

Tutor support material

Entry Level

Edexcel Entry Level Certificate in Science
(8938)

Unit 6: Making Changes

May 2008

Edexcel, a Pearson company, is the UK's largest awarding body offering academic and vocational qualifications and testing to more than 25,000 schools, colleges, employers and other places of learning here and in over 100 countries worldwide. Our qualifications include GCSE, AS and A Level, GNVQ, NVQ and the BTEC suite of vocational qualifications from entry level to BTEC Higher National Diplomas and Foundation Degrees.

We deliver 9.4 million exam scripts each year, with over 3.8 million marked onscreen in 2006. As part of Pearson, Edexcel has been able to invest in cutting-edge technology that has revolutionised the examinations system, this includes the ability to provide detailed performance data to teachers.

Every effort has been made to contact copyright holders to obtain their permission for the use of copyright material. Edexcel will, if notified, be happy to rectify any errors or omissions and include any such rectifications in future editions.

References to third party material made in this specification are made in good faith. Edexcel does not endorse, approve or accept responsibility for the content of materials, which may be subject to change, or any opinions expressed therein. (Material may include textbooks, journals, magazines and other publications and websites.)

Authorised by Roger Beard
Prepared by Sarah Harrison

All the material in this publication is copyright
© Edexcel Limited 2008

CONTENTS

Introduction	1
Worksheets for Unit 6: Making Changes	1

Introduction

This tutor support material accompanies the Edexcel Entry Level Certificate in Science specification and has been designed to help teachers prepare for first teaching of the qualification.

This document is for Unit 6: Making Changes, and includes worksheets to aid the teaching of this unit.

Additional documents are available for all other units within the Edexcel Entry Level Certificate in Science. There is also a Teacher's guide document available on the Edexcel website, which gives more information on specialist language, assessment of practical skills and information on *How Science Works*.

Attention is drawn to the need for safe practice when students carry out laboratory experiments or observe demonstrations. Centres are responsible for the overall risk assessment of experimental work undertaken by learners. Reference must be made to COSHH regulations and any specific local education authority restrictions.

Relevant advice can be obtained from the following publications.

- *CLEAPSS Laboratory Handbook* (available from CLEAPSS School Science Service, website www.cleapss.org.uk)
- *Control of Substances Hazardous to Health Regulations* (HSE, 2005) ISBN 0717629813
- *Hazcards* (2004 update available from CLEAPSS School Science Service)
- *Topics in Safety, Third Edition* (ASE January, 2001) ISBN 0863573169

Worksheets for

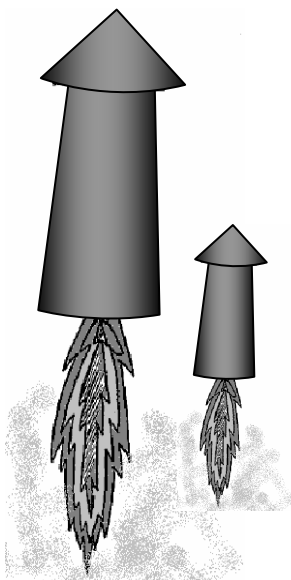
Unit 6: Making Changes

What is a chemical change?

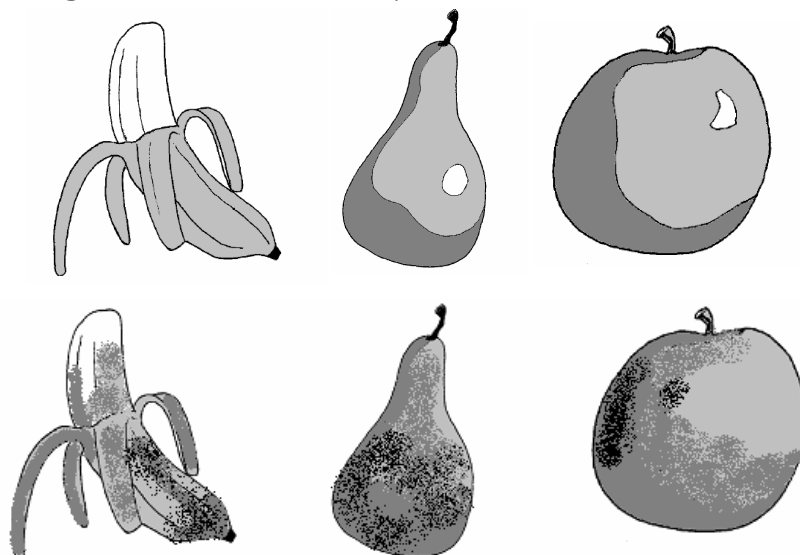
A chemical change or reaction is where one material reacts with another material to form a new substance.

