

Tutor support material May 2008

Entry Level

Edexcel Entry Level Certificate in
Science (8938)

Unit 10: Energy to Make Things Work

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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 10: Energy to Make Things Work*, 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 students. 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 10: Energy to Make Things Work

What is energy?

Energy makes things happen.

Use the following words to complete the sentences below.

see move turns

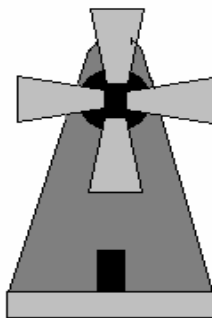
Chemical energy from petrol makes a car _____.



Light energy lets us _____ at night.



Motion (kinetic) energy _____ the sails on a windmill.

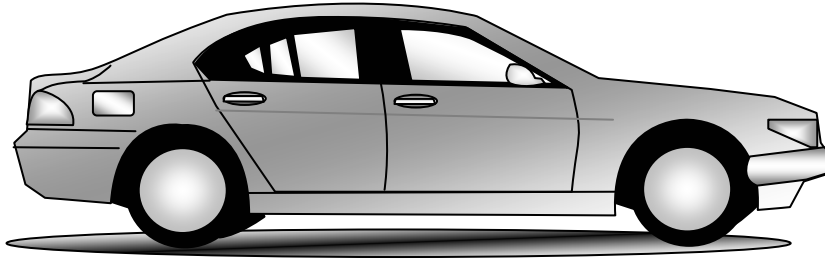


Draw diagrams to show more situations where energy makes things happen.

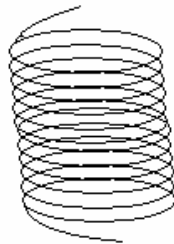
Forms of energy

There are many different forms of energy.

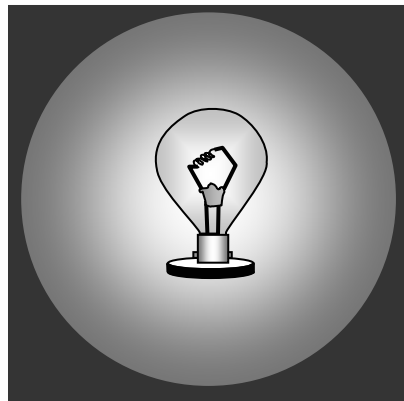
1. Kinetic (movement energy).



2. Potential (position) energy, eg stretched or compressed spring.



3. Light energy.



Potential energy and kinetic energy are types of mechanical energy.

The box lists other types of energy.
Draw diagrams to show each of these.

heat electricity chemical nuclear sound

Energy survey — 1

Find out what types of energy are used at school and at home.

At school

List all the things in the room which use electricity.

1.	4.	7.
2.	5.	8.
3.	6.	9.

List all the things in the room which use gas.

1.	4.	7.
2.	5.	8.
3.	6.	9.

Is there anything else in the room which needs another source of energy?

If so, what is it and what type of energy does it need?

At home

Now make a similar list for your home.

Object	Source of energy

You have listed lots of objects that need energy.

They are used for lots of different jobs.

Let us see if we can sort them into groups on the next page.

Energy survey – 2

Which objects are used for lighting?

Which objects are used for heating?

Which objects are used for entertainment?

Which objects are used for movement?

Temperature

Temperature measures how hot or cold an object is.
You need a thermometer to measure temperature.

Look at your thermometer.

What is it made of? _____.

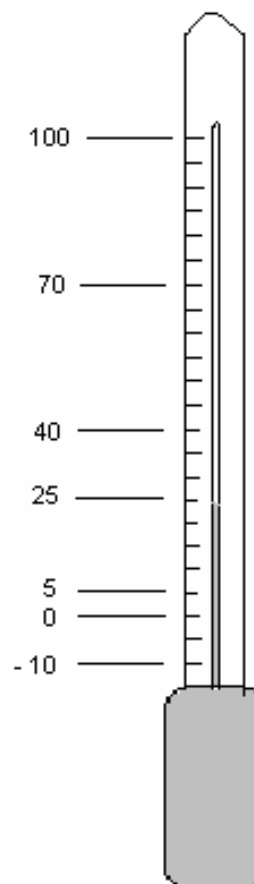
What is the liquid in the tube? _____.

