20 What's it made of?

Materials

1 Brainstorm things that can be made of these materials.

steel, leather, rubber, fibreglass, nylon, gold, cardboard, wool, ceramic, wood, plastic, polystyrene*, glass, wax, paper, polythene, foam rubber, cotton, aluminium*

polystyrene **BrE** – styrofoam **AmE**
aluminium **BrE** – aluminum **AmE**

2 20.1 What kinds of materials do they use to make body implants, like artificial hips and knees? Listen and find out.

3 20.1 Listen again and make notes in the table.

	Advantages	Disadvantages
Steel		
Nickel		
Titanium		

4 Match these adjectives to their meanings.

1 artificial	a not hard or firm
2 soft	b able to last a long time
3 ductile	c weakened or destroyed by chemical action, for example, rusty
4 durable	d easily broken, cracks easily
5 brittle	e not natural, made by people
6 corroded	f flexible, can bend repeatedly without breaking

5 What are these things and what are they made of? Which ones have the qualities in **4**?

Think of more adjectives to describe them. Use a dictionary for help if necessary.

1 2 3 4 5 6 7 8 9

6 Which materials in **5** are:

1 transparent?
2 absorbent?
3 flexible?
4 impermeable?
5 porous?
6 natural?
7 good electrical conductors?
8 good heat insulators?

7 Which materials are most practical for making these things and why? And which materials are impractical and why?

1 windows
2 tables
3 roof tiles
4 electric cables
5 bridges
6 shirts

8 Work with a partner.

A

You are going to work on a project in Finland for three months. It will be winter and very cold. You are deciding what to take with you. Ask your partner for advice. Should you take:

1 cotton or woollen vests?
2 woollen or synthetic socks?
3 leather gloves with fur lining or synthetic ski gloves?
4 sunglasses with polarized lenses or plastic snow goggles?
5 wooden or plastic skis?
6 tin or ceramic plates?
7 polystyrene or plastic cups?
8 a torch with a supply of lead batteries or a torch with a supply of nickel-cadmium batteries?
9 wax-coated waterproof matches or a refillable, plastic lighter?
10 a plastic or a steel snow shovel?
11 a pair of rubber boots or a pair of leather mountain boots?
12 a synthetic sleeping bag or a sleeping bag filled with very soft feathers?

What other things should you take?

B

You are going to work on a project in Africa for three months. It will be very hot in the daytime and you are deciding what to take with you. Ask your partner for advice. Should you take:

1 silk or synthetic shirts?
2 polyester or cotton underwear?
3 a straw sunhat or a cotton baseball cap?
4 a compass or a battery-powered global positioning system?
5 a pair of rubber beach sandals or cotton boots?
6 a pair of polarized sunglasses or sand goggles?
7 aluminium or plastic containers to transport large quantities of water?
8 glass or leather bottles to carry small quantities of water?
9 steel or polystyrene boxes to store food?
10 a canvas or synthetic tent?
11 a foam mattress or a plastic air-bed to sleep on?
12 a convertible sports car with a soft PVC roof that you can roll down or a motorbike?

What other things should you take?

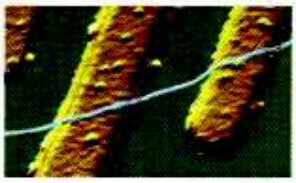
Predictions

1 What do you know about nanotechnology?

1 How will manufacturing processes change in the future?
2 What can we build with nanotechnology today and what will we be able to build in the future?
3 How do you think nanotechnology will affect cars, computers, medicines, etc?

Nanotechnology

Nanotechnology is the science of building tiny things. Today we usually make things by shaping materials – cutting, grinding, milling, etc. But in the future, we'll be able to work on a smaller scale and build things atom by atom.



