

# MATERIALS 3

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Name \_\_\_\_\_

Form \_\_\_\_\_



# Solid, Liquid or Gas?

Solids, liquids and gases are called the **three states of matter**

Look at the materials you have been given and decide what state they are (solid, liquid or gas) they are. Write the name of each substance in the correct column

Substances you may be given include: ice, water, air, sand, rubber, chocolate, sugar, tar, carbon dioxide, steam, smoke, jelly

<b>Solid</b>	<b>Liquid</b>	<b>Gas</b>

## Facts about solids liquids and gases

<b>Solids</b>	<b>Liquids</b>	<b>Gases</b>
Solids do not flow. They always have a fixed shape	Liquids flow and can be poured easily	Gases flow and change shape
Solids always take up the same amount of space	Liquids change their shape depending on their container	Gases spread out to fill the space of their container
Solids can be cut or shaped	Liquids always take up the same amount of space (the <b>volume</b> does not change)	Gases can be squashed (compressed)
Solids stay in one place and can be held		

[http://www.bbc.co.uk/bitesize/ks2/science/materials/solids\\_liquids\\_gases/play/](http://www.bbc.co.uk/bitesize/ks2/science/materials/solids_liquids_gases/play/)

# The three states of matter

## Summary

	<b>SOLIDS</b>	<b>LIQUIDS</b>	<b>GASES</b>
Examples		Oil	Air
Takes the shape of its container		Yes	
The amount of space it takes up stays the same (keeps the same volume)		Yes	
It can be squashed up or compressed	No	No	
It can flow down a pipe	No		Yes

## Changing State: Some Experiments

Name: .....

***Fill in the results on this sheet and then write your own note neatly***

Measure the temperature of some ice: Temperature = .....

Measure the temperature of some cold water: Temperature = .....

Add a small amount of water (about 20ml) to the ice and stir it rapidly.

What is the temperature of the water plus ice?.....

What happens to the ice when it is added to the water? It .....

because.....

What happens to water when its temperature drops below 0°C?

.....

We put some water in a sealed container and left it in the freezer overnight

What happens to the volume of some water when it freezes?

.....

Some water was put into a kettle and heated.

What happens to water when its temperature rises to 100°C?

.....

The steam from the boiling water was allowed to touch a cold surface.

What did you see happen?.....

What happens to steam when its temperature falls below 100°C? .....

What will happen to water left out on a tray in the sun? .....

These words may help you with your answers:

