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# Experiment Manual for Key Stage 2

(Materials and their  
properties Sc3)

Martin D Roberts

**MDR**  
Publishing

Published by  
MDR. Publishing  
PO Box 1173  
Sorting House  
22 Bristol Road  
WINTERBOURNE  
Glos.  
BS36 1RG

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First published by MDR Publishing in 2009

**ISBN:** 978-0-9543512-3-6

**Illustrator:** M.D Roberts

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	<b>Section 2: Finding useful materials</b>
3C2	Survey: what's it used for?
3C3	Photo Survey: what's it used for?
3C4	What's it made of?
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3C8	Survey: Part 1: preparation
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3C13	The scratch test
3C14	Flexibility is a confusing word
3C15	How temperature effects plasticene
	<b>Section 6: Testing absorbency</b>
3C16	Testing the absorption of different materials

## 3C Equipment list

Specialised equipment	Recyclable	Standard equipment/household
Dropper	cereal packets	Materials kitchen towels
	Materials: paper	Materials: blotting paper
	Materials: plastic	Materials: duster
		Materials: news paper
		Materials: photocopy paper
		Materials: tissue paper
		Materials: cotton sheet
		Aluminium foil
<div style="border: 2px solid red; padding: 10px; color: red;"> <p>Please note that, in order to save space in the DEMO, we have only included the equipment list for this unit. The full version will include equipment lists for all units.</p> </div>		
		Materials: ceramic
		Materials: chalk
		Materials: clay
		Materials: copper
		Materials: cotton
		Materials: cotton wool
		Materials: granite (rock)
		Materials: iron
		Materials: paper
		Materials: plasticine
		Materials: rubber
		Materials: sponge
		Materials: wood
		Materials: wool
		Permanent marker
		Plastic cups
		Ruler
		Sand paper

# 3C6 How hard is your floor?

Marbles  Collection of different floor surfaces  Ruler

①

Your teacher has supplied you with a number of different floor materials.

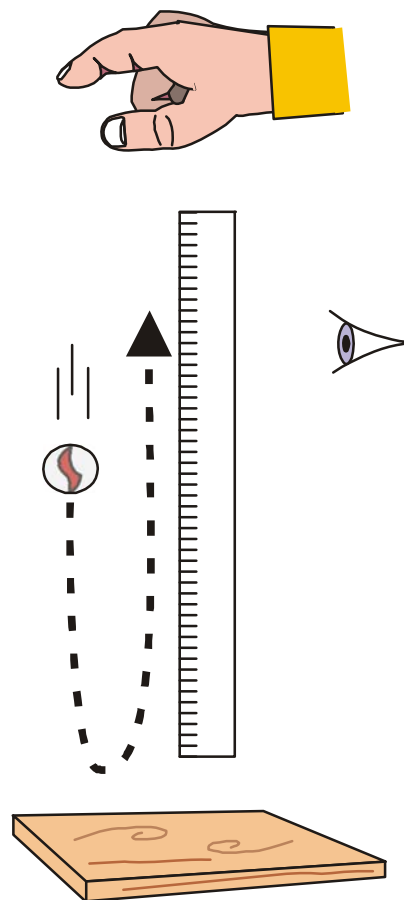
You are going to do a test to find how hard each material is.

②

To do this drop a hard ball like a marble onto the sample and measure the height to which it bounces.

③

Fill in the table below and then represent your results on a bar graph.



Draw the height to which the ball bounces in the table below:

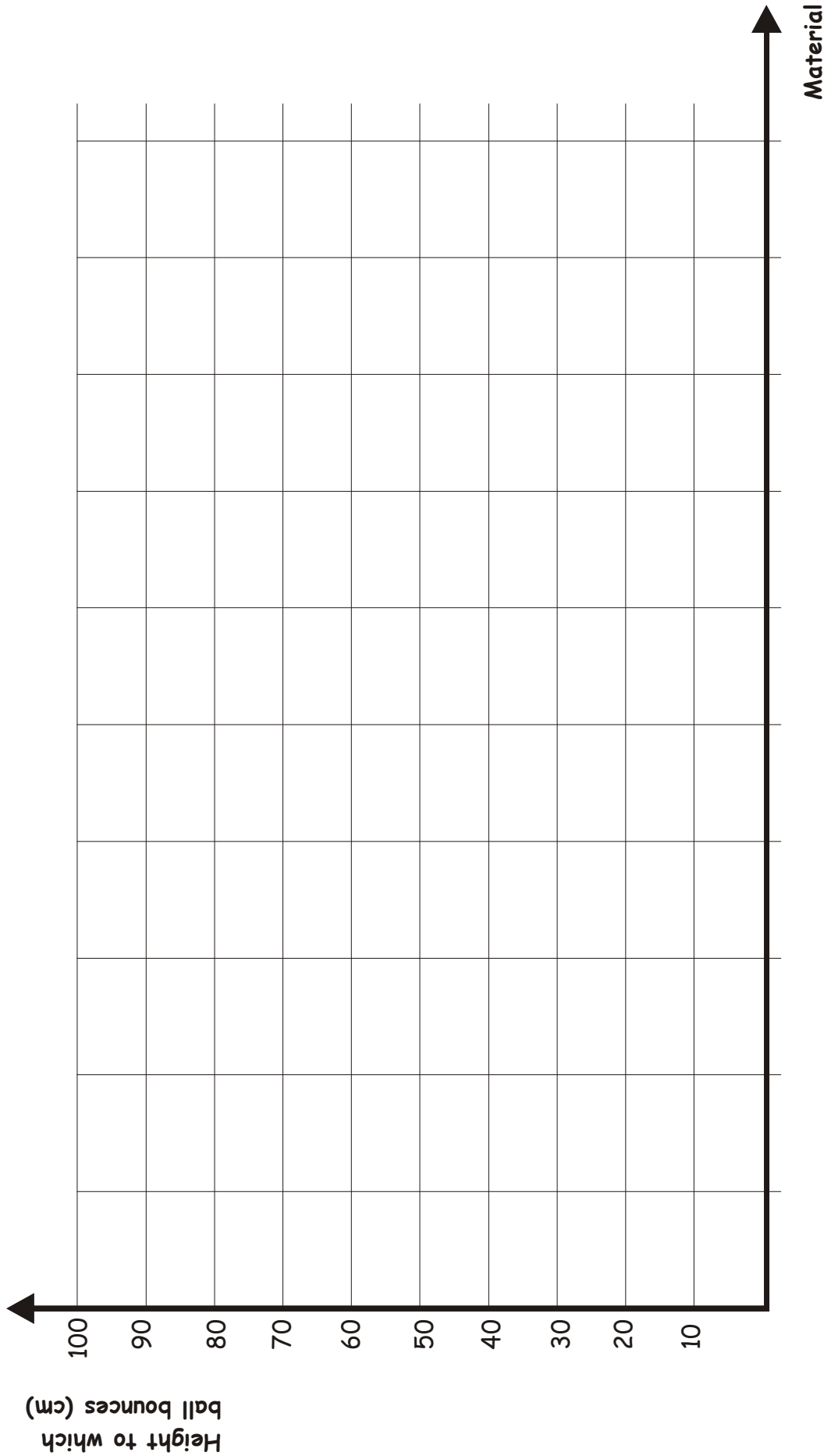
Floor material	Height to which the ball bounces (cm)

Represent your results in the form of a bar graph ([following page](#)).

Which material seems to be the hardest? .....

How did you decide? .....

# 3C6 How hard is your floor?



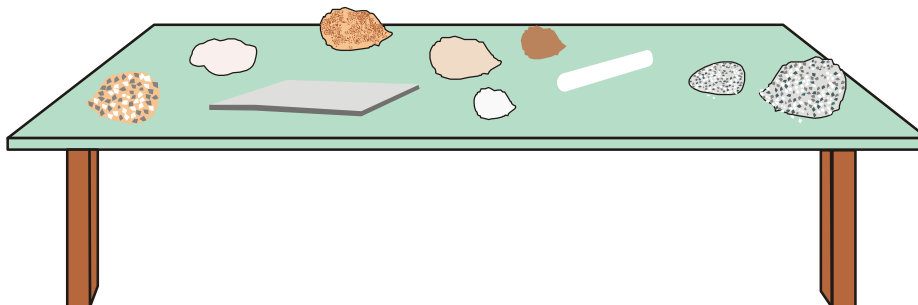
3D Rocks And Soil	
Section 1: Looking at rocks	
3D1	What is your school made of?
3D2	Can rocks float?
3D3	Colouring in granite
3D4	Paper mache volcano: part 1
3D5	Paper mache volcano: part 2
3D6	Paper mache volcano: part 3: The eruption
Section 2: Grouping rocks	
3D7	Grouping rocks: Preparation
3D8	Grouping rocks: texture and appearance
<b>3D9</b>	<b>Grouping rocks: hard or soft rock</b>
Section 3: Erosion and permeability	
3D10	Erosion of buildings
3D11	Breaking up rocks
3D12	Freeze-thaw weathering of sandstone
3D13	Permeability of some rocks
Section 4: Using rocks	
3D14	School photo survey
3D15	Comparing clay with brick
Section 5: Rock is everywhere	
3D16	Rock is everywhere
Section 6: Different types of soil	
3D17	Make some apparatus for soil testing
3D18	What is soil made of? Water I
3D19	What is soil made of? Water II
3D20	What is soil made of? Air I
3D21	What is soil made of? Air II
3D22	What is soil made of? Part 1
3D23	What is soil made of? Part 2
Section 7: The permeability of soil	
3D24	How easily does water filter through soil?

