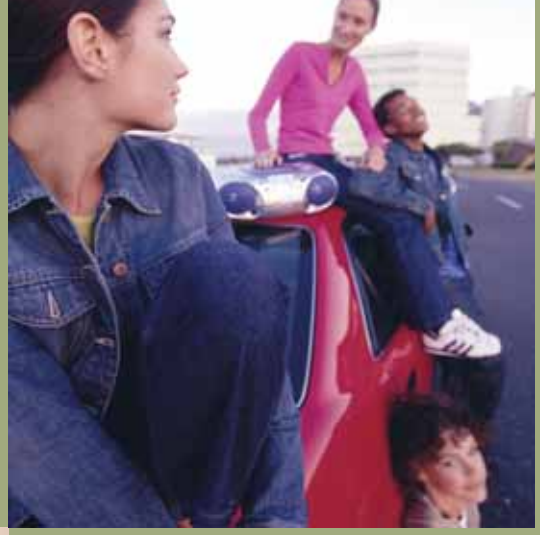
WHAT'S THE FUTURE MADE OF?

Materials for a Modern World

Materials UK
Owned by the materials community



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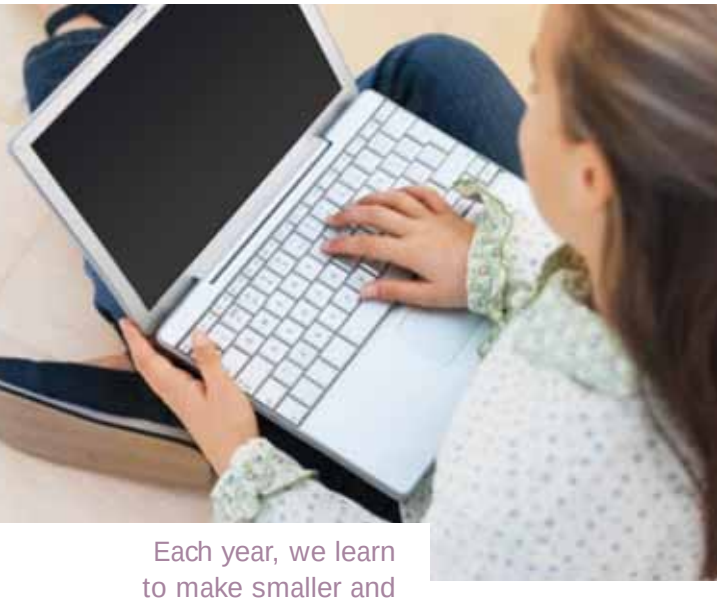
Materials for a Modern World

Materials all around us

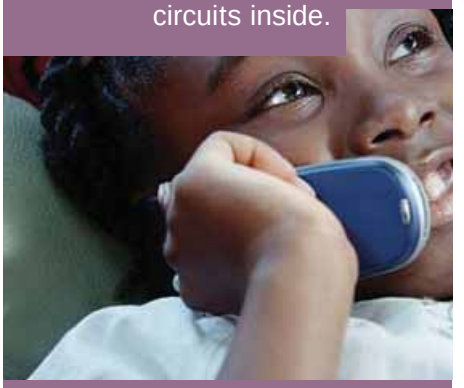
MP3 players, mobile phones, cars, buses, trains, planes, buildings, medicines, computers, electricity, clothes, food, sport – all of these and many more examples depend on materials. The new materials designed today will make our lives different tomorrow.



Each year, we learn to make smaller and smaller electronic components with more advanced materials, so that computers work faster and faster.

Making electricity accounts for 30% of our energy use. New materials mean we can generate and use electricity more efficiently, so that less carbon dioxide is sent into the atmosphere.

Mobile phones and MP3 players contain many different materials from the plastics in the casing and keypad to the many different sorts of metals in the electronic circuits inside.



In the event of a collision, your head is at risk. Today's crash helmets are made of a plastic designed to absorb the energy of impact.