Temperature is measured in _____.

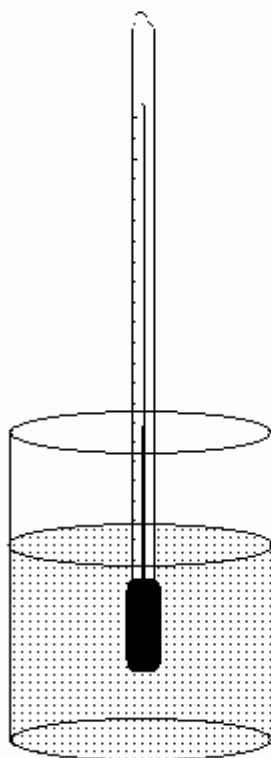
Look at the diagram of the thermometer.

Match the temperature on the thermometer to the following.
Temperatures are shown in Centigrade.

1. Inside a fridge.
2. Melting ice.
3. A warm room.
4. A kettle of boiling water.
5. A hot bath.
6. A cup of coffee.
7. The deep freeze at a supermarket.



Measuring temperature - 1



What you need

- A thermometer.
- A beaker of water.
- A tripod.
- A stop clock.
- A heat proof mat.
- A gauze.
- A Bunsen burner.

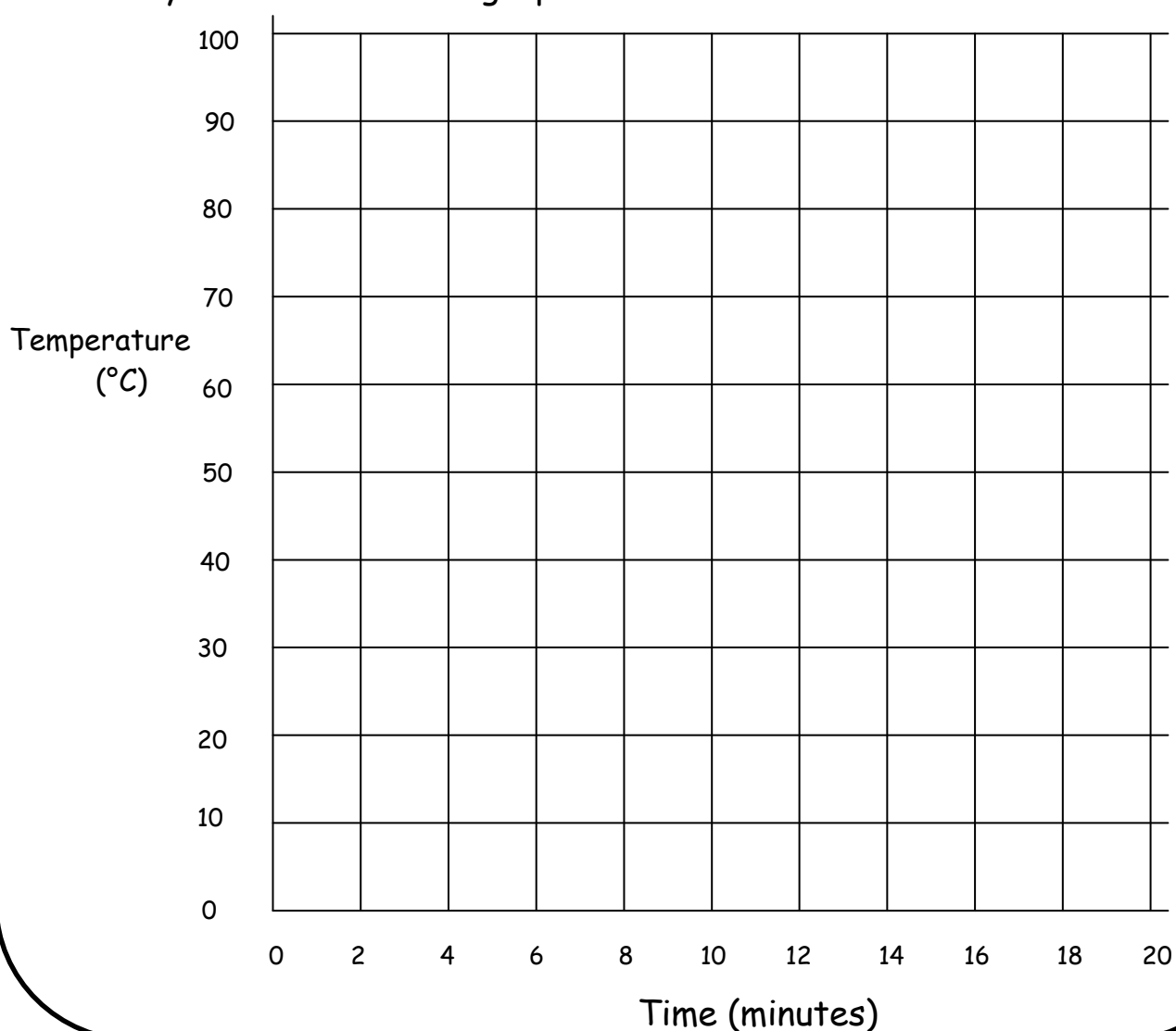
What you do

1. Heat up the water in the beaker.
2. Turn off the Bunsen burner.
