

**Key concept:** 7CS Changing substances

**Sub units:**

1. 7CS.1 Chemical and physical change
2. 7CS.2 pH scale
3. 7CS.3 Neutralisation



**Working scientifically (WS)** is a fundamental part of learning science. It is a combination of all the activities that scientists do and is an important part of learning about and learning through science.

Complete the tasks for each **sub unit** to develop your **WS skills** as well as your **A01** skills (recall knowledge and understanding).

Then tackle the mixed up problems for the **key concept** using the **recall – detect and solve approach** to develop your **A02 skills** (applying your knowledge and understanding).

Name:

Tutor group:

Science teacher:

Completion date for booklet:

## Chemistry

Key concept: 7CS Changing substances

Sub unit: 7CS.1 Chemical and physical changes

Working Scientifically Skill: Estimate the seriousness of the hazards in the activities.

Theme: Scientists explain changes in terms of differences.

Week:

Date:

Signed,  
Stamped,  
or  
acknowledged by your  
teacher.

### Task: Physical or chemical change?

A physical change merely changes the size and shape of an object whereas a chemical change produces a new substance altogether. You are going to complete some activities and decide whether a chemical or physical change has taken place.



#### Activity 1: Make your own mug cake

1. Add these ingredients to a large mug: 4 Tablespoons (Tbsp.) flour, 4 Tbsp. caster sugar, 3Tbsp milk, 1 Tbsp. oil, 1 egg, 1 teaspoon of vanilla essence (optional).
2. Add 2 Tbsp. of cocoa powder if you want to make a chocolate cake (optional)
3. Mix the ingredients together in the mug well using's a fork.
4. Place into a microwave for 2-3 minutes.
5. Allow to cool and enjoy!



#### Activity 2: Aluminium foil

1. Take a small piece of aluminium foil
2. Scrunch this piece up into a ball.

#### Activity 3: The ice cube

1. Collect an ice cube from the freezer.
2. Place into a small drinking glass.
3. Leave for 5 minutes.
4. Watch what happens to the ice.

#### Activity 4: Frying an egg

1. Place a little oil or frylite onto a small frying pan.
2. Take an egg, crack it open and pour contents onto a frying pan.
3. Place the frying pan on a hob and turn it on.
4. Watch and listen as the egg is fried.
5. Turn off the hob and allow the egg to cool.

| Activity       | Physical or chemical change? | How do I know? |
|----------------|------------------------------|----------------|
| Mug Cake       |                              |                |
| Aluminium foil |                              |                |
| Ice cube       |                              |                |
| Frying an egg  |                              |                |
| Paper of card  |                              |                |

#### Activity 5: Paper or card

1. Take a small piece of paper or card
2. Use scissors to cut the paper/card into smaller pieces.

# Chemistry

Key concept: 7CS Changing substances

Sub unit: 7CS.1 Chemical and physical changes

**Working Scientifically Skill:** Estimate the seriousness of the hazards in the activities.

**Theme:** Scientists explain changes in terms of differences.

What facts can you recall about chemical and physical changes?

Use your knowledge organiser for guidance.

**AO1:** Demonstrate knowledge and understanding of:

- 1) scientific ideas
- 2) scientific techniques and procedures.

If a new substance made in a chemical reaction has decreased in mass what does this suggest?

\_\_\_\_\_

**Finish the sentence:** In a chemical changes a new substance  
\_\_\_\_\_

If a new substance made in a chemical reaction has increased in mass what does this suggest?  
\_\_\_\_\_

**Finish the sentence:** A physical change means no new substances are \_\_\_\_\_.

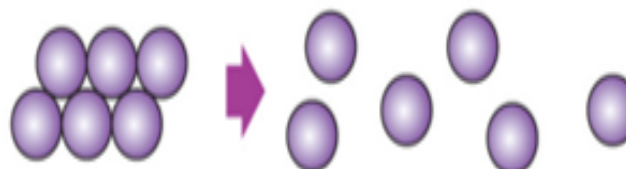
**What** is the evidence for a chemical change?  
\_\_\_\_\_