Chemical reactions cause permanent changes.

Fireworks use fast chemical reactions.



Fruit turning brown is an example of a slow chemical reaction.



Rusting of cars is another example of a slow chemical reaction.



Chemical changes — 1

Some chemical changes are not useful.

Some chemical changes are useful.

Useful chemical changes are used to make products.

In maths we write calculations as an equation with an equals sign.

eg $3 + 2 = 5$

Chemical changes are also represented as equations.

In chemical equations, an arrow is used instead of an equals sign.

The materials reacting together are known as reactants.

The new substance produced is known as the product.



Example 1: Rusting



The shiny metal iron (eg a nail) reacts with moist air.

The reaction produces a new substance, rust.

Rust is a red-brown colour.

Chemical changes – 2

Example 2: Burning

coal + air → heat + carbon dioxide

Coal is a black solid substance.

The coal burns in air to produce heat to keep us warm.

The coal reacts with air to produce heat and a new substance.

The new substance is the colourless gas called carbon dioxide.

What does 'chemical change' mean?

Chemical changes — 3

Give four examples of chemical changes.

- a. _____
- b. _____
- c. _____
- d. _____

Complete the table for the examples you have given.

Material	How it is changed	Appearance	
		Before	After

Chemical changes – 4

Use these words to fill in the gaps in the sentences below.

cooking
repair

rusty

chemical
brown

Materials can be changed into new substances by _____
_____ changes.

The new substance may be useful, for example when
_____ food.

Another useful example is using a car _____
_____ kit.

Sometimes a chemical change is not useful.

When the iron in a car goes _____ it is
not very useful.

When an apple goes _____ it is not
very good.

Task

Make a poster to show examples of chemical changes.

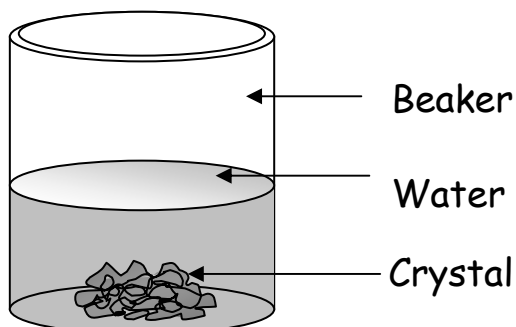
Solubility

What you need

Beaker.

Water.

Copper sulphate or potassium permanganate.



What you do

Place a small coloured crystal of copper sulphate or potassium permanganate in a small amount of water in a beaker.

What do you see after several hours?

The liquid becomes coloured.

This is because the large crystal will have broken down into very small particles.

These particles mix with the water particles to form a solution.

Solubility questions

1 How does the size of particles affect how long it takes for a substance to dissolve?

2 What happens if the water is stirred after adding the crystal to the water?

3 How does particle size or stirring affect the solubility of a substance?

4 What can you do to increase the solubility of a substance?

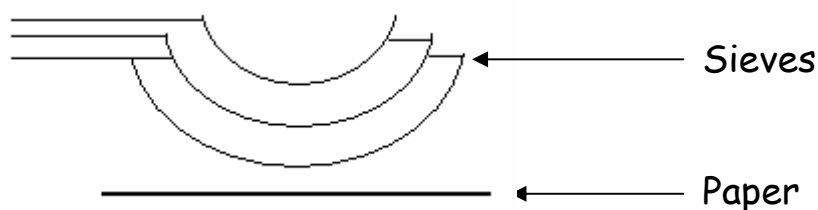
Separating solids of different particle size by sieving

What you need

A mixture of salt, sand and dried peas.

A large sheet of paper.

Either a set of laboratory sieves or a variety of kitchen sieves of different sized meshes.



What you do

1. Arrange the kitchen sieves so that the sieve with the largest mesh is at the top and the one with the finest mesh is at the bottom.
2. Put your dry mixture in the top sieve.
3. Hold the sieves together and gently shake them with a side to side action.
4. Examine each sieve and note the size of the particles in each of them.

Separating solids from liquids by filtering

An insoluble solid can be separated from a liquid by **filtering**.

In the laboratory the solid is separated from the liquid using filter paper.

The liquid passes through small holes in the paper.

The solid particles are too big to pass through the holes.