3. Put the thermometer into the beaker.
4. Record the temperature of the water.
5. Start the stop clock.
6. Write this temperature on the first line of the table on the next page.
7. Read the temperature every two minutes.
Record it in the table on the next page.

Measuring temperature – 2

Time (minutes)	Temperature °C
0	
2	
4	
6	
8	
10	
12	
14	
16	
18	
20	

Plot your results on the graph below:



Sources of energy – 1

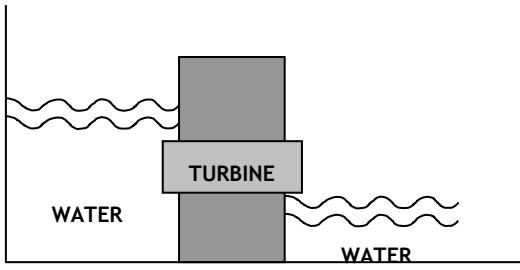
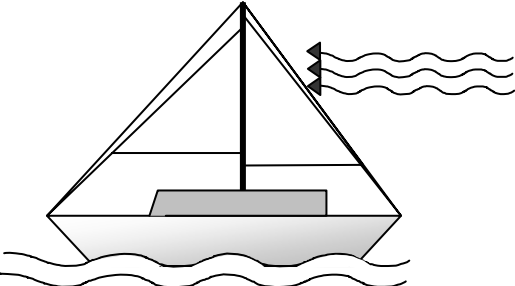
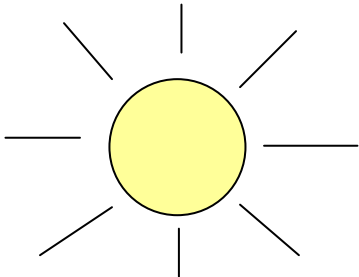
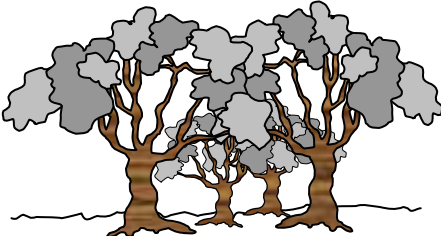

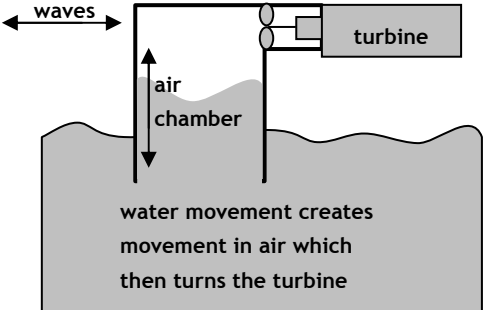
Some energy sources will not run out.