**Melts, Boils, evaporates, condense, freezes**

# Changing state

SOLID LIQUID GAS

Heating or cooling can change materials from one state to another

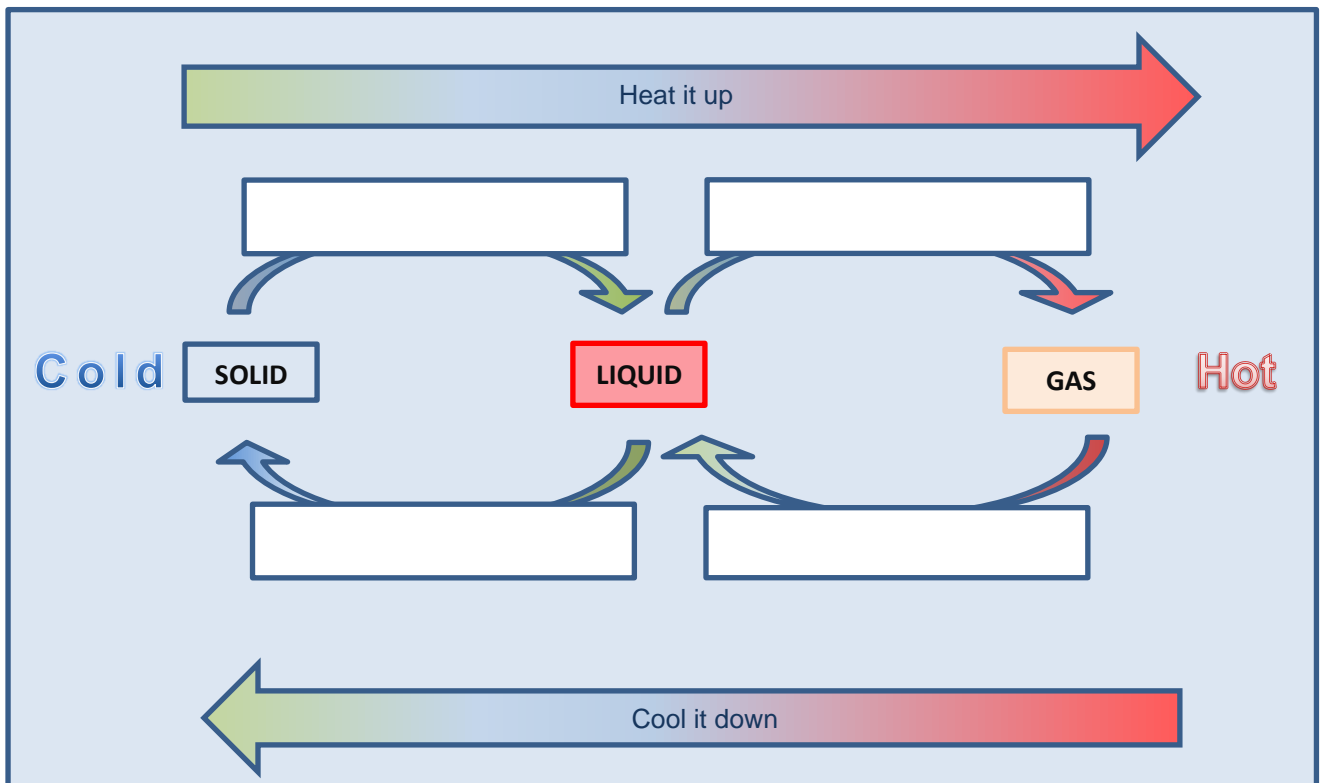
Solid turning into liquid	=	Melt	(heat it up)
Liquid turning into gas	=	Evaporate	(heat it up)
Gas turning into liquid	=	Condense	(cool it down)
Liquid turning into solid	=	Solidify (or freeze)	(cool it down)

The temperature at which a solid changes to a liquid = melting point

The temperature at which a liquid starts to boil = boiling point

Melting point of water =

Boiling point of water =



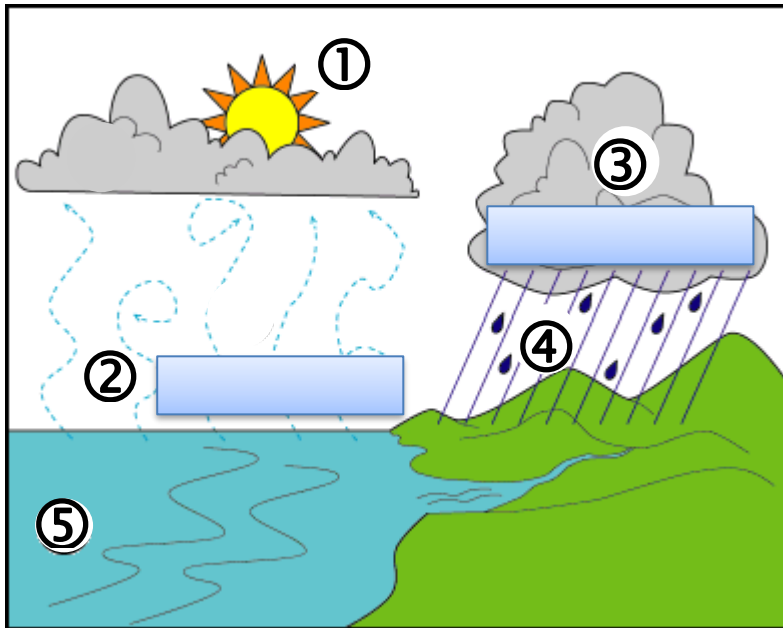
Write the words MELT, CONDENSE, FREEZE, or EVAPORATE in the correct box

Colour in the diagram neatly

Note:

Copy (or cut out and stick) this picture onto a fresh sheet, adding colour and copy the note, filling in the gaps.