They are trapped on the filter paper.

How to separate a mixture of water and soil

What you need

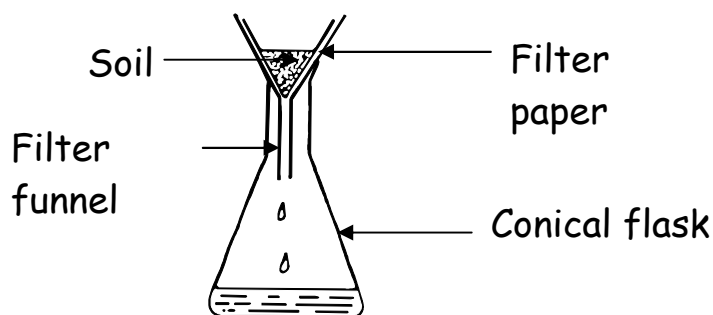
Sample of soil and water.

Filter paper.

Beaker.

Filter funnel.

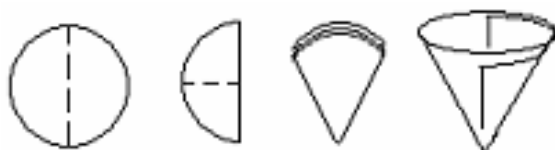
Conical flask or test tube.



What you do

- 1 Fold the filter paper to make a cone.

Your teacher can show you how this is done or you can follow the diagrams below.



- 2 Place the filter paper in the funnel.
Fit the funnel in the mouth of a conical flask or test tube.
- 3 Pour the sample of soil and water into the filter paper.
Make sure the mixture does not flow over the top of the paper.
- 4 Examine the liquid which drips through the filter paper.
The liquid which drips through the filter paper is called the **filtrate**.

Questions on filtering

1. What can you see on the filter paper at the end of the filtering process?

2. What can you see in the liquid that has passed through the filter paper?

3. If you dissolve sugar in water can you separate the sugar by filtering the sugar solution? Explain your answer.

Chemical and physical changes

A chemical change is a permanent change.

A chemical change produces a new substance.

A physical change is not a permanent change.

A physical change lets you get back the material that you started with.

Tick the correct box to show whether these changes are chemical changes or physical changes.

Change	Chemical change	Physical change
Burning wood		
Heating water		
Dissolving sugar in a cup of coffee		
Jelly setting		
Making cement		
Boiling an egg		
Making plaster of Paris		
Rusting of an iron nail		
Painting a wooden fence		
Sparkling firework		
Fuel being burnt in a space craft		

What turns fresh apples brown? — 1

What you need

Apple.

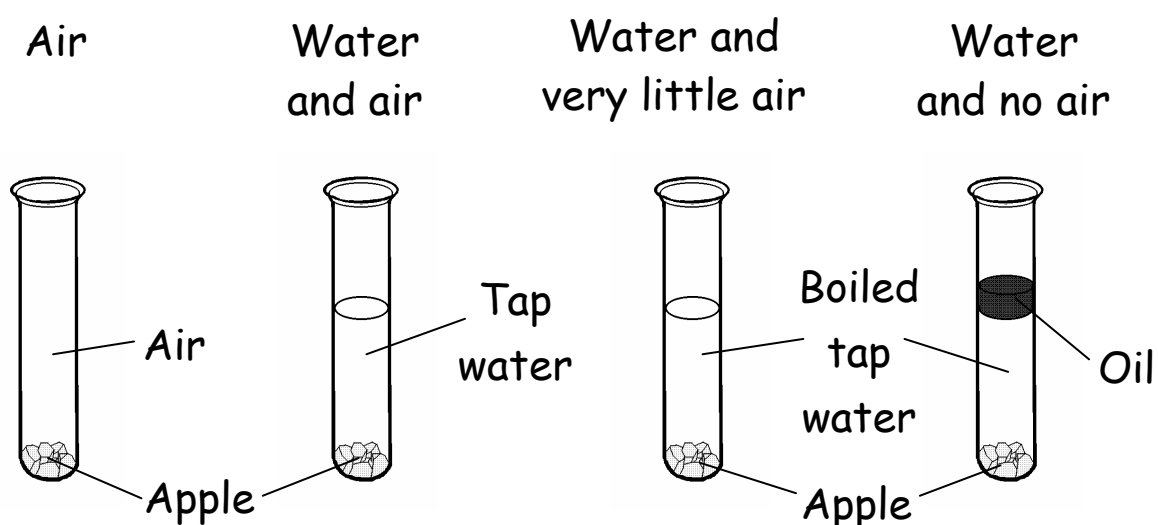
Four test tubes.