# 3D9 Grouping rocks: hard or soft rock

Collection of rocks of varying hardness (see below)  Cement surface

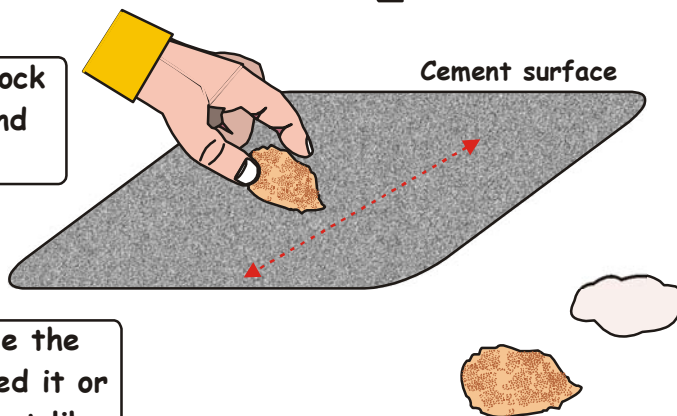
1

Your teacher has supplied you with a number of different rock samples. You are going to make a test to see how hard the rocks are.



2

Go into the playground and rub a rock sample against a cement surface and examine the mark that it makes.



3

Note if the mark was made because the rocks sample broke up as you rubbed it or because the rock cut into the cement like a knife.

Put the rock samples in order of hardest to softest:

1..... 2..... 3..... 4..... 5.....

How did you decide whether one rock was harder or softer than another? .....

.....  
.....

How did you make sure that you carried out a fair test?.....

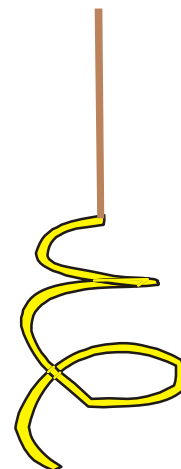
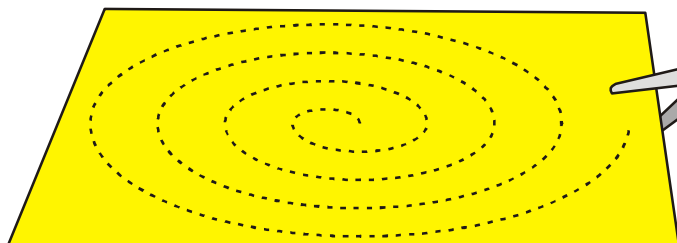
.....  
.....

	<b>4C Keeping Warm</b>
	Section 1: Using touch to judge temperature
4C1	Measure the temperature
4C2	Guess the temperature
4C3	When its difficult to guess the temperature
4C4	Hot bowl - cold bowl
	Section 2: Using a thermometer
4C5	Thermometer readings in various situations
	Section 3: Recording temperatures
4C6	A temperature map of your classroom
4C7	A temperature map of your school grounds
4C8	Solar heater I
4C9	Solar heater II
	Section 4: Keeping things cold
4C10	Melting ice
4C11	Keeping cool in the Sun
	Section 5: Keeping things warm
4C12	Which cools fastest? I (volume)
4C13	Which cools fastest? II (surface area)
<b>4C14</b>	<b>How heat escapes: convection I</b>
4C15	How heat escapes from your body: convection II
4C16	How heat escapes from your body: evaporation
4C17	How heat moves in a liquid
4C18	Make a volcano
4C19	How heat escapes: conduction
	Section 6: Insulation
4C20	Insulation and cooling
	Section 7: Insulators and conductors
4C21	Wooden, plastic and metal spoons
4C22	Insulators and conductors
	Section 8: Uses of thermal insulators
4C23	Photo survey: thermal insulators