# The Water Cycle



Add arrows to the diagram to show how the cycle happens.

Write in the words EVAPORATION and CONDENSATION in the correct boxes on the diagram

Energy from the .....(1) causes water to ..... (2) from lakes, rivers and oceans.

As the air rises it .....

This causes the water vapour in the air to ..... into tiny droplets and a ..... is formed(3).

When the drops of water are big enough they fall as ..... (4)

The rain water soaks into the ground and collects in rivers and flows to the sea (5).

....the Sun causes the water in the rivers and lakes to evaporate and the cycle restarts!

*rain    evaporate    cloud    condense    Sun    cools*

# Investigating the rate at which water evaporates

Write up this experiment in your own words on another sheet of paper

You may cut out and use the table of results if you want

Factors which affect the rate at which water evaporates are:

- The surface area of the water
- The air temperature
- The amount of air movement (draughts, wind etc)

The volume of the water we used, its surface area, the air temperature, the amount of air movement and the length of time we leave the water out for are all things that we can change or measure and are known as **variables**

## What we are going to do:

We are going to do this experiment by taking exactly 250ml of water and leaving it for 1 day and then measure the volume of water that we have left.

**PREDICTION:** I think that the water will evaporate the quickest from .....

## CLASS RESULTS

Conditions	Volume of water at the start of the experiment	Volume of water at the end of the experiment	Volume of water that evaporated
Beaker of water on a cold shelf	250ml		
Tray of water on a cold shelf	250ml		
Tray of water near a fan	250ml		
Tray of water in a warm cupboard	250ml		
Beaker of water outside			
Beaker of water in the fridge			

## Draw a bar graph of the results

**CONCLUSION:** The water evaporated the quickest from: .....

What variables are being kept the same for each experiment:

.....

Name two variables that might change the speed that water evaporates

.....

What did you measure in this experiment?

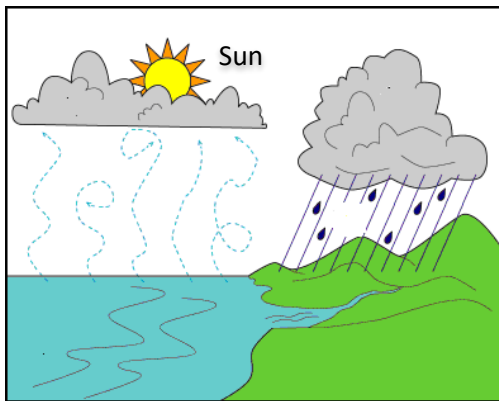
.....



1 Draw lines to link each sentence below to the word being described:

- |    |   |           |
|----|---|-----------|
| a) | When ice warms up it turns to a liquid                          | Condense  |
| b) | When water is cooled it turns to ice                            | Evaporate |
| c) | When a steam is cooled it turns back into little drops of water | Melt      |
| d) | Water in a puddle to disappearing on a hot day                  | Freeze    |

2 Look at this diagram which shows part of the **water cycle**:



Write an **A** on the diagram where **evaporation** takes place.

Write a **B** on the diagram where **condensation** takes place.

Where do you think the energy comes from that keeps the water cycle going?

.....

3. If a lump of chocolate is left in the sun it will .....
4. If we put water into a deep freeze (freezer) it will .....
5. Water in a puddle on a hot day will gradually disappear because the water .....
6. When steam touches a cold mirror in the bathroom little drops of water appear on the mirror.

This happens because the mirror is ..... And the steam .....