Energy sources that will not run out are called **renewable energy sources**.

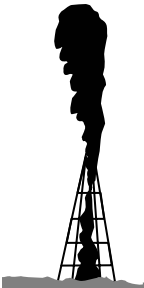
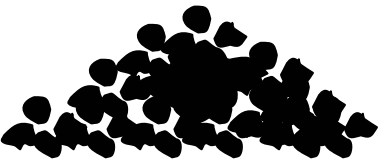
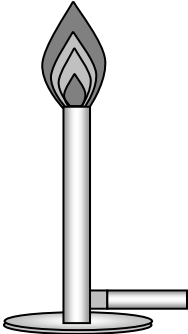
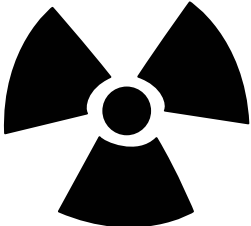
Some energy sources will run out.

Energy sources that will run out are called **non-renewable energy sources**.

Here are some sources of energy.

Water (hydro)	Wind
 <p>A diagram showing a vertical grey structure with a rectangular box labeled 'TURBINE' in the middle. Water is shown flowing from left to right through the structure, with wavy lines representing the water surface. The word 'WATER' is written on both sides of the structure.</p>	 <p>A diagram of a sailboat on water. Three wavy lines with arrows pointing left represent wind blowing across the sail.</p>
Sun (solar)	Bio-mass (plants, trees etc)
 <p>A simple drawing of a yellow sun with several short lines radiating outwards to represent light.</p>	 <p>A drawing of a cluster of trees with green foliage and brown trunks.</p>
Geothermal	Tidal (wave)
 <p>A drawing of a geyser with a vertical pipe and a large plume of white steam or water being ejected from the top.</p>	 <p>A diagram showing a cross-section of the ocean. A vertical pipe goes from the water surface down into the water. At the top of the pipe is a box labeled 'turbine'. Below the turbine is an 'air chamber'. A double-headed arrow labeled 'waves' is above the water surface. A vertical double-headed arrow labeled 'air chamber' is inside the pipe. Below the pipe, text reads: 'water movement creates movement in air which then turns the turbine'.</p>

Sources of energy - 2

Oil	Coal
	
Gas	Nuclear
	

Use a pencil to circle the pictures that show non-renewable forms of energy.

Oil, coal and gas are found in large amounts underground. They are formed from dead animals or plants that have been compressed over a long period of time.

Make a booklet to show as many different sources of energy as you can.

Describe each source.

Here are two examples.

Example 1: We build windmills on hill tops and coasts. Windmills change energy from the wind into electricity.

Example 2: We dig deep into the Earth's crust for coal.

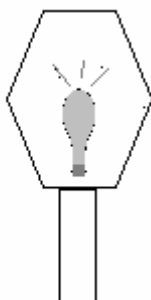
Solar garden lamps

Solar garden lamps use photocells.

These convert sunlight into electrical energy during the day.

The electrical energy is stored.

At night the stored electrical energy is used to light the lamps.



Solar powered car

In August 2000 a group of students built a solar powered car.

The car travelled at 50 miles per hour (75km/h).

It went 4375 miles (7042 km) using the same amount of power that is needed to run a toaster.

The car can travel at 78 miles per hour (125 km/h).



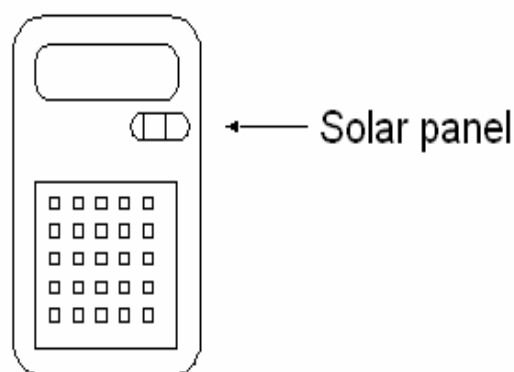
Can you think of any advantages and disadvantages of using solar energy to power electrical devices?