**What** is the evidence for a physical change?  
\_\_\_\_\_

**Give** some examples of a chemical change.  
\_\_\_\_\_

**Can** a new substance formed in a chemical change have a different mass?  
\_\_\_\_\_

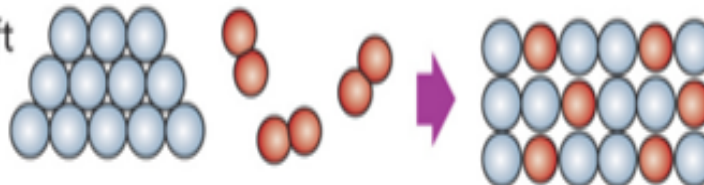
Heating iodine



Chemical or physical: \_\_\_\_\_  
Explanation: \_\_\_\_\_

**Finish the sentence:** In a chemical reaction at least \_\_\_\_\_ new substance is formed.

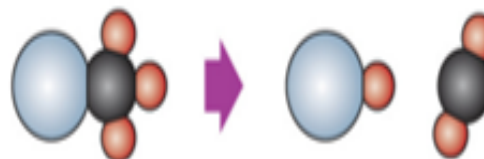
Sodium left in air



Chemical or physical: \_\_\_\_\_  
Explanation: \_\_\_\_\_

**Give** some examples of a chemical change.  
\_\_\_\_\_

Decomposition of copper carbonate



Chemical or physical: \_\_\_\_\_  
Explanation: \_\_\_\_\_

# Chemistry

Key concept: 7CS Changing substances

Sub unit: 7CS.2 pH scale

Working Scientifically Skill: Observe & determine if a substance is acid or alkaline.

Theme: Use indicators to deduce patterns and relationships in data.

Week:

Date:

Signed,  
Stamped,  
or  
acknowledged by your  
teacher.

## Task: Making your own indicator

Many plants contain their own indicators. Hydrangea flowers change their colour depending on whether the soil they are planted in is acidic or alkaline.

You are going to make a natural indicator using beetroot.



## Activity 1: Make your own natural indicator with beetroot

1. Take a beetroot and chop it into small cubes.
2. Place into a pan of water and boil for 25 minutes.
3. Once complete, allow the pan and water to cool.
4. Strain the solution using a sieve into a container.
5. This solution is the indicator you will use for testing.



## No beetroot? Watch this video of the practical! (5mins)

<https://www.youtube.com/watch?v=YajB6y6PLg4>

## Activity 2: Test your indicator

1. Place a little indicator into a plastic cup or mug.
2. Add a little of one of the common household products (see table)
3. Record in the table the colour the indicator changed into.

## Activity 3: Conclusion

Beetroot indicator changes colour to \_\_\_\_\_ in the presence of acids whilst it changes colour to \_\_\_\_\_ in the presence of alkalis.

This is useful because \_\_\_\_\_.

| Household product | Acid or alkali? | Beetroot indicator colour |
|-------------------|-----------------|---------------------------|
| Baking powder     |                 |                           |
| Toothpaste        |                 |                           |
| Vinegar           |                 |                           |
| lemon             |                 |                           |
| Milk              |                 |                           |
|                   |                 |                           |
|                   |                 |                           |

## Why not choose your own products to test?

Seek guidance from parent or carers to make sure the substance is safe to test.

## Activity 4: Research

What colour do hydrangea flowers turn in acidic soils?

\_\_\_\_\_.

What colour do hydrangea flowers turn in alkaline soils?

\_\_\_\_\_.



## Chemistry

Key concept: 7CS Changing substances

Sub unit: 7CS.2 pH scale

**Working Scientifically Skill:** Observe & determine if a substance is acid or alkaline.

**Theme:** Use indicators to deduce patterns and relationships in data.

What facts can you recall about the pH scale?

Use your knowledge organiser for guidance.

**AO1:** Demonstrate knowledge and understanding of:

- 1) scientific ideas
- 2) scientific techniques and procedures.

Which is the more alkaline solution, pH 7 or pH 14?  
\_\_\_\_\_

Which is the more acidic solution, pH 2 or pH 6?  
\_\_\_\_\_

What is the number range of the pH scale?  
\_\_\_\_\_

Solutions above pH 7 on the scale are classed as  
\_\_\_\_\_

Which colour on the pH scale indicates a weak alkali?  
\_\_\_\_\_

What colours indicates acids on the pH scale?  
\_\_\_\_\_

Solutions below pH 7 on the scale are classed as  
\_\_\_\_\_

Which colour does the natural indicator that is beetroot turn in the presence of an:

Acid = \_\_\_\_\_

Alkali = \_\_\_\_\_

Can you give a substance that is classed as an acid?  
\_\_\_\_\_

What is the purpose of an indicator?  
\_\_\_\_\_

Which colour on the pH scale indicates a weak acid?  
\_\_\_\_\_

What colours indicates alkalis on the pH scale?  
\_\_\_\_\_

What is the pH of a neutral substance?  
\_\_\_\_\_

Which colour on the pH scale indicates a strong acid?  
\_\_\_\_\_

Can you give a substance that is classed as an alkaline?  
\_\_\_\_\_

What is the colour a neutral substance on the pH scale?  
\_\_\_\_\_

Which colour on the pH scale indicates a strong alkali?  
\_\_\_\_\_



## Chemistry

Key concept: 7CS Changing substances

Sub unit: 7CS. 3 Neutralisation

Working Scientifically Skill: Predict the outcome of an experiment.

Theme: Scientists theorise about the cause and effects of experimental results.

Week:

Date:

Signed,  
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teacher.