7. What is the temperature at which water boils?.....
8. At what temperature does water freeze (or ice melt)? .....

A red beaker containing **100ml** of water was left on a shelf.  
After 3 days it contained only **80ml** of water

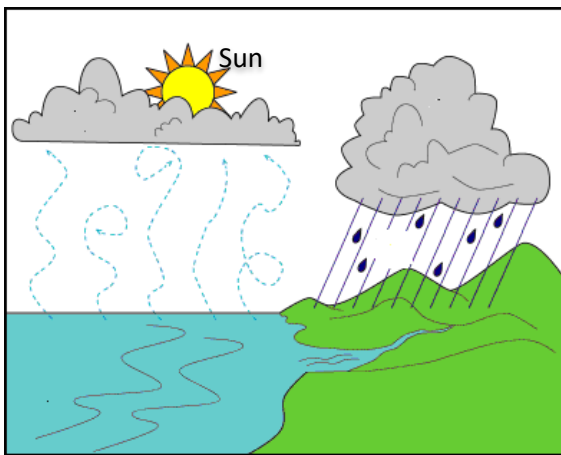
9. Has volume of water in the beaker has GONE UP or GONE DOWN? .....
10. Some of the water in the beaker has evaporated

How much water evaporated from the beaker? .....

1 Draw lines to link each sentence below to the word being described:

- |    |   |           |
|----|---|-----------|
| a) | When ice warms up it turns to a liquid                          | Condense  |
| b) | When water is cooled it turns to ice                            | Evaporate |
| c) | When a steam is cooled it turns back into little drops of water | Melt      |
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2 Look at this diagram which shows part of the **water cycle**:



Write an **A** on the diagram where **evaporation** takes place.

Write a **B** on the diagram where **condensation** takes place.

Where do you think the energy comes from that keeps the water cycle going?

.....

11. If a lump of chocolate is left in the sun it will .....

This happens because .....

12. If we put water into a deep freeze (freezer) it will .....

this happens because .....

13. Water in a puddle on a hot day will gradually disappear because ...

.....

14. When steam touches a cold mirror in the bathroom little drops of water appear on the mirror.

This happens because .....

15. What is the temperature at which water boils?.....

16. At what temperature does water freeze (or ice melt)? .....

## Part 2

A class did an experiment to find out what conditions made water evaporate the fastest .

They took three beakers, each containing 100 ml of water

Beaker 1 was poured into a shallow tray and left on a shelf in the laboratory

Beaker 2 was poured into a shallow tray and left in a warm cupboard

Beaker 3 was left on a shelf in the science laboratory

The next day the pupils poured the water from the trays back into each beaker to see how much water was left.

These were their results:

Condition	Volume of water at the start (ml)	Volume of water remaining after one day (ml)	Change in volume (ml)
<b>Beaker 1</b> Poured onto a tray on a cool shelf	100 ml	80ml	20ml
<b>Beaker 2</b> Poured a tray in a warm cupboard	100ml	75ml	X
<b>Beaker 3</b> Left in the beaker on a cool shelf	100ml	95ml	X

1. Complete the table by filling in the remaining boxes (marked X)

2. Why is the volume of water in the beaker less after leaving it for a day?

.....

3. Which beaker lost the most water (1, 2 or 3)? .....

4. Why do you think the water in the tray evaporated quicker than the water in the beaker?

.....

5. Name one factor the pupils kept the same for each experiment?

.....

# More about Dissolving and Solutions

Write up this experiment in your own words on another sheet of paper

Apparatus: stopwatch or timer, spatula, 100ml beaker, thermometer

Place 100 ml of cold water into a beaker

Add 1 spatula of salt and stir. Time how long it takes the salt to dissolve.

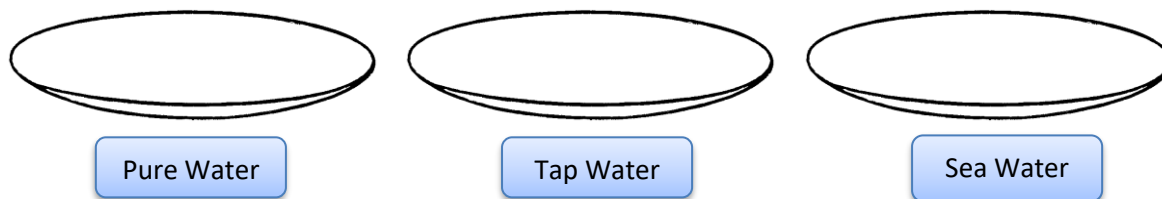
How could we help the salt dissolve quicker? .....

