1 Using electricity

Electricity is a very important type of energy. There are lots of ways we can describe electricity – they all have specialised meanings.

Draw lines to connect each word with its meaning and unit.

Word	Meaning and unit
current	the 'push' to move electricity; measured in **volts**
energy	the flow of electrons around a circuit; measured in **amps**
power	amount of energy used by a device every second; measured in **watts**
voltage	total amount of energy a device uses; measured in **joules** or **kilowatt-hours**

Complete the sentences below using words from the box.

energy	**large**	**long**	**units**	**mains**	**more**

1. The electricity we buy is called ________________ electricity. We have to pay for the total amount of ________________ we use. This is measured in kW-h, which are called ________________ for short.

2. Every device has a 'power rating' that shows how much energy it uses every second. We can use the power to work out how much each device costs us to run. It will cost more when

the power is ________________

the time is ________________

the cost of 1 unit is ________________

This equation allows us to work out how much we spend:

$$\text{cost of electricity} = \frac{\text{power (in watts) x time it is on (in hours) x cost of 1unit (in pence}}{1000}$$

Example

A kettle has a power rating of 2700 W. It is on for a total of 30 minutes a day. 1 unit costs 15p.

Step 1: change the time to hours by dividing by 60

$$\frac{30}{60} = 0.5$$

Step 2: write down all the numbers in the equation

$$\text{cost} = \frac{2700 \text{ x } 0.5 \text{ x } 15}{1000}$$

Step 3: work out the answer using your calculator

cost = 20.25

Step 4: write down the answer with its unit

cost = 20.25p

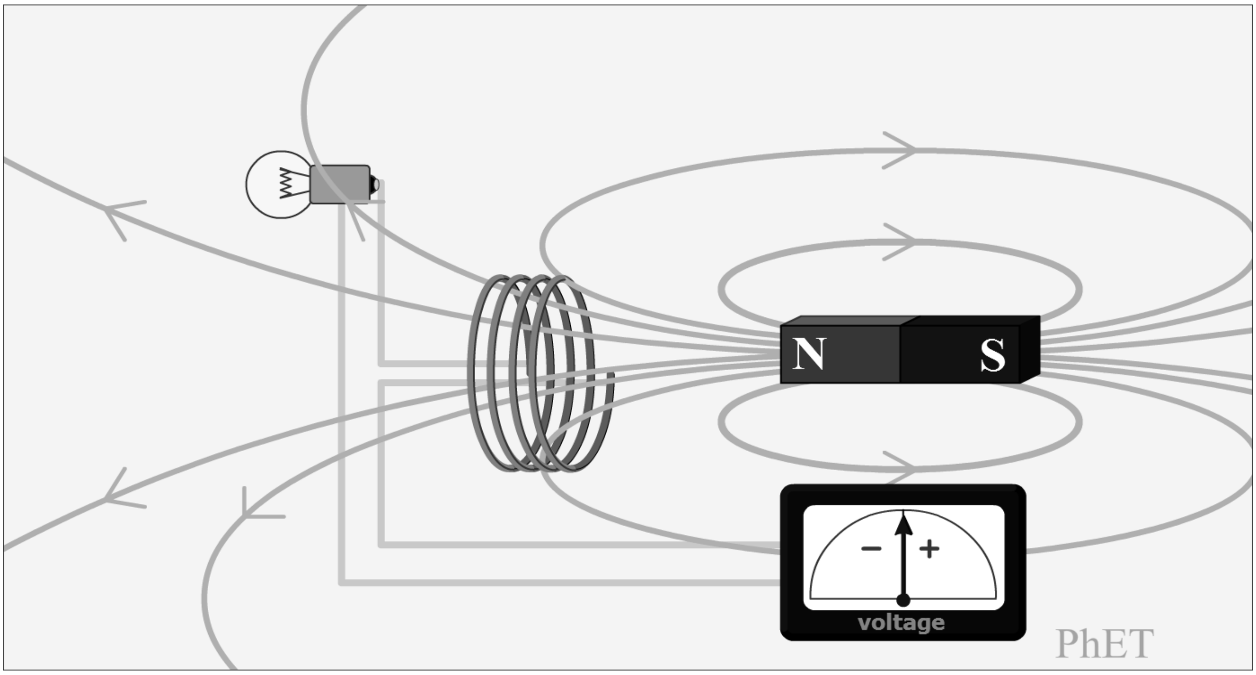
Do these calculations following the 4-step method.

Device	TV	Low-energy light bulb	Electric cooker
Power	150 W	15 W	3500 W
Time	480 min	10 h	150 min
Cost of 1 unit	15p	18p	16p
Step 1			
Step 2			
Step 3			
Step 4			

2 Making electricity in the laboratory

Some students use a program to investigate making electricity – http://phet.colorado.edu/en/simulation/faradays-law

This diagram shows their program.



Label all the items on the diagram. Use words from this box to help you.

coil of wire	**light bulb**	**magnet**	**magnetic field lines**
north pole	**south pole**	**voltmeter**	

Is there a battery shown in the diagram? ________________________________

Using this program there are two ways of knowing if electricity is made.
What are the two ways?

1. ____

2. ____

Image on this page reproduced courtesy of PhET Interactive Simulations University of Colorado http://phet.colorado.edu

With the help of a partner, use the program to investigate making electricity.

Complete the results chart for this investigation. Look **very** carefully at the pointer on the voltmeter as well as at the light bulb.

What they did	Speed of movement	What they saw
Moved the N pole into the big coil	quick	
	slow	
Moved the S pole into the coil	quick	
	slow	
Moved the N pole out of the coil	quick	
	slow	
Moved the S pole out of the coil	quick	
	slow	
Kept the magnet still inside the coil	none	

The students also tried the same things but used the small coil.

What difference did they find? ____

Their teacher helps them with a conclusion for their investigation.
Fill in the missing words using word of your own.

Conclusion

You can make electricity in a lab by moving a __________________ into a __________________ .

The faster you move it, the __________________ electricity you make.

When there is no movement, there is __________________________________ .

You get more electricity when you use more _____________________________ .

You can change the direction that the electricity flows in by

____

or by ____.

This way of __________________ electricity is called **electromagnetic induction**.

Teacher notes

The experiment that this worksheet is based on is sometimes tricky to set up and because the reading on the ammeter/voltmeter is fleeting, it is hard for some students to watch as carefully as they need to. Hence, an online demonstration is a good alternative, particularly because students can use the program themselves.