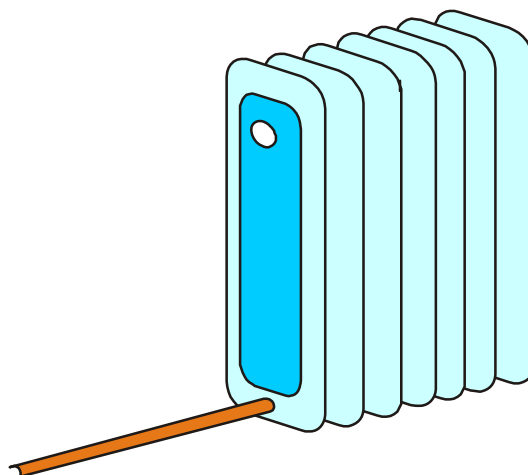
## 4C14 How heat escapes: convection I

Card  Scissors  String  Sticky tack  Heat source

- ① Cut a spiral from a piece of paper or card.



- ② Hang it above a heat source as indicated opposite and observe what happens.



What does the mobile do when you hang it above the radiator? .....

.....

**This happens because warm air is moving.**

Where does the warm air come from? .....

.....

In which direction does warm air move, upwards or downwards? .....

	<b>4D Solids And Liquids</b>
	Section 1: Introduction
4D1	Grouping solids: spider diagram
	Section 2: Sorting liquids from solids
4D2	Sorting liquids
4D3	Confusing materials
4D4	Fluidity of liquids
4D5	The shape of a liquid
4D6	Tilting liquids
4D7	Volume of liquids
<b>4D8</b>	<b>Changing the volume of a liquid and a solid</b>
4D9	Pouring liquids (part 1)
4D10	Pouring liquids (part 2)
4D11	Siphoning liquids
	Section 3: Measuring volume
4D12	How much liquid will a container hold?
4D13	Measuring volume by displacement
4D14	Measure your lung capacity
4D15	Measure the volume of a drop of water
4D16	Make a displacement vessel
4D17	Using a displacement vessel
	Section 4: Pouring solids
4D18	Investigating dry sand
4D19	Investigating wet sand
	Section 5: Freezing and melting
4D20	Freezing water
4D21	Melting chocolate
4D22	Icebergs: part 1
4D23	Icebergs: part 2
	Section 6: Melting temperatures
4D24	Melting point of ice
4D25	Adding salt to ice
4D26	Melting point of chocolate
	Section 7: Mixing solids
4D27	Separating marbles, sand, rice and paper clips
4D28	Separating iron filings and sand
4D29	Separating sand from salt?

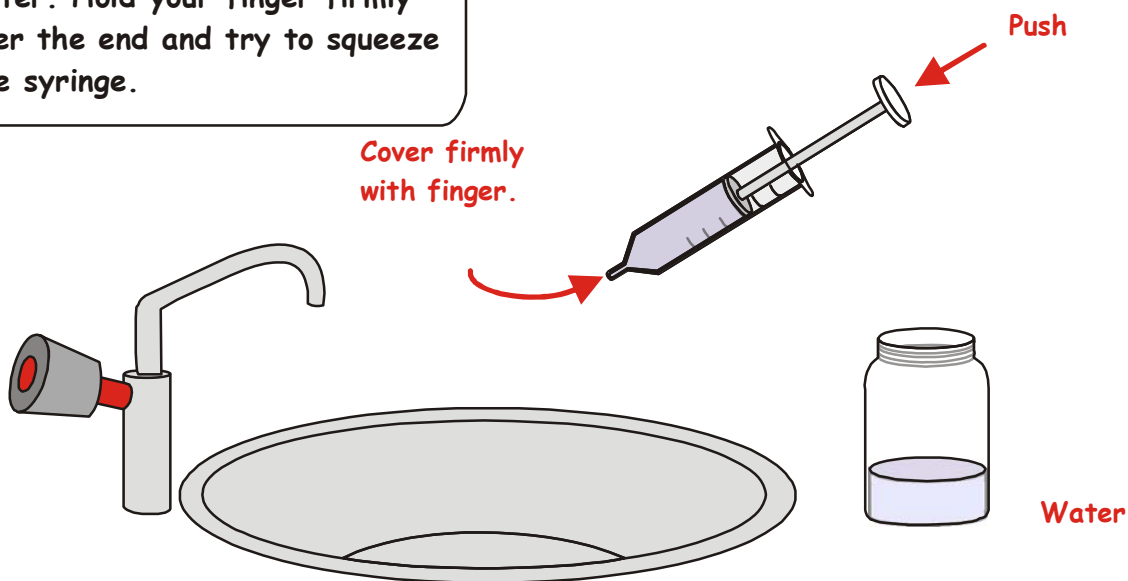
	Section 8: Adding solids to water
4D30	Soluble or insoluble?
4D31	Adding salt to water
4D32	Adding sand to water
	Section 9: Separating solids and water
4D33	Separating salt from water
4D34	Separating pigments in ink
	Section 10: Making solutions
4D35	Speeding up dissolving: temperature
4D36	Speeding up dissolving: powder and stirring