How could we get the salt back again?.....

## Comparing the dissolved solids in pure water, tap water and sea water

Place 10 ml of each type of water into a watch glass and let the water evaporate.

Compare what is left behind on the glass when the water has all gone.



### Results

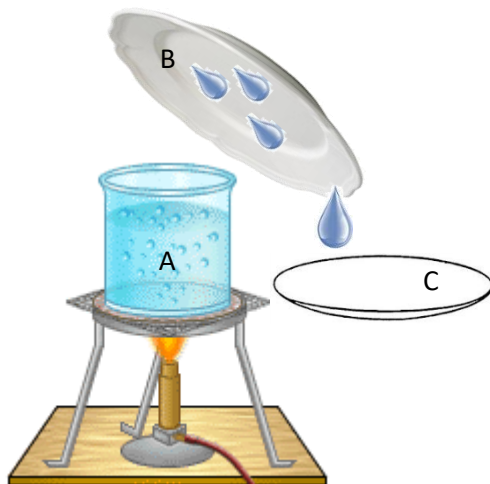
Type of water	Result
Pure water	
Tap water	
Sea water	

Write the words SOLVENT, SOLUTE and SOLUTION in the correct box below

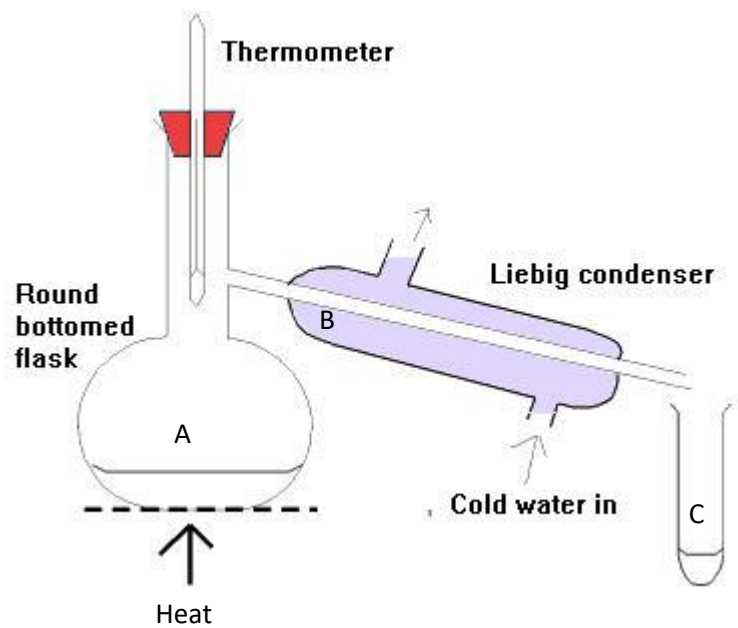
Substance	Word that describes the substance Write the word <i>Solvent</i> , <i>Solute</i> or <i>Solution</i>
SALT	
WATER	
SALTY WATER	

How could we get the water back again from the salty water?.....

## Distilling some water



Colour in the diagrams neatly



Explain what is happening at A, B and C:

A: .....

B: .....

C: .....

What difference would there be between the water at A and the water at C?

.....

## Investigation:

### Aim of the investigation

To investigate the effect of temperature on making a solution

### This is what am going to do:

I will have four beakers of water, each at a different temperature, and will time how long it takes 1 sugar lump to dissolve in each.

### This is what I am going to measure

### This is the factor (variable) I am changing for each experiment:

### I am going to keep these factors the same for each experiment

### These are my results

Temperature of the water	Time taken to dissolve

Now draw a line graph of your results (temperature on X-axis, time to dissolve on the Y axis)

### This is my conclusion:

# Reversible and irreversible changes

## Examples of reversible changes:

- Water evaporating
- Dissolving sugar
- Melting chocolate
- Freezing water

All the changes above are temporary can be easily reversed.