From PHET very clear and simple to use: http://phet.colorado.edu/en/simulation/faradays-law

Another suitable online demonstration: http://www.magnet.fsu.edu/education/tutorials/java/electromagneticinduction/index.html

This worksheet is the first of two on the same topic. The second gives more controls etc. You may want to complete this as a class activity rather than working in pairs. But in either case, this video is at the right level: http://www.youtube.com/watch?v=BKXw2OjuPpY

You may want to watch these sources yourself:

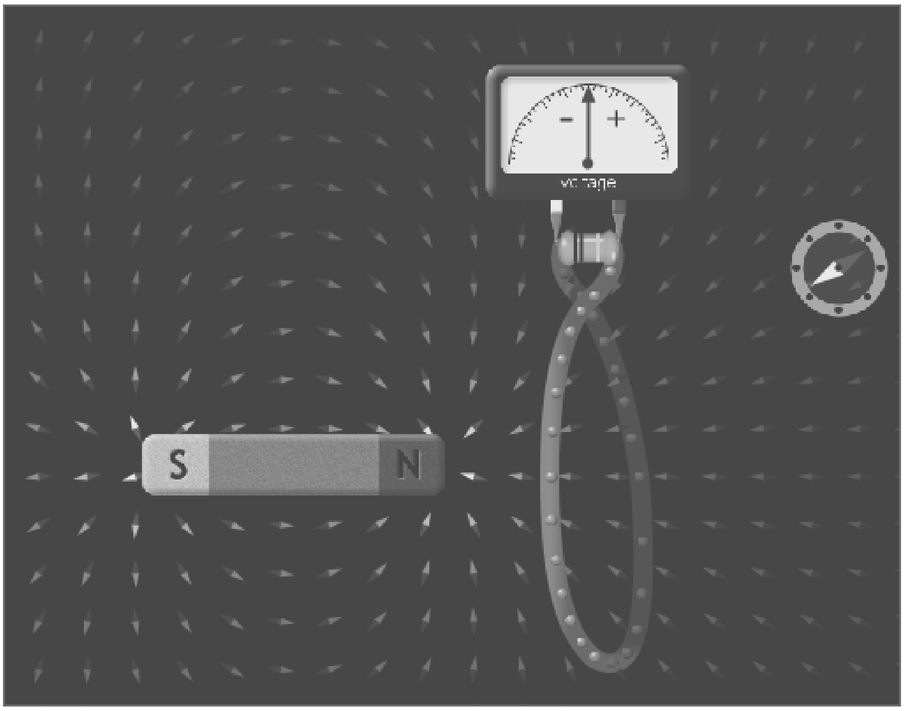
http://www.youtube.com/watch?v=--o0fqS4MBY

http://www.youtube.com/watch?v=S0wbEl7caTY

3 More electromagnetic induction

In this worksheet, you will need to use another program to investigate electromagnetic induction – http://phet.colorado.edu/en/simulation/faraday.

This is a diagram from the program using the 'Pickup Coil' tab.



Use the program to find out the answers to these questions.

1. What happens when:

   you use a stronger magnet? ____

   you use a smaller loop area? ____

2. What do the small blue dots on the coil represent?

   ____

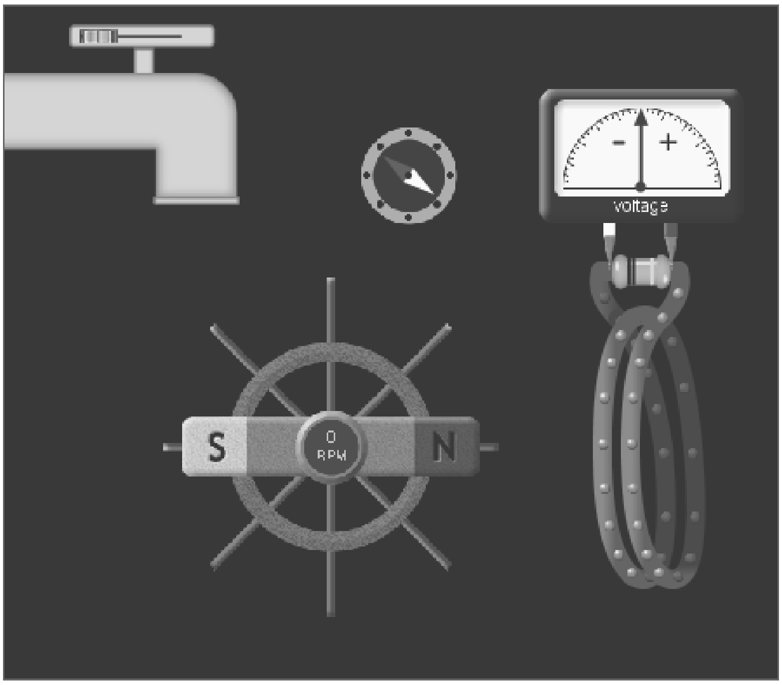
3. What do you notice when you move the magnet into and out of the coil?

   ____

The problem with making electricity this way is that as soon as you stop moving the magnet, the electricity stops.

To get mains electricity in our houses, we somehow have to keep a magnet moving through a coil. You can investigate how to do this using the 'Generator' tab.

Image on this page reproduced courtesy of PhET Interactive Simulations University of Colorado http://phet.colorado.edu