Tap water.

Boiled tap water.

Oil.

What to do



1. Place four test tubes in a test tube rack.
2. Fill half the second test tube with tap water.
3. Fill the third and fourth test tubes halfway with boiled tap water.
4. Cut some apple into small pieces.
5. Place some pieces of apple into each test tube.
6. Pour a thin layer of oil into the fourth test tube.
7. Wait for 20 minutes.
8. Write down the appearance of the pieces of apple in the table on the next page.

What turns fresh apples brown? – 2

Tap water contains air.

The air is driven off when tap water is boiled.

Some air gets back in.

Oil does not let air through.

Oil stops any air getting back into the water underneath the oil.

Contents of test tube	Amount of browning after 20 minutes
Air only	
Water and air	
Water and a little air	
Water and no air	

1 What causes an apple to go brown?

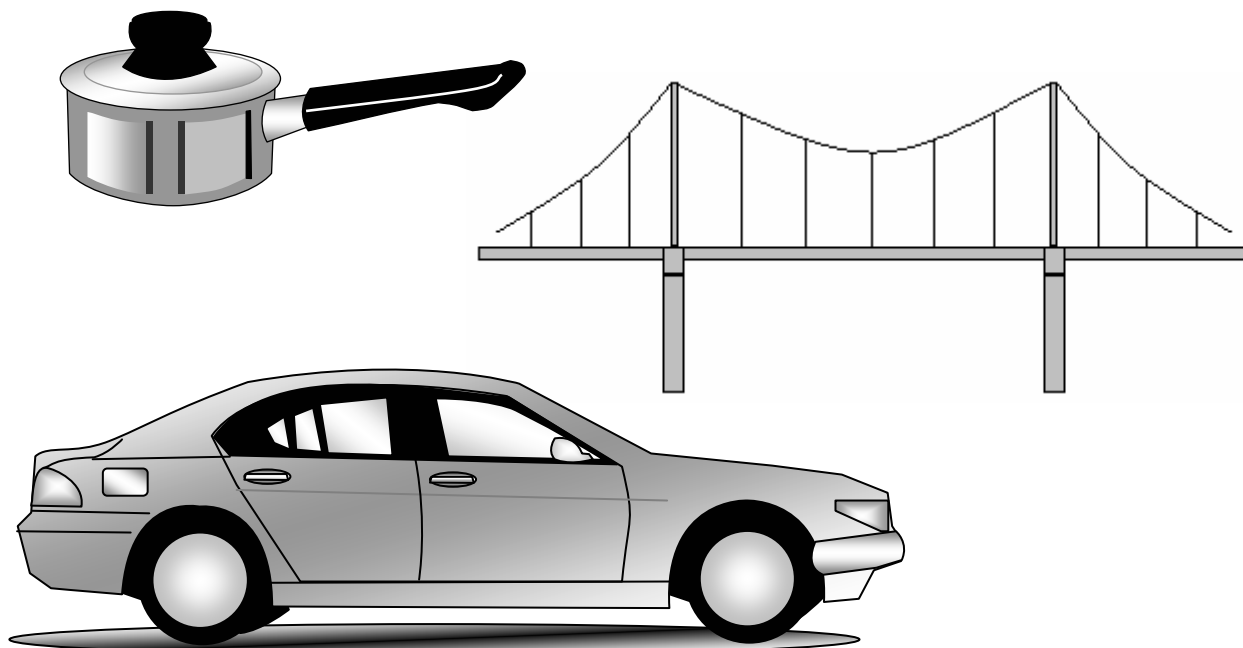
2 Is this a permanent change?

3 Is apple browning a chemical change?

4 Why are apples not normally brown inside?

Rust

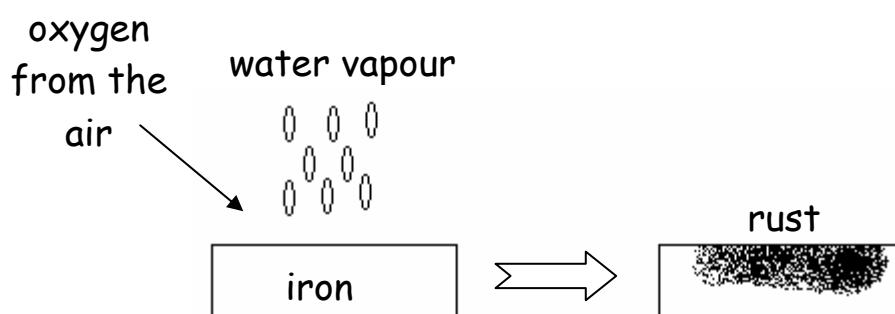
Many things are made of metals.