They are sometimes called physical changes and **no new chemicals are formed**.

## Examples of Irreversible changes:

- Making toast
- Cooking an egg
- Rusting
- Burning (eg burning wood)

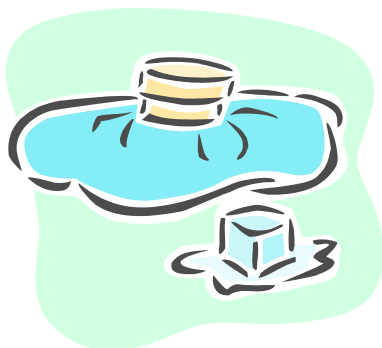
The changes above are **permanent** and cannot be reversed.

They are sometimes called chemical changes and always result in a new chemical substance being formed.

When a new substance is formed it means that a chemical reaction has taken place.

Signs that a chemical change is taking place:

1. A change in temperature (it will usually get hot)
2. A colour change (eg a blue chemical turns white)



On the next pages there are examples of some irreversible changes

## Investigating RUSTING

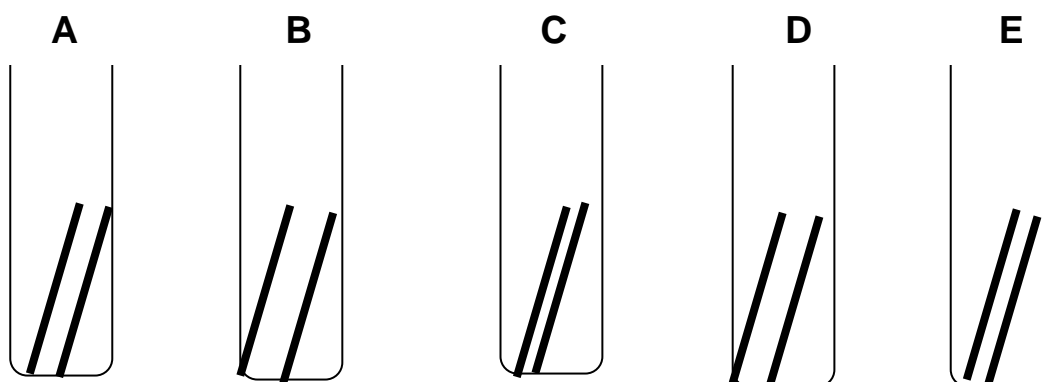
### My hypothesis:

I think that the following conditions are needed for nails to rust:

In order to test my hypothesis I did the following experiment

I took ..... test tubes and placed ..... nails in each tube

The conditions in each tube were different as shown below



The nails were left in the test tubes for ..... days

### Results of rusting experiment:

	Contents	Conditions	Result
Tube A	Air and water	Air water	
Tube B	Air + Drying agent	Air, no water	
Tube C	Boiled water	Water, no oxygen	
Tube D	Air and sea water	Air Water salt	
Tube E	Nothing (control)	Normal	

A drying agent is a chemical that takes water from the air and keeps the air dry

**Conclusion:** In order to rust a piece of iron needs the following conditions:





Metal can be painted



Chain should be coated with oil



Tin can (Iron coated with tin)



Use aluminium  
instead of iron

Galvanized Iron bucket (Iron coated with zinc)

**1. This question is about reversible and irreversible changes**

Write the word **REVERSIBLE** or **IREVERSIBLE** in each space provided

<b>Action</b>	<b>Type of change</b>
<b>Cooking</b> an egg	
<b>Freezing</b> water	
<b>Rusting</b> iron	
<b>Burning</b> wood	
<b>Baking</b> a cake	
<b>Melting</b> chocolate	
<b>Steam forming little drops on a cold window</b>	

**2. Draw lines to link each sentence below to the word being described:**

- |  |           |
|--|-----------|
| a) When a solid chocolate is heated it turns to a liquid | Condense  |
| b) When water is cooled it turns to                      | Evaporate |
| c) When a steam touches a cold mirror it will            | Burn      |
| d) Water in a puddle will slowly                         | Freeze    |
| e) If wood is heated it will                             | Rust      |
| f) If iron is left outside it will                       | Melt      |

**5. This question is about how to stop things going rusty**

- a. How can you stop the bicycle chain from going rusty?