4. What happens to the magnet when you turn on the tap?

____

5. What effect does this have on the indicator? ___________________________

6. What happens when the wheel goes faster? ___________________________

7. What do you need to do on the program to get the most electricity?

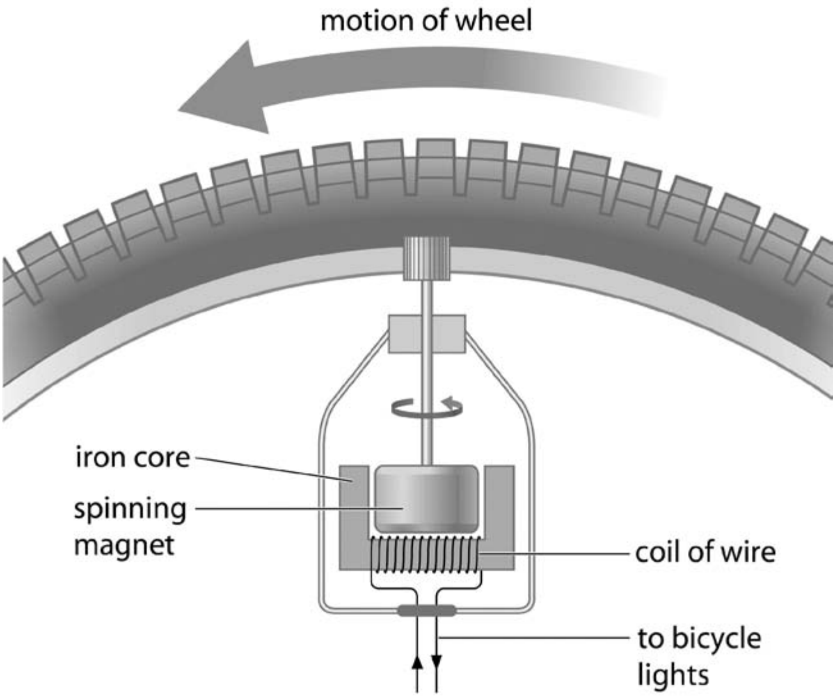
____

____

____

Image on this page reproduced courtesy of PhET Interactive Simulations University of Colorado http://phet.colorado.edu

Outside the laboratory, we can make small-scale electricity using a bicycle dynamo.



Instead of using a water wheel, we use a friction wheel, which is pushed onto the tyre.

When you pedal, the light comes on.

Dynamos are often connected to a rechargeable battery.

8. Suggest **one** reason why people use a rechargeable battery with their dynamo.

____

____

Teacher notes

The worksheet is based on http://phet.colorado.edu/en/simulation/faraday

Your school may have some kit that allows you to demonstrate a generator.

Similar coverage to the worksheet: http://www.youtube.com/watch?v=tC6E9J925pY

This clip (after the first minute) shows a lab-sized power station:
http://www.youtube.com/watch?v=SPTJUtO0-_E

It is a good idea to lead into the difference between this demo and a 'real-life generator' – these are good clips:

hydroelectric power http://www.youtube.com/watch?v=rnPEtwQtmGQ

coal-fired power http://www.youtube.com/watch?v=SeXG8K5_UvU

leads into transformers http://www.youtube.com/watch?v=20Vb6hlLQSg

Both these show nuclear power station...only use if you have done Topic 7:

http://www.youtube.com/watch?v=SeXG8K5_UvU

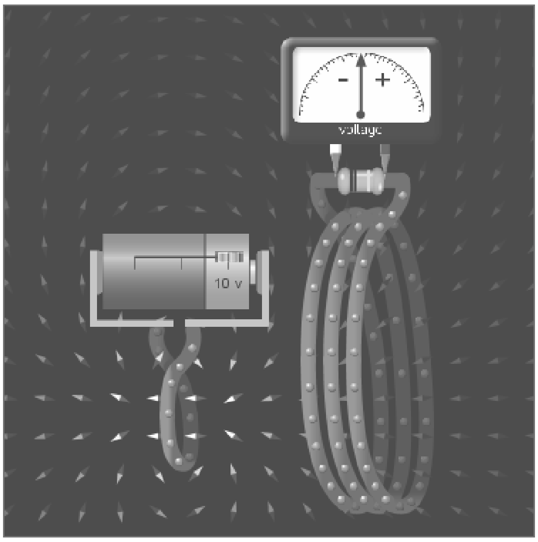
http://www.youtube.com/watch?v=SeXG8K5_UvU

This could be useful too: http://www.furryelephant.com/content/radioactivity/nuclear-reactor-power-simulation/

4 The transformer

Use the 'Transformer' tab of http://phet.colorado.edu/en/simulation/faraday

Use this set-up: a battery, 1 loop with pickup coil of 3 loops, and a voltmeter.



1. What happens to the voltmeter when you change the battery voltage?

   ____

2. What happens when you move the battery and coil closer to the pickup coil?

   ____

3. Describe how the blue dots (electrons) move when:

   the battery reads 10 V to the right ______________________________

   the battery reads 10 V to the left ______________________________

4. What do you notice about the magnetic field (the little magnets)?

   ____

A battery provides electricity that moves in only one direction – this is called direct current or d.c. electricity. This can't be used to induce electricity because the magnetic field is not changing.

5. Move the slider on the battery backward and forward as quick as you can. What happens to the voltmeter now?

   ____

6. Try this again, but use the light bulb instead of the voltmeter. What happens?

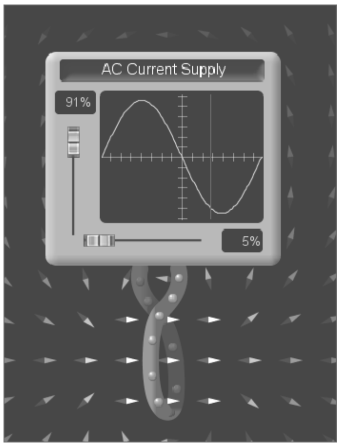
   ____

7. Is the big coil connected to a battery or a power source? ________________

Image on this page reproduced courtesy of PhET Interactive Simulations University of Colorado http://phet.colorado.edu

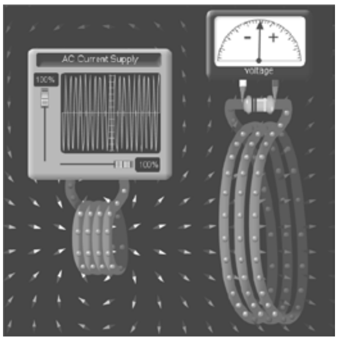
By changing the direction of the electricity quickly, you change the magnetic field. This induces an electric voltage and current, even though there is no physical connection between the two coils. An electric current that changes its direction is called a.c. (alternating current).

Use an a.c. supply instead of the battery – set it to display a big wave as shown here. Watch the current (blue dots) as the red line moves along.



8. What happens to the direction of the current?

____



Now set this up on your screen – the a.c. supply at maximum, with four loops, and the voltmeter connected to three loops on the pickup coil.

9. What happens when you move the smaller coils closer to the big coil?

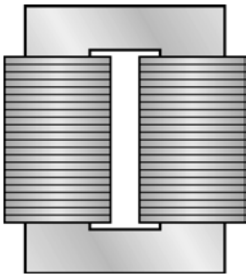
____

Try this again, but move it so that the small coil is ***inside*** the big coil.