Energy from the sun - solar cells

Solar cells can convert light energy into electrical energy.
Solar cells may be used in calculators and in satellites.

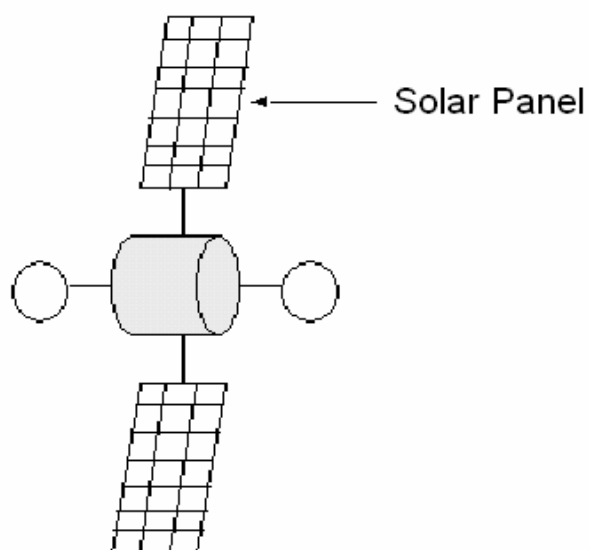
Calculators

You may have seen a calculator that does not need batteries.
This type of calculator has a solar cell.
These calculators seem to work for ever if you have enough light.



Satellites

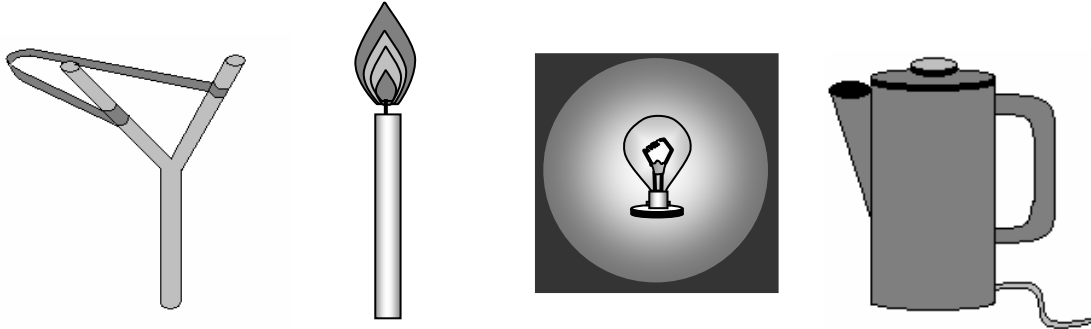
Satellites use many solar cells to power their electrical systems.



Energy transfer

Use the words in the box to fill in the blanks in the sentences.
You can use a word more than once.

movement light electrical sound heat chemical



A catapult changes potential energy into _____ energy.

An electric kettle changes electrical energy into _____ energy.

A lamp changes electrical energy into _____ energy.

A hairdrier changes _____ energy into heat energy.

A singer changes chemical energy into _____ energy.

A buzzer changes _____ energy into _____ energy.

A candle changes _____ energy into _____ energy
and _____ energy.

Look at the list of objects in the box.

loudspeaker microphone battery electric fire

Which of these objects

1. changes chemical energy into electrical energy? _____

2. changes sound energy into electric energy? _____

3. changes electric energy into sound energy? _____

4. changes electric energy into heat (thermal) energy? _____

Conductors and insulators — 1

In your last experiment the temperature of your water dropped as time passed.

The water was getting colder.

The water was losing heat energy.