.....

- b. How could stop a metal bench from going rusty?

.....

# Assessment test 2B

Name:.....

## 1. Classify the following as a reversible or irreversible change:

Write the word **REVERSIBLE** or **IREVERSIBLE** in the space provided

<b>Action</b>	<b>Type of change</b>
<b>Cooking</b> an egg	
<b>Freezing</b> water	
<b>Dissolving</b> salt in water	
<b>Rusting</b> iron	
<b>Burning</b> wood	
<b>Baking</b> a cake	
<b>Melting</b> chocolate	
<b>Condensing</b> steam	

## 2. Draw lines to link each sentence below to the word being described:

- |  |           |
|--|-----------|
| a) When a solid chocolate is heated it turns to a liquid | Condense  |
| b) When water is cooled it turns to ice .....            | Evaporate |
| c) When a steam touches a cold mirror it will.....       | Burn      |
| d) Water in a puddle will slowly .....                   | Freeze    |
| e) If wood is heated it will.....                        | Rust      |
| f) If iron is left outside it will.....                  | Melt      |

3. Mary left some chocolate on the back seat of her Mum's car and found that it went soft. She put it in the 'fridge and by the evening it was hard again.

- a) Explain how the 'fridge made the chocolate go hard again

.....

Later that day Mary burnt some her toast so decided to put the toast in the 'fridge to see if it would turn back to bread. She found it did not work.

- b) Explain why the fridge helped with the chocolate but would not help with the toast.

.....

4. What conditions are needed for a piece of iron to go rusty (tick ONE of them)

Air

Water

Air and Water

5. The following items are made mostly out of iron.

How would you prevent each from going rusty:

a. Bicycle chain on a bike:.....

b. Metal park bench:.....

6. Give one reason people might use aluminium instead of iron to make a bicycle frame

.....

# Sherbet recipe

## Ingredients:

1 cup of icing sugar

1 teaspoon citric acid

1 teaspoon bicarbonate of soda

1 teaspoon of flavoured jelly crystals (optional)



## Method

Mix all the ingredients together

Taste

Adjust as necessary:

too sour: add more sugar

Not sour enough: add a tiny amount of citric acid

Eat using liquorice straw or lolly to dip in.



## Tips:

- Do not use too much citric acid; doing so can give you a tummy ache
- Try not to inhale sherbet
- Do not eat too much sherbet at one time; you'll be sick!
- If the citric acid is ground into a powder and the whole mixture sieved it will be smoother.

## Words list

<b>Natural</b>	Found in nature. Note made by humans. Wood is natural
<b>Synthetic</b>	Man-made. Artificial. All plastics are man-made.
<b>Solute</b>	The substance dissolved in a solution
<b>Solvent</b>	The liquid used to make a solution (usually water)
<b>Solution</b>	A clear liquid containing a dissolved solid
<b>Soluble</b>	Able to dissolve      eg sugar is soluble in water
<b>Insoluble</b>	Cannot dissolve      eg sand is insoluble in water
<b>Evaporate</b>	When a liquid turns into a gas
<b>Boil</b>	When a liquid turns into a gas at its boiling point
<b>Condense</b>	When a gas or vapour turns into a liquid (when it cools down)
<b>Freeze</b>	When a liquid turns into a solid (when it cools down)
<b>Melt</b>	When a solid turns into a liquid (when it warms up)
<b>Irreversible change</b>	A change where a new chemical substance is formed eg burning, cooking, rusting, adding vinegar to baking soda
<b>Reversible change</b>	A change when something changes state (eg melts) but does not actually form a new substance. Examples of reversible changes include evaporation, condensation, freezing, melting and dissolving.