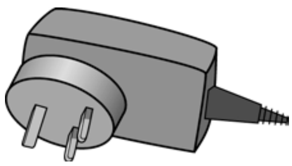
10. What happened ? ____

The two coils make up a device called a **transformer**. These are used to change the size of a voltage.

To make it work better, the two coils are both wrapped on the same core of magnetic material.



You have lots of transformers in your home – some are inside the device (e.g. microwave ovens). Some of them look like this.



11. Write a list of devices that use a transformer in your home.

____

____

____

Images on this page reproduced courtesy of PhET Interactive Simulations University of Colorado http://phet.colorado.edu

Teacher notes

This worksheet is based on http://phet.colorado.edu/en/simulation/faraday and is designed to lead the students through a conceptually difficult topic.

You may have suitable kits to use in your school – please note that many students will burn the plastic coating off the wires when making a model transformer: http://www.all-science-fair-projects.com/science_fair_projects_encyclopedia/How_to_make_a_transformer

This site shows a.c. very clearly, but stick to the resistor and not the capacitor or inductor: http://www.magnet.fsu.edu/education/tutorials/java/ac/index.html

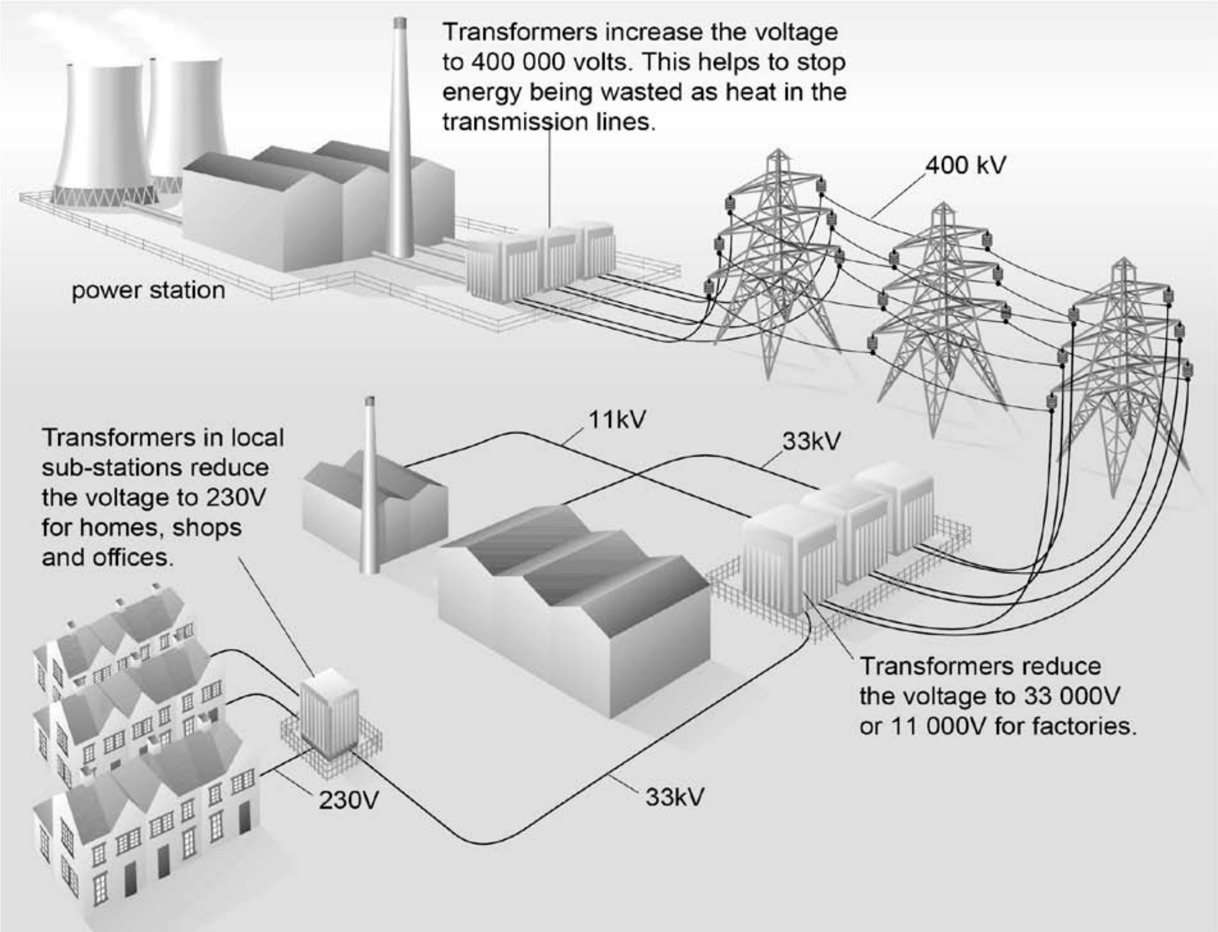
You may find sections of these useful, although it is more than the specification calls for:

http://www.youtube.com/watch?v=-O7JL6a8uVY

http://www.youtube.com/watch?v=3m-1Bv5VRWU

5 Transmitting electricity

We use transformers to transmit electricity around the country. They can be seen near our towns and cities.



1. Why do we need to transmit electricity?

   ____

   Watch a video to see some of the problems with transmitting electricity.

2. What happens to the light bulb at the end of the line when there are long wires between the light bulb and the electricity supply?

   ____

   ____

3. Explain what has happened to all the energy. It has ______________ because

   ____

   ____

   ____

4. Complete these sentences using words from the box.

country	**electrical energy**	**kill people**	**cables**
smaller	**step-down**	**step-up**	**voltage**

The National Grid is a way of carrying ________________________ across the ________________________. At the power station the ________________________ is increased using a ________________________ transformer. The energy is carried ________________________ . At a town, ________________________ transformers make the voltage smaller. The very high voltage in the cables makes the energy loss ________________________ but this is dangerous because it can ________________________ .