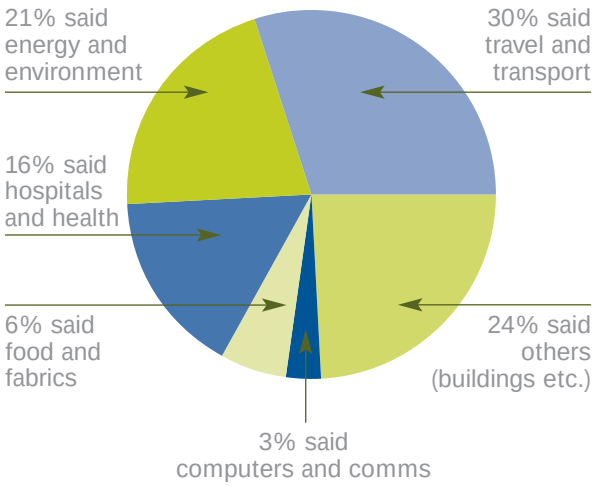
Many different materials are used in modern buildings – for extra strength, to save energy and to look good.

Making a difference

We asked 200 young people aged 14-17 for their ideas about new materials:

In what areas could new materials make a difference in the future?

THIS IS WHAT THEY THOUGHT:



What do you think?

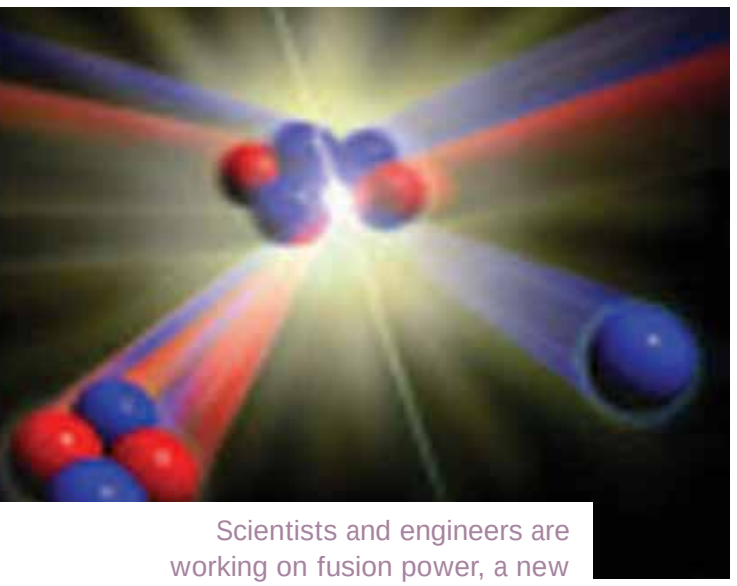
Modern materials make a big difference in our lives. Nobody imagines that materials will solve all of the world's problems, but they will have a part to play.

Where do you think materials scientists and engineers should try to make a difference?

Energy and the environment

The materials we use most – steel, aluminium and concrete – require a lot of energy to make them from their raw materials. Today, that energy comes mostly from fossil fuels (coal, oil and gas).

The bad news is that, when fossil fuels are burned, carbon dioxide is released into the atmosphere, and this is causing climate change. We can't go on using non-renewable energy sources like this – the situation is unsustainable. That's why scientists and engineers are working on new energy sources which do not damage the environment.



Scientists and engineers are working on fusion power, a new way of generating electricity. The problem is that the hydrogen fuel must be heated to millions of degrees celsius. It's going to take some pretty special materials to contain such a hot gas.

For more information visit **www.howstuffworks.com/fusion-reactor** or **www.fusion.org.uk**

The next generation of mobile phones might run using clean fuel cells. They could be recharged with a simple injection of clean fuel. Fuel cells react hydrogen with water to produce water and electricity.

For more information visit **www.howstuffworks.com/fuel-cell**

LED lights are on their way. These highly-efficient lights are already in use in cycle lights, and soon LED light-bulbs will be available for our homes and other buildings.

