides the class into groups of four or five. As a demonstration for the game, the teacher gives each group one game card. Some groups may receive two game cards if there are less than 12 groups in the class.
5. The teacher asks one group to start the game by having one group member ask the question on their card. The rest of the class has to check their own card to see if they get the correct answer on their card.
6. The group who has the correct answer on their card has one group member to read out the answer. The group member then reads out the question on the lower half of the card.
7. The game continues until all questions are asked and answered. The teacher gives guidance where necessary.

**Playing the loop-card game – group activity (20 minutes)**

8. After the class is familiar with the game rules, the game can be played within each group.
9. The teacher distributes each group a set of cards and tells the class that they are going to have group competition.

10. Each group starts playing the game at the same time.
11. A set of cards are distributed among the group members and each member receives two to three cards. One group member start asking a question from one of his/her card. Then the game continues as before.
12. The group who has finished asking and answering all the questions on their cards is the winner.
13. If time allows, the game can be played again in another format of group competition. For example, the boys can select 12 representatives and the girls also select 12. Then the boys' group and the girls' group compete in the game.

Game cards for the loop-card game

Coffee	pH 6	Vinegar is more acidic.
<i>What is the pH value of milk?</i>	<i>Which one is more acidic: soft drink or vinegar?</i>	<i>What is the pH value of toothpaste?</i>
pH 9	Glass cleaner is more alkaline.	pH 7
<i>Which one is more alkaline: glass cleaner or toothpaste?</i>	<i>What is the pH value of a neutral substance?</i>	<i>Name one household substance that is strongly alkaline.</i>
Oven cleaner	It is acidic.	Antacid
<i>Is toilet cleaner acidic or alkaline?</i>	<i>Name one household substance that is weakly alkaline.</i>	<i>What are the pH values of all alkaline substances?</i>
Greater than pH 7	Lemon juice	Distilled water
<i>Name one household substance that is strongly acidic.</i>	<i>Name one neutral household substance.</i>	<i>Name one household substance that is weakly acidic.</i>