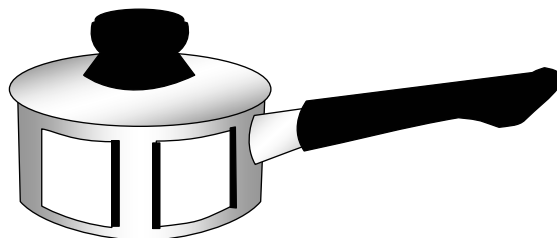
Where was this heat energy going? _____

As the water got colder more heat energy was lost.
Most of this heat energy went through the glass of the beaker.

This is called **conduction**.

Solids that let heat move through them quickly are good conductors of heat.

Poor conductors are called **insulators** of heat.



The pan is a good conductor. The pan is made from _____.

The handle is an insulator. The handle is made from _____.

Why is the pan made from a good conductor of heat? _____

Why is the handle made from a good insulator? _____

Conductors and insulators — 2

Think of some objects that are good conductors of heat energy.
Explain why they need to be good conductors.
One example has been done for you.

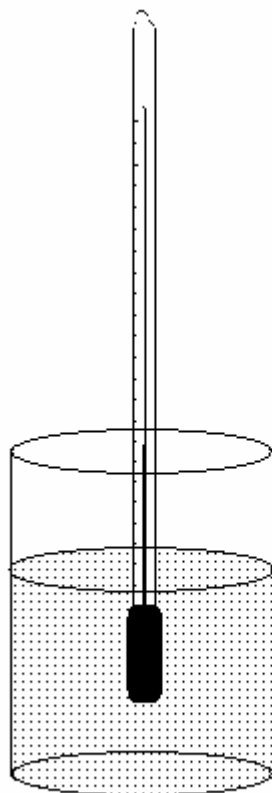
Object	Why it is a good conductor
Saucepan	To get the food hot quickly

Think of some objects that are good insulators of heat energy.
Explain why they need to be good insulators.
One example has been done for you.

Object	Why it is a good insulator
Saucepan handle	So you do not burn your hand

Reducing heat losses — 1

You know from your earlier experiment that heat energy is lost from the beaker of hot water.



List two ways of reducing heat losses from the beaker of water.

1. _____

2. _____

Additional work

Now design an experiment to test one of your ideas to see how well it works.

The next page will help you to plan your experiment.

Reducing heat losses – 2

What equipment do you need?

How will you carry out your test? _____

What measurements will you make? _____

How will you make sure it is a fair test? _____

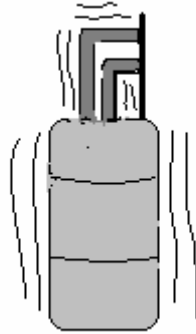
Now carry out your test.

Carefully write down all your results.

Would it help to draw a graph?

Hot water systems

Hot water pipes and tanks need insulating.



How could you reduce the heat lost from a hot water tank?

How could you reduce the heat lost from hot water pipes?

What else could you do to save money in heating your home?

Stopping heat losses — 1

It costs a lot of money to heat our homes and offices.

Some of this money is wasted.

Heat is lost through windows, walls and roofs.

Here are some methods for reducing these heat energy losses.

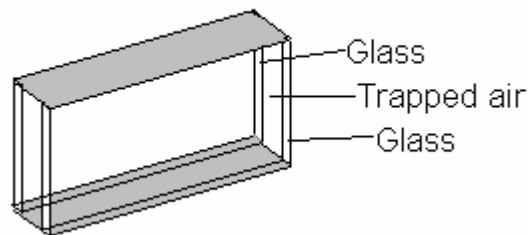
loft-insulation
double glazing

cavity-wall insulation
draught excluder

lagging
curtains

For each of the following diagrams say

- which method is used
- where you would use it
- how it works.