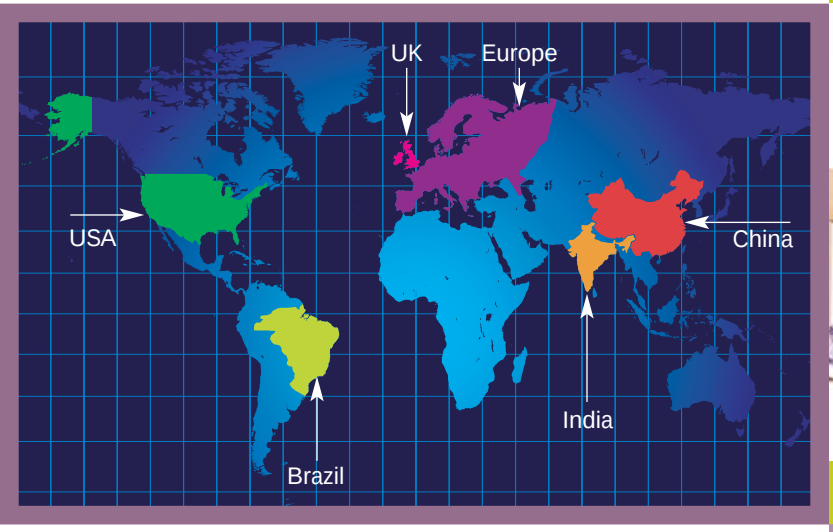
For more information see **www.howstuffworks.com/led**

Pelamis wave generator: A new generation of wave power machines is on its way. These floating generators must be made of materials capable of surviving in the roughest seas.

For more information see **www.oceanpd.com**

Keeping it clean

China's economy is growing fast. Its people are becoming prosperous. China makes one third of the world's steel, and opens a new coal-fired power station every fortnight, but this adds to the high levels of harmful carbon dioxide that we in Europe and the USA already release into the atmosphere.



Countries like China, India and Brazil are developing fast. If their people are to have the high standard of living that we enjoy, we need to find new energy sources and new ways of using materials.

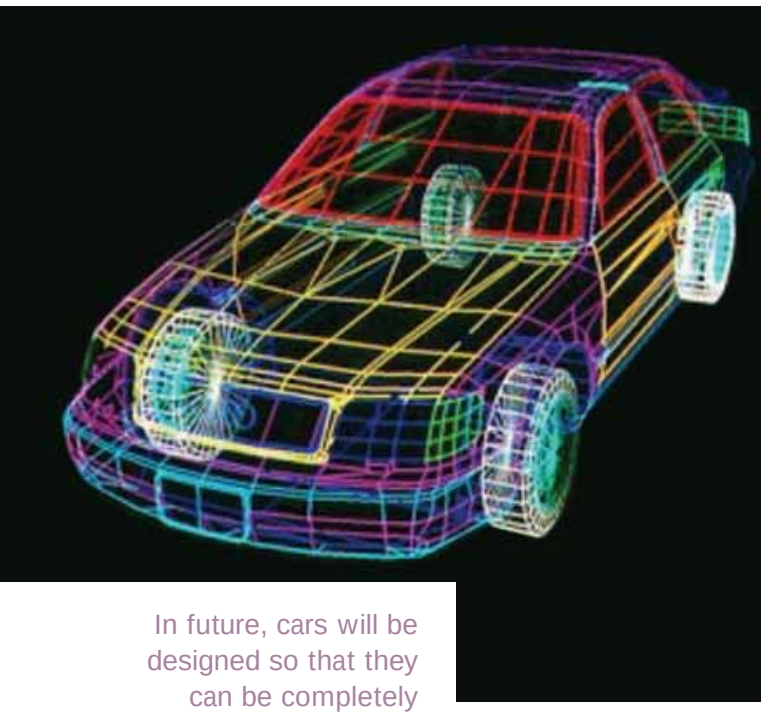
What do you think?

It would be good to live in a sustainable world with less poverty, where we didn't damage the environment.

What part can new and advanced materials play in this?

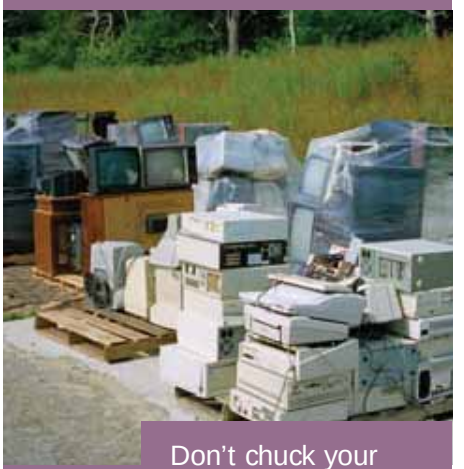
Making more of materials

We are very wasteful. Dumping our rubbish in landfill sites is a waste of natural resources and valuable materials are lost forever. The ground may become polluted with hazardous chemicals. We have to re-use more of the materials we make.