Nanowire (blue) on platinum electrodes (yellow)
Magnification: x 120,000

Today scientists can build nanowires – extremely strong tubes that are just four atoms wide. And when they have the manufacturing systems, they'll be able to build anything we want – diamonds, water, food, robots, etc. We'll be able to make all kinds of things smaller, lighter, cheaper, stronger, and smarter.

We're at the start of a technological revolution and nanotechnology will affect every part of our lives – cars, computers, medicine, energy supplies, food, buildings, clothes. And it will happen sooner than most people think. By 2010 you won't be able to count the number of businesses using nanotechnology.

can and *be able to*

Be able to often has the same meaning as *can*.
Some scientists ***can / are able to*** *make wires just four atoms wide.*
Use *can* to talk about the skills people have now.
Use *be able to* to talk about future possibilities.
We ***can*** *produce nanowire.* (today)
We'll ***be able to*** *produce nanorobots.* (in the future)

2 Complete these predictions about nanotechnology. Use each verb in the list once.

~~construct~~	remove	store	wear
replace	resist	take	send
clean up	perform	stop	

CARS Manufacturers will be able to *construct* cars from lightweight materials that are 50 times stronger than steel. Today's two-tonne Cadillac could weigh only 50 kg in the future.
The materials used to build cars will be able to .....[1] scratches, dents, and rust.

COMPUTERS We'll be able to .....[2] trillions of bytes of information in a structure the size of a sugar cube.

MEDICINE Doctors will be able to .....[3] broken human bones with artificial bones made with nanotechnology.
Nanorobots will be able to .....[4] surgery.
We'll be able to .....[5] pills containing nanorobots.

THE ENVIRONMENT We'll be able to .....[6] nanorobots up into space to rebuild the ozone layer.
Other nanorobots will be able to .....[7] pollutants from water and .....[8] oil spills.

CLOTHES Everyone will be able to .....[9] computers and colour screens because they will be built into their clothes.
We'll be able to .....[10] our clothes from getting dirty by making them with stain repellent fabrics.

3 Discuss these questions.

1 Which predictions in **2** do you find most interesting? Why?
2 Can you see any applications for nanotechnology in your job? What things would you like to be smaller, stronger, etc?
3 Could nanotechnology affect employment in your industry? (How?)
4 Do you like the idea of having nanorobots inside your body? Some people say we'll be able to live for ever with nanotechnology. Would you like to?
5 Is nanotechnology always going to be a good thing? Can you see any dangers?

Possibilities

1 Do your customers ever ask for things you can't provide, for example, special product features, faster delivery times? What do they want?

2 20.2 Listen to a customer asking a supplier about a part. What part is it? What does the customer want?

3 20.2 Listen again. Complete the questions the customer asks.

1 Can you ..... it ..... to €30?
2 Is it possible to make them in .....?
3 And will they be able to ..... high temperatures?
4 Will they be all right at ..... °C?
5 What about .....?

What were the supplier's answers? How certain were they?

Degrees of certainty

impossible
↓
a *It can't be done*
b *Probably not*
c *Maybe*
d *I think so*
e *I'm sure it is*
↓
possible

4 What degree of certainty do these expressions indicate? Are they a, b, c, d, or e?

1 Probably
2 Not a hope
3 Possibly
4 I don't think so
5 Yes, we've done it before

5 Is it possible to invent these things? How certain are you? Write a, b, c, d, or e.

1 a car that is powered by water
2 a device that drives our cars for us
3 a device that stops people from drinking and driving
4 a solar-powered airplane
5 something that detects spam emails and deletes them with 100 per cent accuracy
6 a way to eat more food without getting fatter
7 white paint that stays white and doesn't darken with age
8 a way to distribute electricity to homes and factories without using wires or cables
9 a way to forecast next month's weather with 99 per cent accuracy
10 a device that translates what you say in your language and immediately says it in English
11 something that tells us what animals are thinking
12 a cure for all cancers
13 a computer that's more intelligent than a human
14 a machine that transports us through time

Compare your ideas with some other students. See if you can get them to agree with you.