Useful metals include iron and steel.

The problem with iron and steel is that they rust.

Rust is caused by a chemical reaction between iron, oxygen (from the air) and water vapour.



What makes iron rust? — 1

What you need

Four test tubes.

Test tube rack.

Shiny iron nails.

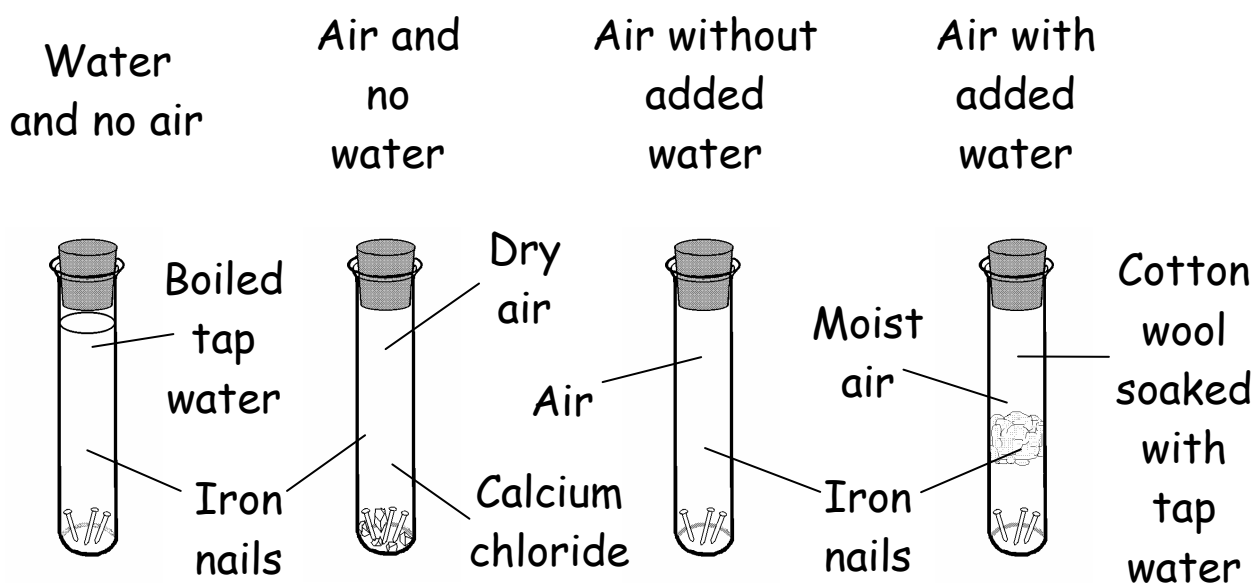
Calcium chloride (CARE).

Tap water.

Boiled tap water.

Rubber bungs.

Cotton wool.



What to do

- 1 Set up and label the test tubes as shown. Calcium chloride dries the air in the second test tube.
- 2 Put the test tubes into a test tube rack.
- 3 Let them stand for one week.
- 4 After one week, write down the appearance of the nails in the table on the next page.

What makes iron rust? – 2

Contents of test tube	Appearance of nail after one week
Water and no air (boiled water)	
Air and no water	
Air without added water	
Air with added water	

Look at your results. What makes iron rust?

What do you think would happen if you put a shiny iron nail into water that has air in it?

How can we stop metals from rusting?

Things that rust have to be repaired or replaced.

List some things that rust _____

Why is rusting a nuisance? _____

How to stop things rusting

Stopping air and water from reaching iron and steel can prevent rusting.

Covering the surface of the iron or steel can stop air and water from reaching iron and steel.

This table shows methods used to prevent rusting.

Method	What is treated	Notes
Paint.	Steel structures eg bridges, ships.	If the paint is scratched or becomes chipped, the exposed iron rusts. Rusting spreads underneath the remaining paint.
Grease or oil.	Moving parts of machinery eg car engine.	The moving parts must be kept oiled.
Galvanised iron.	Roofing, dustbins.	Iron is dipped in molten zinc to make galvanised iron.
Tin coating or chromium plating.	Food cans, bicycles and car parts.	A very thin layer of tin or chromium is plated onto the surface of iron and steel.