In future, cars will be designed so that they can be completely dismantled at the end of their lives and the parts like the engine, tyres, windscreen and body recycled to make new cars and other products.

We could turn our household waste into useful electricity like this French power station. Useful metals and minerals could be taken out of the waste as it is processed and recycled to make new products.

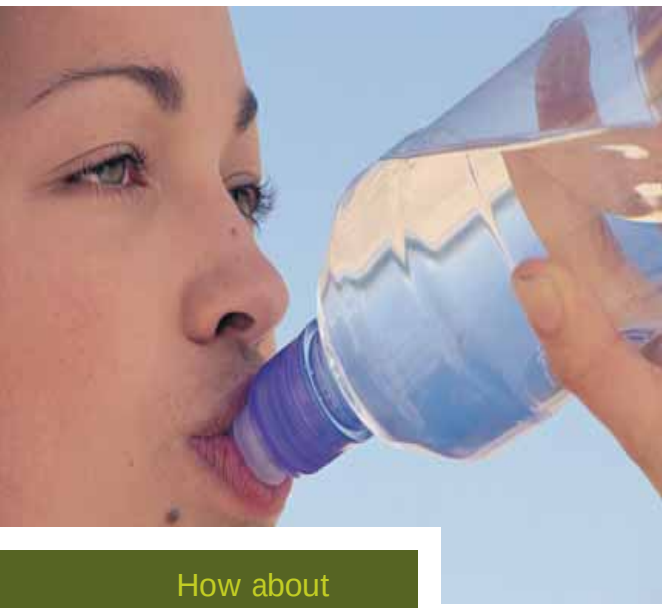


Don't chuck your old computer at the tip! New regulations mean that electronic equipment must be recycled.

Re-use & re-cycle

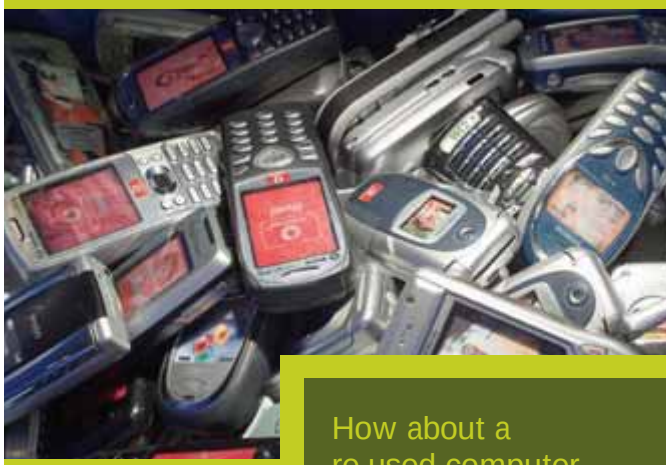
We asked our survey group of 200 students for views on recycling of materials:

How would you feel about buying a recycled product if it was cheaper than a new one?



How about a re-useable bottle?

9 out of 10 were happy.



How about a re-used computer or a mobile phone?

Only half were happy.

What do you think?

It makes sense to re-use or re-cycle materials. That way, we use less of our scarce resources.

Why are people happy to use recycled bottles, but reluctant to buy re-used phones or computers?

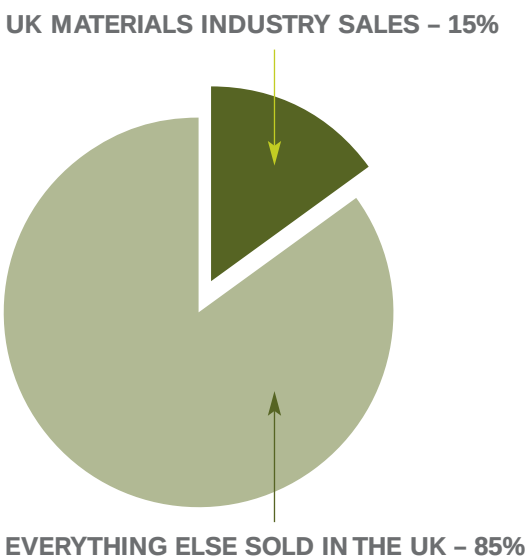
How can we encourage people to make better use of materials?