Teacher notes

Suitable videos are:

http://www.youtube.com/watch?v=cQQ9g1vg-b0

http://www.youtube.com/watch?v=x5m0U8daywk

This section of *Bite size* is useful because it pulls the entire section together:

http://www.bbc.co.uk/schools/gcsebitesize/science/aqa_pre_2011/energy/using_electricity rev1.shtml

6 Energy types

Watch this video – it shows different types of energy in action.

http://www.youtube.com/watch?NR=1&v=k60jGJfV8oU&feature=endscreen

Draw lines to connect each energy type to what has this sort of energy.

Energy type	What has this sort of energy
heat energy	all objects that are moving
gravitational potential energy	an object that is squashed
electrical energy	objects that are hot
sound energy	objects that give off light
kinetic energy	an object that has been lifted off the ground
elastic potential energy	an object making a noise
chemical energy	an electric current moving in a circuit
light energy	anything that is a fuel
nuclear energy	comes from atoms splitting up

This is a table to help you remember energy types. Fill in the energy types – some have been done for you.

Most	magnetic
Kids	
Hate	
Learning	
G	
C	
S	
E	elastic potential
Energy	
Names	

Watch this video about energy transfers.

http://www.youtube.com/watch?feature=player_embedded&v=TOC9A9pAaKg#!

There is a rule in science about energy. It states that:

Energy can't be created or destroyed – it can only be changed from one form to another.

1. What is this rule called? ____

2. Explain why energy is important in everyday life.

   ____

   ____

   ____

   ____

Teacher notes

The clips from *phoenixfilmandvideo* are the free bits before they ask you to buy them – but they are still useful.

Using energy: http://www.youtube.com/watch?v=ASZv3tIK56k

KE and PE: http://www.youtube.com/watch?v=ASZv3tIK56k

This site allows students to play around with some ideas:
http://www.energystar.gov/index.cfm?c=kids.kids_index

A colouring book that could make the basis of poster work:
http://www1.eere.energy.gov/kids/pdfs/coloringbook_2010.pdf

An activity book – possibly something for the odd spell or for homework:
http://www1.eere.energy.gov/education/pdfs/activitybook_2010.pdf

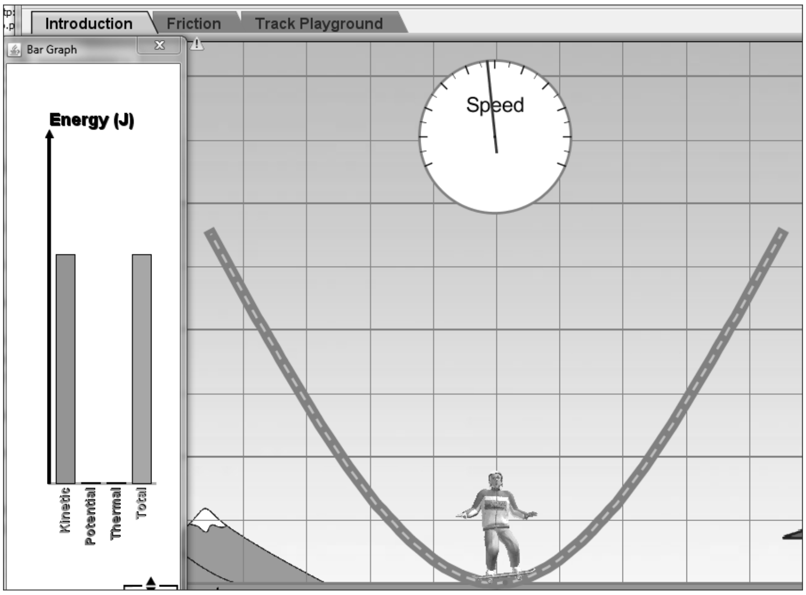
7 Energy changes

Energy can't be created or destroyed – it can only be changed from one form to another. These are also called energy transfers.

Use this program to investigate the energy changes that can happen in a skate park.

http://phet.colorado.edu/en/simulation/energy-skate-park-basics

Use the 'Introduction' tab and stop the skater at different positions. Look at the speed and the energy bar chart.



1. What do you notice about the total energy?

____

____

2. What is the pattern between the speed and the kinetic energy?

____

____

3. How does increasing the mass of the skater make a difference?

____

Now find out what happens when you change the skate track to this one.

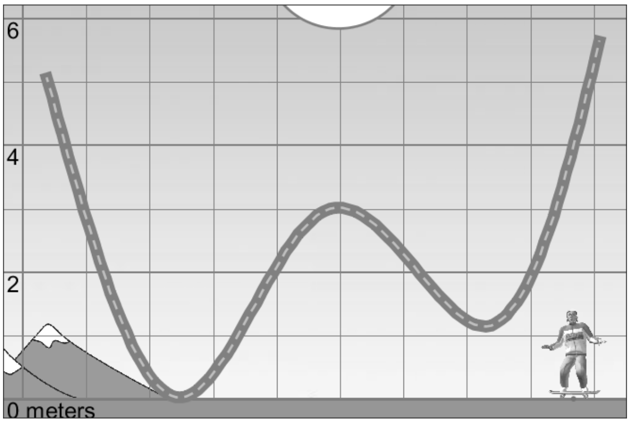
4. Describe and explain what happens to the energy in this case.

____

____

____

____



Images on this page reproduced courtesy of PhET Interactive Simulations University of Colorado http://phet.colorado.edu

Use the 'Friction' tab to investigate the effect of friction for both tracks.

5. Complete these sentences using the words from the box.

constant	**decreases**	**warm**	**friction**
heat	**kinetic**	**kinetic energy**	**less**
more	**potential**	**potential energy**	**speed**
slow down	**useful**	**wasted**	**fire**

a At the top of the track, the skater has only gravitational _______________ .

b A person who is heavier has _______________ total energy.

c When the skater moves down the track his _______________ increases and so does his _______________ , but his potential energy _______________ .

d His total energy always remains _______________ .

e _______________ energy is shortened to KE and gravitational _______________ energy is shortened to PE.

f Sometimes, KE is changed into _______________ because of _______________ .

g Friction makes things _______________ .

h This is called 'loss of energy' because the heat is not doing anything _______________ .

i When there is _______________ friction, then less energy is _______________ .

j Sometimes changing electrical energy into heat is helpful – e.g. in an electric _______________ .

6. Name as many devices as you can that can be used to make electricity.

____

____

____

Teacher notes

The PhET program is the simpler version of *Energy skate park* – which you could use if you wished.

Also use the old worksheets ‘re-vamped’.