Task

Make a poster to show some things that have been treated to stop them rusting. Include at least one thing for each method shown in the table.

Safety signs

- 1 Write down the meaning of each of the safety signs shown below.
- 2 Write down an example of a chemical that should display each warning symbol.



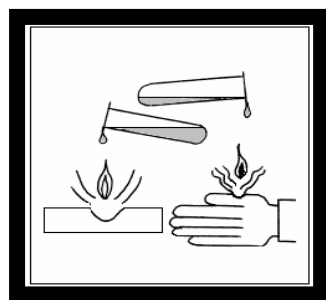
Meaning: _____

Example: _____



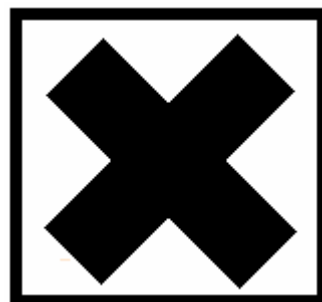
Meaning: _____

Example: _____



Meaning: _____

Example: _____



Meaning: _____

Example: _____



Meaning: _____

Example: _____

Types of substances

What you need

Perfume spray.

What you do

- 1 Your teacher will squirt a little perfume from the front of the class.
Put your hand up when you smell it.
- 2 Discuss what happened.

What you need

Different solids, liquids and gases.

You could use pictures of different solids, liquids and gases.

What you do

- 1 Arrange the substances into solids, liquids and gases.
Write down the names of the substances in the table below.

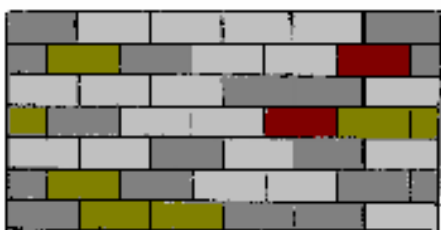
Substance	Colour	Solid, liquid or gas

- 2 Make a poster to show the substances in these three states.

Solids, liquids and gases

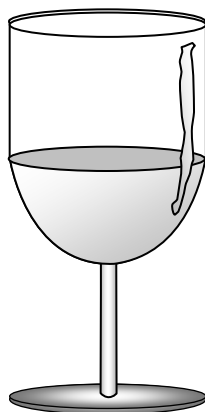
Substances can exist in one of the three states of matter.

- Solids have a fixed shape and a fixed size.
- Liquids have a fixed size
Liquids flow to take the shape of the container.
- Gases do not have a fixed shape or size.
Gases flow and fill up all the available space.



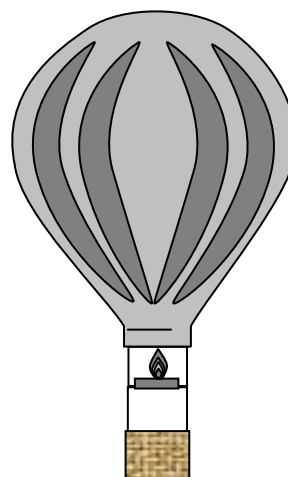
Brick wall

Solid



Juice

Liquid



Hot air balloon

Gas

Changes of state — 1

A substance may change its state when it is heated or cooled.
We can follow the change of state of ice when it is heated.

What you need

Small ice cubes.
Tripod, gauze and Bunsen burner.
Iced water in test tube.
Small beaker.
Stirring rod.
Holder for test tube.

What you do

- 1 Place two or three ice cubes in the beaker.
- 2 Put the beaker on the gauze and gently heat it.
Gently stir the ice and watch the change of state.
- 3 Continue heating and stirring.
Describe the change of state that you see in your notebook.
- 4 Place some iced water in a test tube.
- 5 Carefully hold the test tube above the beaker.
- 6 Write down what you see on the outside surface of the test tube and any change of state.
- 7 Stop heating and allow the beaker and its contents to cool down.
- 8 If available, place the beaker and its contents in a freezer.
- 9 Write down what you see and any change of state.

Results

What happens to the ice when heated? _____.

What is seen on the outside of the test tube? _____.

Which change of state is taking place on the outside of the test tube? _____.