Making materials, making money

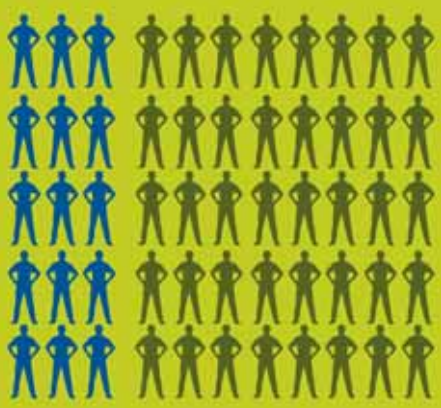
The materials industry in the UK makes an enormous variety of materials, including steel, glass, aluminium, plastics, rubber, paper, carbon fibre, textiles and concrete.

The UK's materials industry

The UK materials industry is very big and has annual sales of £200 billion – that's 15% of everything sold in the UK.



About 15 million people are employed in the materials industry with a further 4 million people employed in related industries'.



Key: 1 symbol represents 100,000 jobs in the UK

What do you think?

Materials play an important part in our lives, and the wealth of the UK.

Can you suggest any new problems which the UK materials industry could help to solve?

A job to be done

The materials industry employs many young people – here are two we would like you to meet.

DR. SHIRLEY DAVEY
Age: 29
Occupation: Researcher
Company: Northern Ireland Bioengineering Centre

Shirley has always had an interest in how things work, at school her best subjects were Chemistry, Biology and Mathematics. She studied Chemical Engineering at university and now looks at how new materials work in the very harsh conditions of the human body.

In her spare time she has learned the vital importance of advanced materials in extreme sports. She is a keen scuba diver and in 2003 she sailed to the Artic Circle. 'When 30m underwater or crossing an ocean your life depends on the strength of a piece of steel wire or the toughness of plastic tubing.'

There is a huge variety of jobs in the materials industry.

You could be a:

- **Scientist** – studying and developing new materials;
- **Technician** – working with modern materials making machinery;
- **Designer** – designing new products using new materials;
- **Engineer** – using new materials in buildings, transport, electronics, and medicine;
- **Manager** – there are all kinds of management jobs in materials.

Ask your teacher how you could find out more about jobs in the materials industry or visit this website:
www.materials-careers.org.uk

DR. DAVID EGNER
Age: 31
Occupation: Technology Manager
Company: Corus

From a relatively early age I knew that I wanted to work in a technological field. At school I was always really interested in the physical science and technology classes. I studied Materials Science at university and now work for the steel maker, Corus.

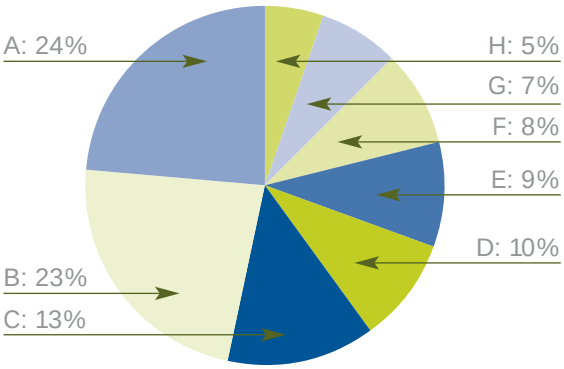
My current role is managing a team of technologists who are responsible for developing new or improved steel products. Given my time again would I do it differently? Probably not, I find my career hugely exciting and challenging. I also go home with a good feeling of contribution, in that I can look at every day objects and say, "I had a part in making that".

Opportunities ahead

We asked our group of 200 14-17 year olds:

What do you most want from your future career?