8 Heat energy

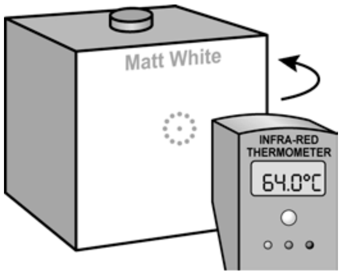
1. What do the radiators do in a house? ______________________________

____

A scientist called John Leslie used this equipment to find out what colour of surface makes the best radiator of heat energy.

He filled up a metal box with boiling water and measured the heat coming off each side.

A program called 'Leslie's cube' shows his experiment.



http://www.succeedingwithscience.com/resources/heatonthemove/heatonthemove.swf

Use the program to fill in this set of results.

Surface colour	Temperature	Best radiator
shiny		
gloss black		
matt black		
matt white	64.0°C	

2. We can say that ______________ is the best emitter of heat. The worst emitter is ______________ .

3. Suggest why we have shiny kettles ______________________________ .

4. If we want the most heat emitted, what colour should we paint our radiators?

____

You will do an experiment to investigate which colours are best at taking in or absorbing heat energy. ('Attracting' is not a correct word here – it should only be used with magnets and static electricity.)

5. Draw the equipment you used to investigate the absorption of heat. Label the diagram.

6. Write down what you did (the method).

____

____

____

____

____

____

7. Which surface was best at taking in heat energy? ______________________

8. Explain the following statements using your knowledge about heat absorption.

a In hot countries we paint the outside of houses white.

____

____

b A dark coloured car that has been left in the sunshine is always hot when you get in it.

____

____

c Solar panels are always painted black.

____

____

Teacher notes

The first experiment uses this link:

http://www.succeedingwithscience.com/resources/heatonthemove/heatonthemove.swf

There are many suitable experiments to show absorption. For example, if you have a sensible class, you can wrap the back of someone's hand with aluminium foil and the back of another hand with cling wrap painted black (colloidal aquadag). Hold the hands equi-distant from a heat source (blue Bunsen flame is OK). Ensure that students do not 'play chicken', holding a hand until it scorches!

Otherwise, these links give some simple experiments that can be used for heat absorption:

http://www.ehow.co.uk/info_8118565_science-effect-color-heat-absorption.html

http://www.sciencekids.co.nz/experiments/lightcolorheat.html

http://www.juliantrubin.com/encyclopedia/physics/heat_absorption.html

http://www.monstersciences.com/energy-science-experiments/51-energy-experiment-en01-heat-absorption.html

9 Energy-saving devices

1. Why do people want to save energy at home?

____

____

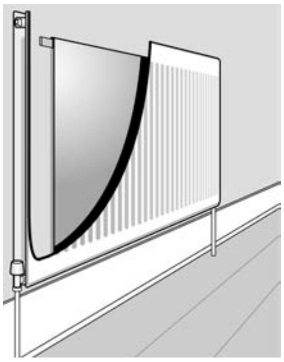
Use the internet to find the names of five common devices that can save you energy at home. Write these here and explain what they do.

2. Which of these costs the most? ______________________

3. Which costs the least? ______________________

4. Which works out as the best value for money? ______________________

5. Explain how each of these saves money and energy.



a radiator reflector:

____

____

____

b closed curtains on the windows:

____

____

c low-energy light bulb:

____

____

Many people are confused about low-energy light bulbs.

Use the internet to find out about the four different types of light bulb. Put your results in this table.

Name of type of light bulb	How much energy they use compared to incandescent	How long they last	Can they be used with a dimmer?	Do they get hot when used?
incandescent	100%	1000 hours	yes	yes

6. Which of these light bulbs costs most? ______________________________

7. What else do we have to consider when choosing light bulbs for our house?
(Hint – this is measured in lumens)

____

____

8. Which bulb do you think is best for everyday use in the house?
Explain your answer.

____

____

9. Suggest why incandescent (filament) bulbs are not on sale anymore.

____

10. Which bulbs are used in modern cars? ______________________________

11. Suggest some advantages of these bulbs. ___________________________

____

____

Teacher notes

This link has a simple explanation of incandescent, CFL and LED bulbs (not halogen)

http://www.youtube.com/watch?v=Pk60-D61h34

Which? has some good links but there are many others:

http://www.which.co.uk/energy/energy-saving-products/guides/10-eco-products-you-dont-need/

http://www.which.co.uk/energy/energy-saving-products/guides/how-to-buy-energy-saving-light-bulbs/

http://www.which.co.uk/energy/saving-money/guides/how-to-use-less-electricity/money-saving-tips/

http://www.amazon.co.uk/Radflek-Radiator-Reflectors-Sheets-Radiators/dp/B003E1CIGQ/ref=sr_1_45?ie=UTF8&qid=1364756197&sr=8-45 for an alternative radiator image

10 Electrical appliances

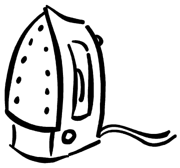
Find out what voltage, current and power each of these electrical devices needs.

Device	Voltage	Current	Power
Torch 			
Portable radio 			
Alarm clock 			
Watch 			
Mobile phone 			
Laptop 			

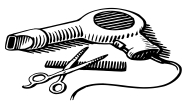
Electrical power

Everything that we plug into the electricity supply runs at the same voltage – that's about **230 V** in this country.

Different devices can use different amounts of electrical energy when they are switched on for the same period of time. This depends on their power rating – that's how many **watts** (**W**) they use.

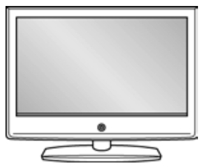


Iron
1000 W



Hairdryer
500 W

Light bulb
12 W



TV
150 W

Heater
1500 W

The iron has a bigger power rating than the television set. So when they are both switched on for the same length of time, the iron uses more electrical energy than the TV set.

The devices in the diagrams above are all switched on for the same length of time.

List these devices in order of running cost – put first the one that costs the most to run.

Order	Device	Watts
1		
2		
3		
4		
5		

The cost of electricity

Electricity comes into your house through underground cables. Electricity goes through an electric meter before being sent through your house's electrical wiring system to all the sockets.

Some meters are inside a house

Some meters are in a box on the wall outside the house

1. Where is the electric meter in your home?

____

Your meter measures how much electricity is used in your house.