Changes of state – 2

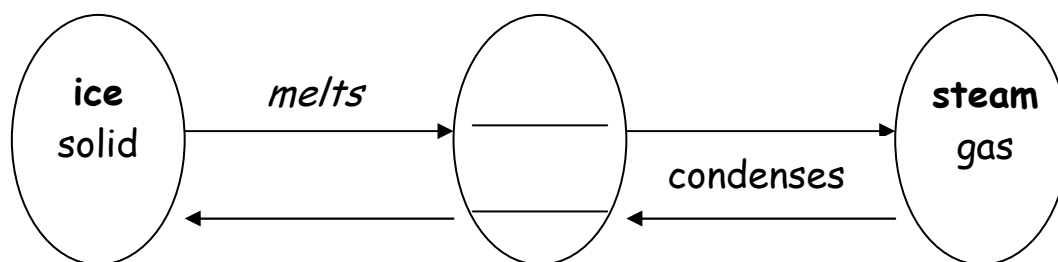
Complete the summary below by adding the names of substances and changes of state which you saw. Use the following words.

water

freezes

liquid

evaporates



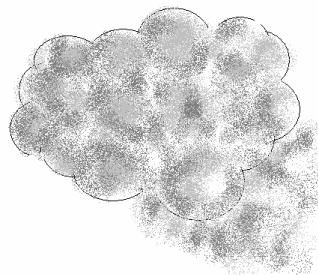
Ice



Water



Steam



Changes of state — 3

Complete the table of changes of state.

Change	Warming or cooling	Name of change
Solid to liquid		
Gas to liquid		
Liquid to solid		
Liquid to gas		

Questions

Use the words from the list to complete the following sentences.

melts solid freezes evaporates gas condenses liquid solidifies

Candle wax is a _____.

When the candle is lit the wax turns to a _____.

As the molten wax runs down the side of the candle it _____.

On a hot day ice cream _____.

Helium is a _____ that is used to fill party balloons.

When steam in a bathroom meets the cold window it _____.

Ice patches form on wet roads in winter because the water _____.

If a watch glass containing rain water is left near a warm radiator the
_____ (two words)