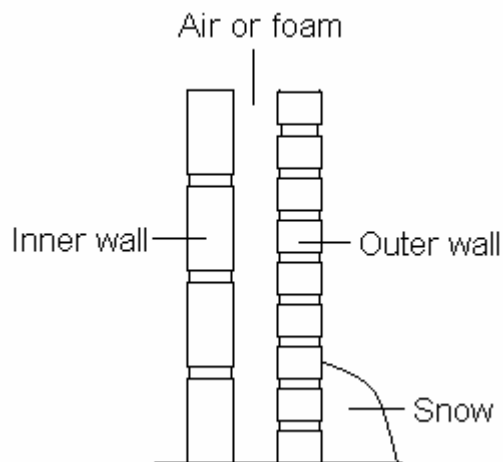


Which method is used? _____

Where you would use it? _____

How does it work? _____

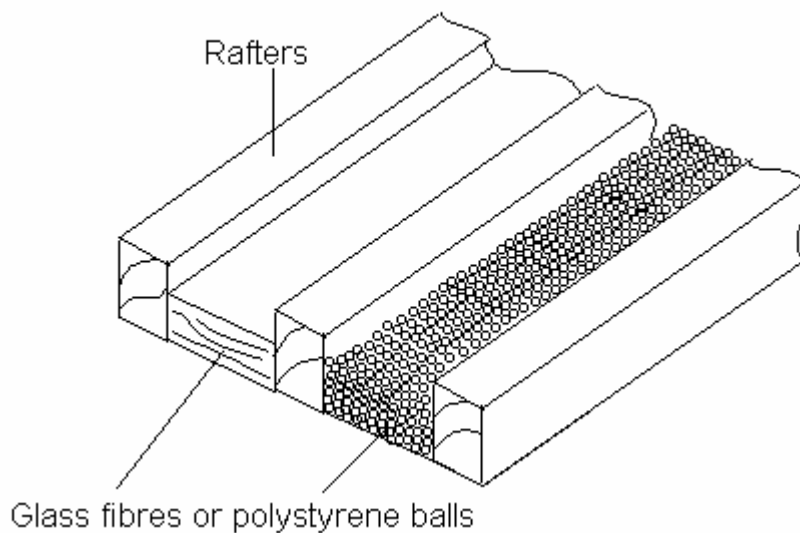
Stopping heat losses — 2



Which method is used? _____

Where you would use it? _____

How does it work? _____

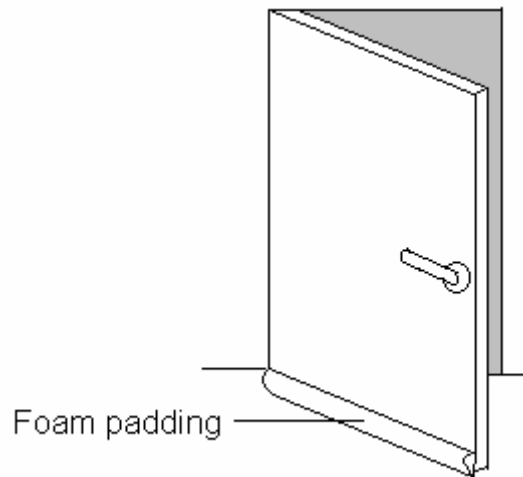


Which method is used? _____

Where you would use it? _____

How does it work? _____

Stopping heat losses — 3



Which method is used? _____

Where would you use it? _____

How does it work? _____

Curtains

Explain why you should draw your curtains on a cold winter's day.

Word search

Chemical

Petrol

Cold

Potential

Electrical

Renewable

Energy

Solar

Heat

Sound

Hot

Store

Kinetic

Temperature

Light

Wind

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

Across

- 1 These convert sunlight into electrical energy during the day.
- 4 This type of material lets heat flow through it easily.
- 6 This is a form of energy that warms you up.
- 7 This type of material is a poor conductor of heat energy.
- 9 This measures how hot or cold an object is.
- 13 This reduces heat loss through windows.
- 15 This is a form of energy that is stored in a spring or elastic band.

Down

- 2 This changes electric energy into sound energy.
- 3 This is an example of a renewable energy source.
- 5 Temperature is measured in this unit.
- 8 This is an example of a non-renewable energy source.
- 10 This reduces heat loss through pipes.
- 11 This is a form of energy that you hear.
- 12 This changes energy from the wind into electricity.
- 14 This is a form of energy that you can see.

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