Sometimes a meter is read every three months; sometime the supplier estimates how much you use.

Suppliers measure the amount of electricity a house uses in **kilowatt-hours** – they shorten this to '**units**' of electricity:

1 kilowatt-hour is 1 unit

The amount of electricity used by any device depends on:

its power (in kilowatts)

how long it is switched on for (in hours).

Your electricity meter shows how many units of electricity are used in your house.

Some people have special electricity meters called '**Economy 7**'

2. Use a textbook or the internet to find out what 'economy 7' means.

____

____

____

3. Explain why many people like to use 'economy 7' meters.

____

____

____

4. Mr White has his electricity meter read in February – the reading was 47 200 units.

   The time before that was in November – when the reading was 47 000 units.
   The amount of electricity that Mr White has used is:

   48 200 − 47 000 = 1200 units.

   Mrs Green had her electricity meter read in May (58 000 units) and three months later in August (59 000 units).

   Work out how many units Mrs Green has used.

   Who has used the most electricity − Mr White or Mrs Green? _____________

5. Mr White and Mrs Green have to pay 15 p for each unit of electricity that they use.

   So Mr. White's electricity bill is 1200 units × 15 p per unit.

   = 18 000p

   = £180.00

   Work out Mrs Green's electricity bill:

   Cost = ______________ units × 15p per unit

   = ______________ p

   = £ ____________

   Who has the bigger electricity bill – Mr White or Mrs Green? _____________

10 Sources of energy to make electricity

1. Why do we need energy to make electricity?

____

Our energy sources can be sorted into *those that will run out* and *those that will not run out*. Use the words in the box to complete the chart below.

biomass	**coal**	**gas**	**geothermal**	**wind**
hydro	**oil**	**non-renewable**	**nuclear**	**wave**
renewable	**solar**	**tidal**		

....
sources that will run out

- ....
- ....
- ....
- ....

....
sources that will not run out

- ....
- ....
- ....
- ....
- ....
- ....
- ....

Use the internet to find the answers to these questions.

2. Which three of the energy sources are called ‘fossil fuels’?

____

3. What is meant by ‘geothermal’? Which country uses geothermal a lot?

____

____

4. Why are farmers now growing crops of fast-growing ‘elephant grass’ (*Miscanthus)*?

____

5. What else can they grow for this purpose?

____

6. What are the problems with nuclear power?

____

____

Choose one of these and watch the video about it:

hydroelectric power http://www.youtube.com/watch?v=g8DTiztIMFA

wind power http://www.youtube.com/watch?v=niZ_cvu9Fts

solar power http://www.youtube.com/watch?v=NDZzAIcCQLQ

wave power http://www.youtube.com/watch?v=_1WWO2nUI98

tidal power http://www.youtube.com/watch?feature=endscreen&v=N2nRPBDA6U0&NR=1

7. Fill in this fact card for the energy source you have chosen. You may have to use the internet to find some of the information.

Source ____
One place in the UK where this is used ____________________
Does it provide a constant supply of electricity? _______________
How much electricity it provides _________________________
An advantage of this source is __________________________
A disadvantage of this source is _________________________

Teacher notes

If you have time, these are useful clips to introduce the lesson and tie in energy and electricity:

National Grid – general into to energy sources http://www.youtube.com/watch?v=__zB80Saglk

Electricity generation http://www.youtube.com/watch?v=20Vb6hlLQSg

For the last section, you may wish to put pupils in groups of 5, so that they complete one fact card each. The following is just for ease of copying.

Source ______________________________

One place in the UK where this is used ______________________________

Does it provide a constant supply of electricity? ______________________________

How much electricity it provides ______________________________

An advantage of this source is ______________________________

A disadvantage of this source is ______________________________

Source ______________________________

One place in the UK where this is used ______________________________

Does it provide a constant supply of electricity? ______________________________

How much electricity it provides ______________________________

An advantage of this source is ______________________________

A disadvantage of this source is ______________________________

Source ______________________________

One place in the UK where this is used ______________________________

Does it provide a constant supply of electricity? ______________________________

How much electricity it provides ______________________________

An advantage of this source is ______________________________

A disadvantage of this source is ______________________________

Source ______________________________

One place in the UK where this is used ______________________________

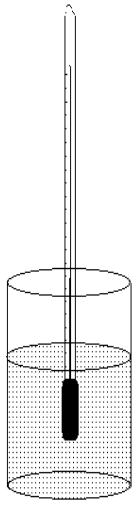
Does it provide a constant supply of electricity? ______________________________

How much electricity it provides ______________________________

An advantage of this source is ______________________________

A disadvantage of this source is ______________________________

11 Reducing heat losses



Fill a beaker with hot water from the kettle.

Use a thermometer to measure the temperature of the water.

After 5 minutes measure the temperature of the water again.

1. What happened to the temperature of the water after 5 minutes?

____

____

2. Explain what has happened to the energy in the water.

____

____

3. Write down **two** ways of reducing energy losses from the beaker of water.

____

____

With the help of a partner, design an experiment to test one of your ideas. Circle this idea in Question 3.