# 4D8 Changing the volume of a liquid and a solid

Syringe  Jam jar or plastic cup  Sink

①

Two thirds fill a syringe with water. Hold your finger firmly over the end and try to squeeze the syringe.

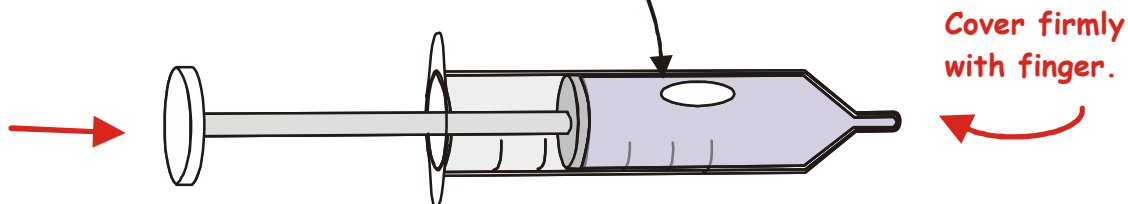


②

Pull the handle back a little allowing a small air bubble to enter the chamber.

③

Hold the syringe horizontally so that the bubble is positioned in the middle, then compress and observe what happens to the bubble.



Is it easy to change the volume of a liquid?.....

How does the experiment in part two and three above show you that gases are easier to compress than liquids?

Why are bicycle tyres filled with air and not water? .....

	<b>5C Gases Around Us</b>
	Section 1: Grouping solids and liquids
5C1	Grouping solids and liquids (spider diagram)
	Section 2: Understanding air
5C2	The mass of air in a football
<b>5C3</b>	<b>Demonstration that air has a weight</b>
5C4	The weight of the air in your classroom
5C5	Air pressure: keep the water in the cup
5C6	Air pressure: keep the tissue dry
5C7	Air pressure: keep the water in the jar
5C8	Air pressure: karate!
5C9	Air pressure: remove the air from a bottle
5C10	How to make a syringe pump
5C11	How to make a suction pump
5C12	Air pressure: how to make a barometer
	Sections 3 and 4: Thinking about powders and sponges
5C13	Powders contain air
5C14	How much air is there in sand?
5C15	How much air is there in a sponge?
	Section 5: Air in soil
5C16	What is soil made of? (part I)
5C17	What is soil made of? (part II)
	Section 6: Important gases
5C18	Gases of the atmosphere (photo survey)
5C19	How much Oxygen is in the atmosphere I?
5C20	How much Oxygen is in the atmosphere II?
5C21	Eggstraordinary
5C22	Preparation of limewater
5C23	Properties of Carbon Dioxide (fire extinguisher)
5C24	Which gases do we breath out?
5C25	Investigating fizzy drink bottles I
5C26	Investigating fizzy drink bottles II
5C27	Raising raisins
5C28	Helium balloons
	Section 7: Evaporation ( <b>see unit 5D: changing state</b> )
	Section 8: Properties of gases
5C29	Gases can move from place to place
5C30	The effect of heat on a gas
5C31	Crushing a milk container
5C32	Changing the volume of a gas
	Section 9: Differences between gases, solids and liquids
5C33	Venn diagram: solids liquids and gases