**Task: Inflate a balloon without blowing! DYK it is possible to inflate a balloon using a simple neutralisation reaction?**



### Equipment:

- Vinegar, Baking soda (powder), 1 x Bottle, 1 x balloon

### Activity 1: How to inflate your balloon

1. Pour about 20 ml of vinegar into the bottle.
2. Put 2 teaspoons of baking soda into the balloon.
3. Attach the balloon around the neck of the bottle, taking care not to let any baking soda fall into the bottle (you may need some sticky tape to secure the balloon).
4. Once the balloon is securely fastened to the bottle, lift the balloon so that the baking soda is tipped into the bottle. Sit back and watch the balloon inflate!



No equipment? Watch this video of the practical! (3mins)

<https://www.youtube.com/watch?v=5mCcFzcClvE>

### Activity 2: What type of reaction do you think is occurring?

Physical or chemical?

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How do you know?

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### Activity 3: What causes the balloon to inflate?

Use these words in your answer: baking soda, vinegar, reaction, mixes, carbon dioxide, balloon, gas

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## Chemistry

Key concept: 7CS Changing substances

Sub unit: 7CS. 3 Neutralisation

Working Scientifically Skill: Predict the outcome of an experiment.

Theme: Scientists theorise about the cause and effects of experimental results.

What facts can you recall about Neutralisation?

Use your knowledge organiser for guidance.

AO1: Demonstrate knowledge and understanding of:

- 1) scientific ideas
- 2) scientific techniques and procedures.

Circle the correct bold word in the sentences below.

- Acids taste sour/feel soapy.
- Some acids and alkalis are corrosive/correlated.
- A concentrated solution of an acid is more/less corrosive than a dilute solution.

Complete the sentences on indicators and the pH scale

- The pH scale is a measure of how \_\_\_\_\_ or \_\_\_\_\_ a solution is. An acid has a pH from \_\_\_\_\_ to \_\_\_\_\_. An alkali has a pH from \_\_\_\_\_ to \_\_\_\_\_. A neutral solution has a pH of exactly \_\_\_\_\_. You can use an \_\_\_\_\_ to find out whether a solution is acidic or alkaline.

What is the pH of a neutral substance?

\_\_\_\_\_

What is the colour a neutral substance on the pH scale?

\_\_\_\_\_

What is meant by the term 'neutralisation'?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Finish the sentence:

Adding alkali raises the pH. It can neutralise an \_\_\_\_\_ solution.

Which colour on the pH scale indicates a strong alkali?

\_\_\_\_\_

Finish the sentence:

Adding acid lowers the pH. It can neutralise an \_\_\_\_\_ solution

Solutions above pH 7 on the scale are classed as \_\_\_\_\_

Which is the more alkaline solution, pH 7 or pH 14?

\_\_\_\_\_

Solutions below pH 7 on the scale are classed as \_\_\_\_\_

Which colour does the natural indicator that is beetroot turn in the presence of an:

Acid = \_\_\_\_\_

Alkali = \_\_\_\_\_

Which colour on the pH scale indicates a weak acid?

\_\_\_\_\_

**Detect****Recall****Solve**

# 7CS Mixed up problems

- 1 Two students heated a piece of white, calcium carbonate. It glowed with a bright light. A white solid was left behind.  
 Jamie: "There was evidence of a chemical change".  
 Adi: "There was not enough evidence of a chemical change".  
 Who do you think was correct? Give a reason.

- 2 Peter heated water in a flask and saw bubbles form. He decided this was a chemical change because a new gas formed.  
 Do you think Peter was correct? Explain your answer.



**Mass of powder**

| Before heating (g) | After 2 minutes (g) | After 4 minutes (g) |
|--------------------|---------------------|---------------------|
| 5.0                | 3.2                 | 3.2                 |

- 3 Ahmed weighed some green copper carbonate. Then he heated it strongly in a test tube for two minutes. He noticed the powder turn black. He weighed the powder and heated it for a further 2 minutes. It did not change colour again.
- i) What is the evidence for a chemical change after 2 minutes?  
 ii) Was there a chemical change between 2 and 4 minutes?  
 Give a reason.

AO2: Apply knowledge and understanding of:

- 1) scientific ideas
- 2) scientific enquiry, techniques and procedures.



**4** Your stomach contains acid to help digestion and kill bacteria. Too much acid in the stomach can cause painful indigestion.



**i)** Explain how an indigestion tablet could work to stop indigestion.

**ii)** Explain why taking too many indigestion tablets could increase the chances of food poisoning.

**5** Litmus paper can test if a solution is acidic or alkaline. The table shows the colour changes of red and blue litmus paper. How would you use litmus paper to show that a substance is neutral?

| Type of litmus paper | Colour in acid | Colour in neutral solution | Colour in alkali |
|----------------------|----------------|----------------------------|------------------|
| Red                  | Red            | Red                        | Blue             |
| Blue                 | Red            | Blue                       | Blue             |

**6** Chemical changes take place in the leaves of oak trees during the year.

Write down some evidence for this claim.