Wordsearch Unit 6

Melt

Solid

Iron

Chemical change

Product

Sieve

Freeze

Liquid

Steel

Rust

Soluble

Filter

Evaporate

Gas

Reactant

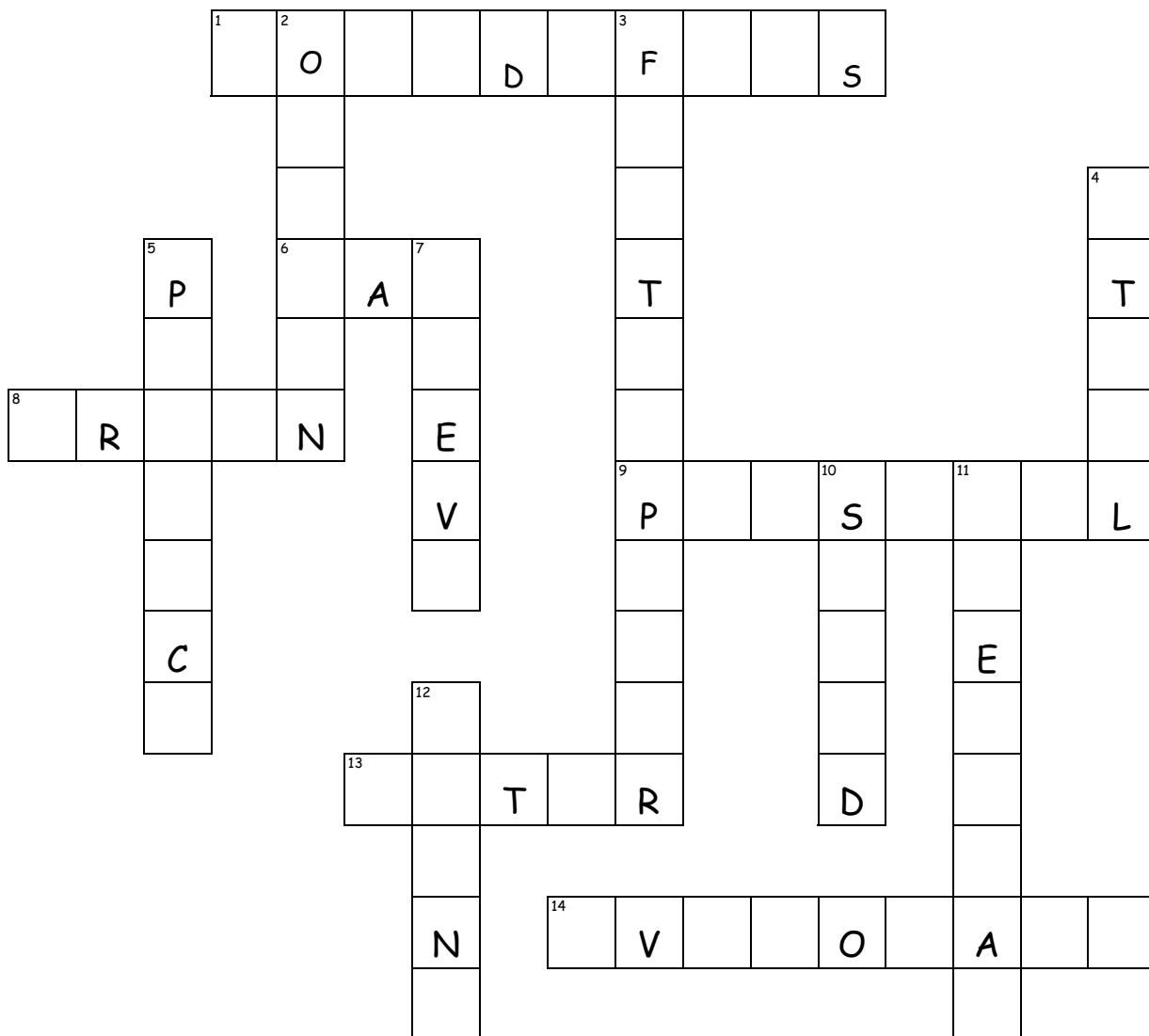
Reaction

Grease

Paint

P	B	I	N	P	Q	R	T	C	U	D	O	R	P	A	U	C	B
H	T	P	M	S	B	N	O	H	I	X	Q	M	P	K	B	T	G
L	I	O	G	Q	Q	Y	F	E	V	D	I	L	O	S	H	J	D
A	G	P	I	B	E	U	V	M	G	O	L	I	Z	Q	E	R	A
M	R	V	E	V	L	A	X	I	E	S	F	S	D	G	O	S	Z
P	E	G	E	S	Z	C	K	C	X	R	E	A	C	T	I	O	N
H	A	I	E	M	R	U	O	A	L	X	B	F	S	D	L	I	T
H	S	I	X	F	G	S	O	L	U	B	L	E	A	N	S	T	M
W	E	Q	T	V	T	I	G	C	E	S	X	Q	O	E	D	E	Z
M	X	A	H	Q	T	F	S	H	D	F	U	R	F	Y	H	N	A
E	V	I	T	H	U	M	S	A	E	R	I	O	B	G	P	F	P
L	S	L	I	Q	U	I	D	N	E	R	O	B	Z	A	B	C	A
T	F	I	L	T	E	R	P	G	D	N	L	O	N	S	I	G	I
O	R	C	H	W	X	U	D	E	U	H	T	U	E	M	D	Q	N
S	E	H	Y	F	U	S	T	F	D	R	E	A	C	T	A	N	T
N	E	W	Z	V	O	T	M	N	O	Q	X	H	Q	J	B	N	K
N	Z	B	E	V	A	P	O	R	A	T	E	N	I	M	A	O	Z
M	E	R	F	N	S	T	E	E	L	B	L	M	C	T	I	D	Q

Letter ladder



Across

- 1 What happens to a liquid when it freezes?
- 6 Which state of matter does not have a fixed shape or size?
- 8 Fruit is turned this colour by a slow chemical reaction.
- 9 Which type of change lets you get your original materials back?
- 13 Which liquid makes cars rust?
- 14 Liquids do this when they boil.

Down

- 2 Which gas makes cars rust?
- 3 What would you use to separate a solid from a liquid?
- 4 Name a metal that can rust.
- 5 The name given to new substances produced by chemical reactions.

- 7 This apparatus is used to separate particles that have different sizes.
- 10 Which state of matter has a fixed shape?
- 11 Which type of reaction causes a permanent change?
- 12 You may use this to protect a bridge or car from rusting.

May 2008

For more information on Edexcel and BTEC qualifications please contact
Customer Services on 0870 240 9800
or <http://enquiries.edexcel.org.uk>
or visit our website: www.edexcel.org.uk

Edexcel Limited. Registered in England and Wales No. 4496750
Registered Office: One90 High Holborn, London WC1V 7BH. VAT Reg No 780 0898 07

A PEARSON COMPANY