# 5C3 Demonstration that air has a weight

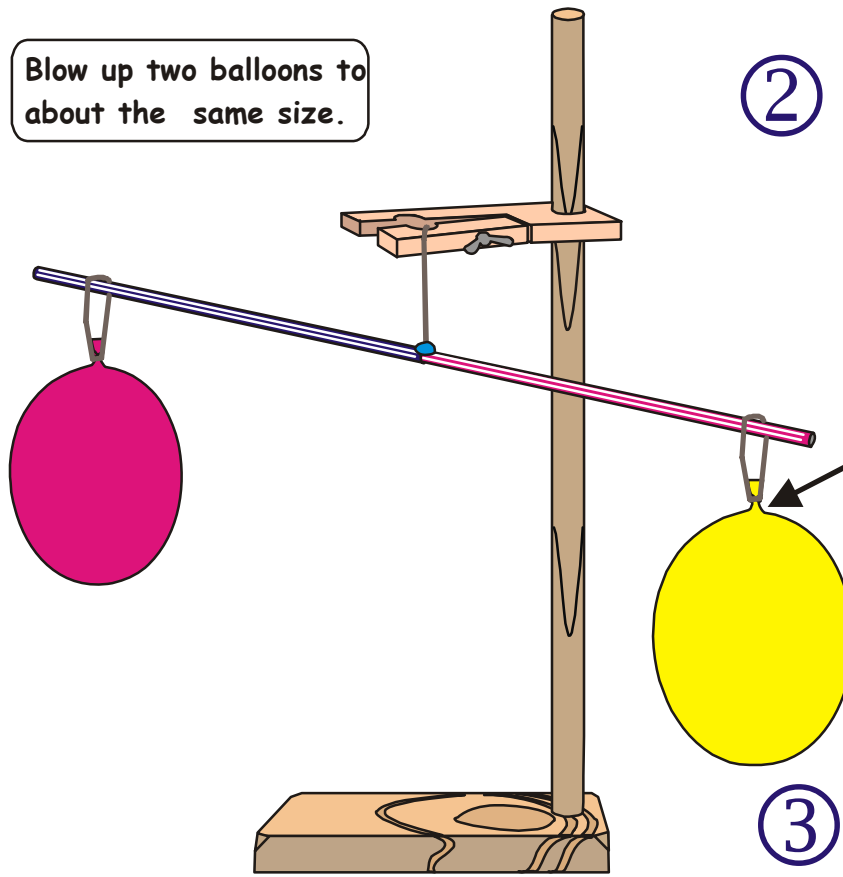
Plastic straws  Sticky tack  Support stand  Thread  Two balloons

①

Blow up two balloons to about the same size.

②

Hang the balloons from the beam adjusting the position to balance them correctly.



Puncture the balloon in the neck so that it deflates but does not explode.

③

When they are perfectly balanced burst one balloon with a drawing pin and observe what happens.

What happens to the balance when the balloon bursts?.....

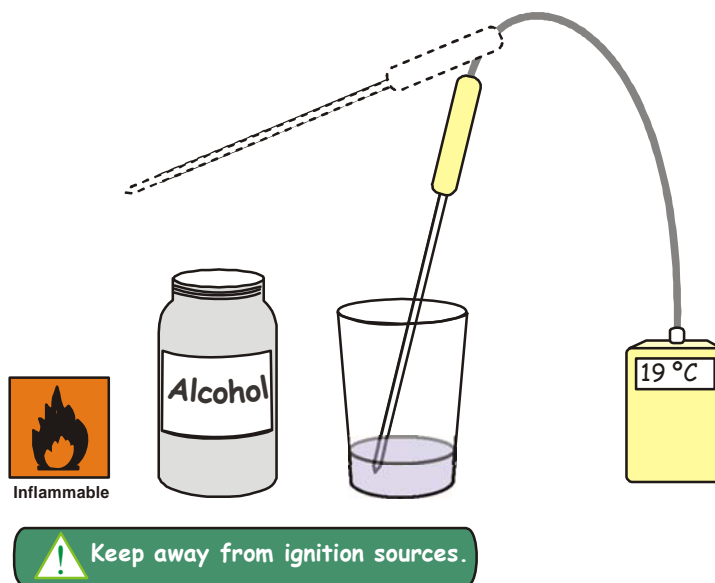
What does the experiment tell you about air?.....