Here are some of the things they said:



A: I want to earn lots of money – ***135***
B: I want job satisfaction – ***132***
C: I want to use creative skills – ***76***
D: I want a job that has respect in the community – ***54***
E: I want opportunities for promotion – ***53***
F: I want to work with many different people – ***50***
G: I want to change the world – ***41***
H: I want to travel as part of my job – ***29***

A CAREER IN MATERIALS CAN GIVE YOU ALL OF THESE.

What do you think?

Look at the ideas shown in the pie chart.

Which of these factors would be most important for you?

What you can do

Look out for products which are made from recycled materials and think about how you dispose of them. That way, you will use up less of the Earth's limited resources.

ADD MATERIALS TO YOUR LIST OF POSSIBLE CAREERS. EVERY NEW MATERIAL HAS TO BE DESIGNED AND MANUFACTURED BY SOMEONE – IT COULD BE YOU.

Learn more about modern materials at school and college. It makes sense to understand the technological world in which we all live.

Why not take a look at some of the websites listed on page 14 of this booklet.

Materials Wordsearch

Photocopy this page and then see if you can find 12 common materials that can be found all around you.

1. You can see through this smashing material.
2. This material is used for car tyres.
3. Most of our clothes are made from this.
4. A famous henge is made from this natural material.
5. Houses are built from things made of this.
6. The outside of a pencil is made from this material.
7. Modern tennis rackets are made from this.
8. The pages of a book are made from this material.
9. Railway lines are made from this hard but tough material.
10. It's a metal but very light.
11. A man-made material that is almost everywhere we look.
12. It's a liquid at first and then sets as solid as rock – used mainly for building.

WORDSEARCH

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

Website addresses

Visit some of these websites to find out more about the world of materials.

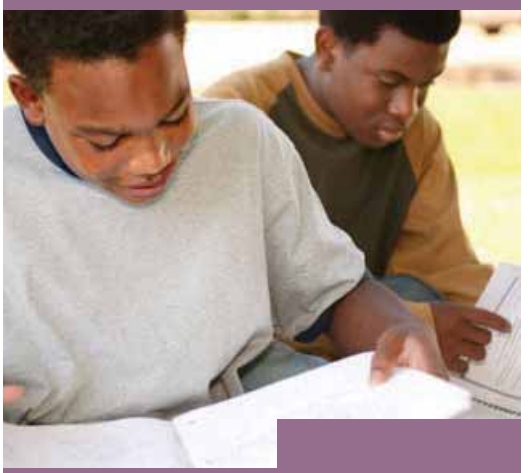
Science Museum Challenge of Materials:
www.sciencemuseum.org.uk/on-line/challenge/

Institute of Materials, Minerals and Mining:
www.materials-careers.org.uk/

School Science:
www.schoolscience.co.uk/content/3/chemistry/materials/index.html

How Stuff works:
www.howstuffworks.com/

BBC website for Key Stage 3 Science:
www.bbc.co.uk/schools/ks3bitesize/science/



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Easington Community College, Easington Village, Durham

Samuel Lucas JMI School, Hitchin, Hertfordshire

Thurston Community College, Thurston, Suffolk

Thanks also to SETNET for their expert advice and assistance and David Sang for writing the report.

WORDSEARCH ANSWERS.

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

NOTE FOR TEACHERS

This publication is designed to highlight to children in early Key Stage 3 the diversity of materials in our everyday lives, the important part that new materials have in ensuring our future well being, and the career opportunities available in the UK materials industry.

It has been produced by Materials UK and the Department of Trade & Industry in response to the recommendations of the Materials Innovation and Growth Team (Materials IGT), which delivered its final report in March 2006. Online versions of the Materials IGT Report, this publication and further information on Materials UK can be found at **www.matuk.co.uk**

There is range of initiatives for young people aimed at highlighting the properties and uses of materials and careers in the materials industry. For detailed information on how to find relevant activities in your region, please visit the education and skills section of the Materials UK website.

FEEDBACK

We are very interested in what your pupils have to say about the questions posed in this publication and we would welcome any comments they may have via e-mail to Materials UK, c/o **Nick.Morgan@dti.gsi.gov.uk**

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