	<b>5D Changing State</b>
	Section 1: Introduction
5D1	Concept map
	Section 2: Water evaporation
5D2	Evaporation from your hand
<b>5D3</b>	<b>Evaporation from a thermometer</b>
	Section 3: Evaporation of other liquids
5D4	Evaporation of different substances
	Section 4 and 5: Planning to investigate evaporation
5D5	How heat effects evaporation
5D6	How surface area effects evaporation
	Section 6: Drying and evaporation
5D7	Investigating drying: surface area
5D8	Investigating drying: location
5D9	Chalking puddles
	Section 7: Condensation
5D10	Condensation I
5D11	Condensation II
5D12	How to make clouds
	Section 8: Finding condensation
5D13	Photo survey: finding condensation
	Section 9: Boiling
5D14	Boiling point of water (teacher demo) (using a kettle)
	Section 10: Observing melting
5D15	Melting ice
5D16	Adding salt to ice
5D17	Melting chocolate
	Section 11: Reversible changes of state
5D18	Photo survey: reversible and irreversible processes
5D19	Heating and cooling Tin
	Section 12: The water cycle
5D20	The water cycle

## 5D3 Evaporation from a thermometer

Digital thermometer  Plastic cup  Alcohol or surgical spirit

Take a probe thermometer and place it in a beaker of alcohol. Then remove it and observe the temperature readings.



What is the name of the physical process that occurs in this experiment?.....

What change of state occurs?

..... → .....

Write your results in the table below:

Substance	Temperature change
Water	
Alcohol	

Which substance evaporated fastest?

**Substances need heat in order to evaporate.**

Where do the alcohol and water get the heat from?.....

.....

	<h2>6C More About Dissolving</h2>
	Section 1: Making water clear
6C1	Make a pebble bed filter
6C2	Filtering dirty water using a filter bed
6C3	How to fold filter paper
6C4	Filtering dirty water using different filters
6C5	What's in water? (bits)
	Section 2: Making water pure
6C6	Is clear water pure water?
6C7	Is the liquid pure?
6C8	Water dissolves gases
	Section 3: Testing evaporation of a solution
6C9	Distillation of salt water
	Section 4 and 5: Testing dissolving solids
<b>6C10</b>	<b>Which substances dissolve in water?</b>
6C11	Dissolving solids I: temperature
6C12	Dissolving solids II: grain size
6C13	Dissolving solids III: stirring
6C14	Dye solutions
6C15	Tie dyeing: preparing the solution for dyeing
6C16	Tie dyeing: dyeing a tee-shirt
6C17	How to write a secret message

# 6C10 Which substances dissolve in water?

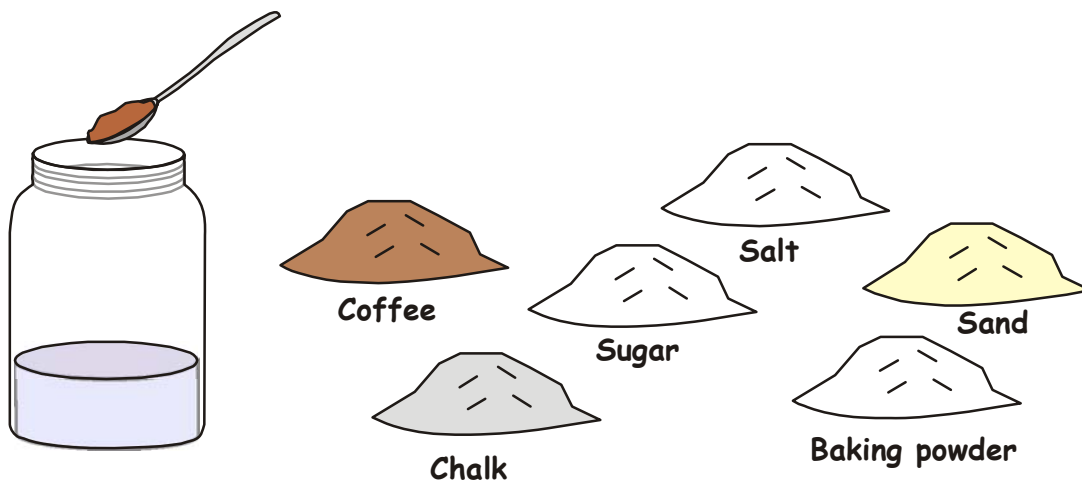
Plastic cup  Teaspoon  Selection of substances (see below)

①

Your teacher has provided you with a number of common substances. You must decide which dissolve in water and which don't.

②

In each case add a spoonful of the substance to water and stir for a while. Then, note below if the substance is still visible or not.



How do you decide if something dissolves or not? .....

Fill in the table below:

Substance	Visible after stirring?	Dissolves easily	Does not dissolve
Salt			
Sugar			
Chalk			
Sand			
Coffee			

Insert the words **soluble** or **insoluble** to complete the sentences below:

If a substance dissolves in water it is said to be .....

If a substance does not dissolve in water it is said to be .....

Salt is ..... in water whereas sand is.....

6D Reversible And Irreversible Changes	
	Section 1: Mixing materials with water
6D1	Survey: Mixing various substances with water
	Reversible changes
6D2	Mixing ink with water
6D3	Mixing oil with water
6D4	Mixing oil with surgical spirit
6D5	Mixing and separating salt and sand
6D6	Make an indicator from red cabbage
6D7	Using your indicator (reversing the colour)
	Irreversible changes
<b>6D8</b>	<b>Alka Seltzer ® bomb</b>
6D9	Alka Seltzer ® rocket
6D10	Chemical reactions: Effervescence
6D11	Chemical reactions: Heat change
	Section 2: Filtration and evaporation
6D12	Separating oil from water
6D13	Separation of salt from rock salt
	Section 3: Making new materials
6D14	Make some Plaster of Paris Christmas decorations
6D15	Make a fossil leaf
6D16	How to make green slime
6D17	Cleaning old coins
6D18	How to make a lava lamp
6D19	Mixing vinegar with baking powder
6D20	Make a volcano
6D21	Make your volcano erupt
6D22	Chemical reactions: Colour changes
6D23	Dissolving an egg shell
6D24	Acids are corrosive
6D25	Chemical reactions: Effervescence tablets
6D26	How to make tooth paste

	Section 4: Heating and cooling materials
6D27	Melting Tin to make badges
6D28	Heating a bimetallic strip
6D29	Comparing heating and burning
6D30	Make some floating candles
6D31	How to make charcoal (a home experiment)
6D32	How to make fossilised fir cones
	Section 5: Burning
6D33	Photo survey: fuels
6D34	What is wood ash?
6D35	Burning requires Oxygen
6D36	Video: exploding custard
6D37	Burning steel wool
6D38	Burning Magnesium
6D39	Burning peanuts
6D40	Review: Crossword puzzle

# 6D8 Alka Seltzer<sup>®</sup> bomb

Effervescent tablet  Camera case

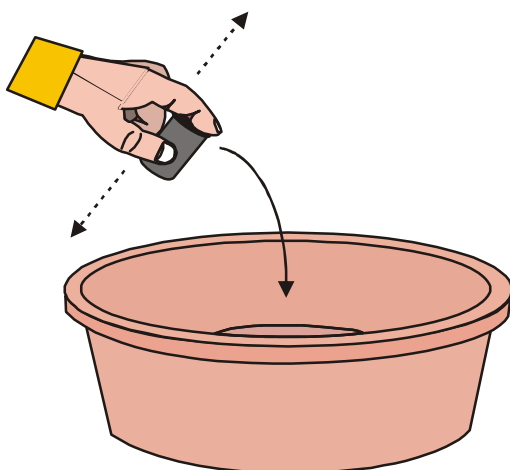
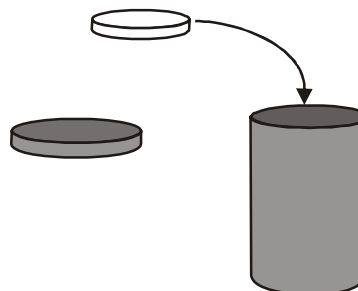
For this activity you need to use a film cartridge. There are usually two types: one where the lid fits over the case another where the lid fits into the case. You need the second type.

①

Nearly fill a film case with water then add an Alka Seltzer tablet.

②

**QUICKLY** secure the lid and shake vigorously for a few seconds.



③

Place the film case in a sink or a washing up bowl and observe what happens.

Describe what happens in the experiment: .....

.....

.....

Why does the lid fly off? .....

.....

A chemical reaction takes place in this experiment. What is the name of the gas produced?

.....

(see experiment 6D10.)

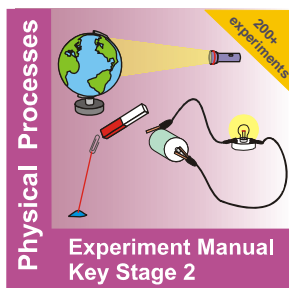
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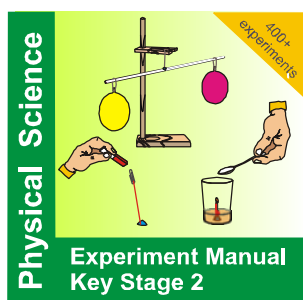
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