4. Write a list of all the equipment you need.

____

____

5. Describe how you will carry out your test.

____

____

____

____

____

____

____

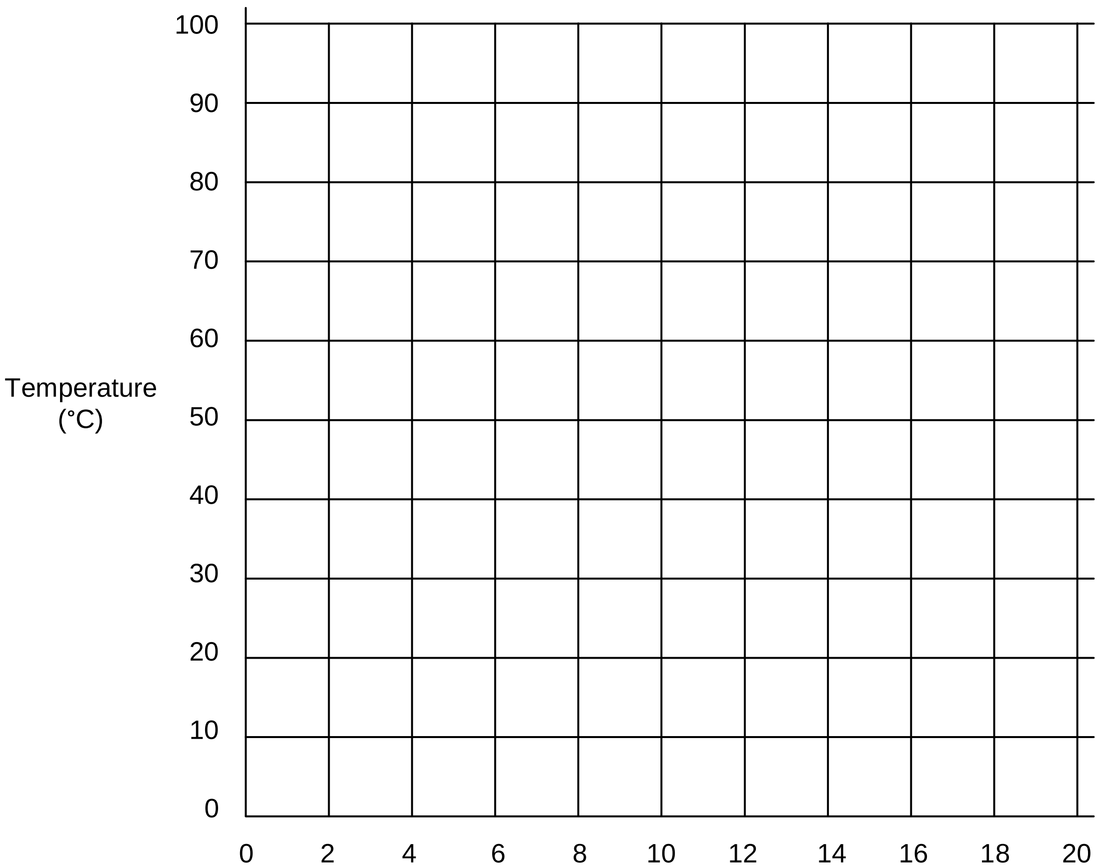
Before you start, make a results table to write down your measurements – you may not need all these columns; or you may need more.

6. How did you make sure it was a fair test?

____

____

7. Use the grid below to draw a scatter graph of your results.



8. What did you find out?

____

____

12 Stopping heat losses

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

Some of this money is wasted – heat is lost through windows, walls and roofs.

The box below shows some methods used to reducing heat energy losses.

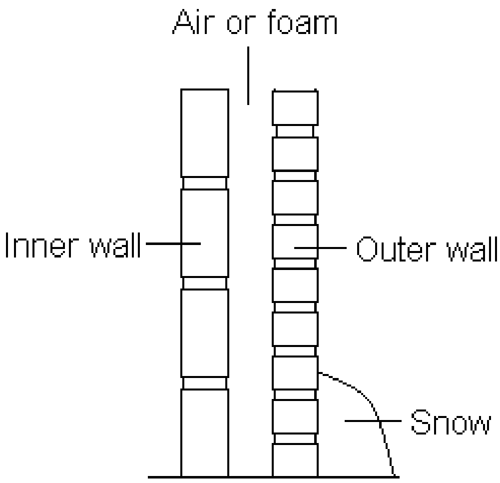
loft-insulation	**cavity-wall insulation**	**lagging**
double glazing	**draught excluder**	**curtains**

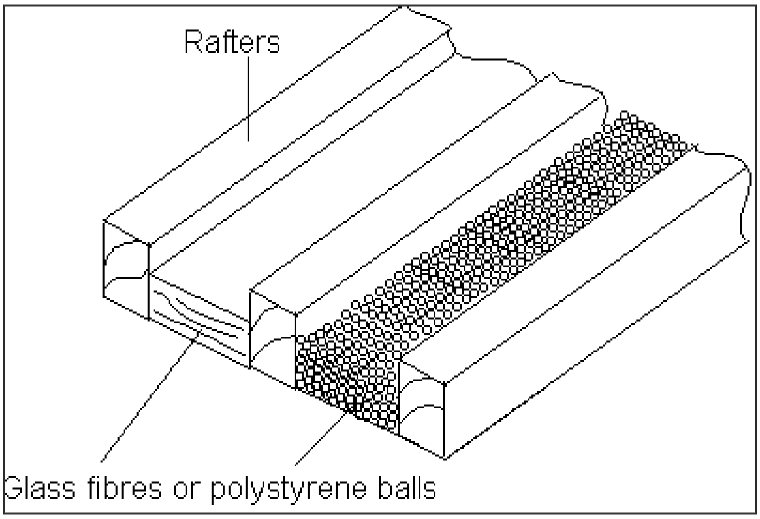
For each of the following diagrams, write in the tables:

what method is being used to reduce heat energy losses

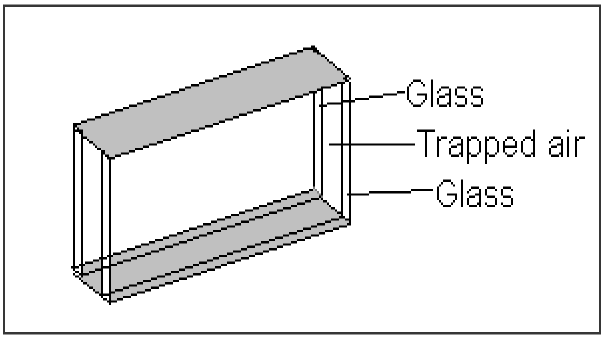
where you would use this method

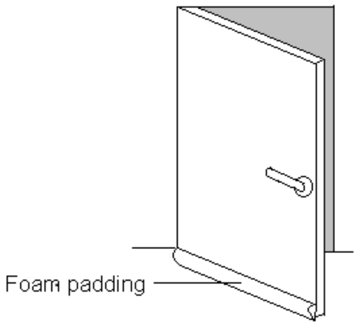
a description of how it works.





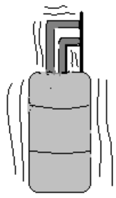
Method		**Method**	
Where it is used		Where it is used	
How it works		How it works	





Method		**Method**	
Where it is used		Where it is used	
How it works		How it works	

Hot water pipes and tanks need insulating.



1. How can you reduce the heat energy lost from a hot water tank?

____

____

2. How can you reduce the heat energy lost from hot water pipes?

____

____

Curtains

3. Explain why you should close the curtains on a cold winter's day.

____

____

4. What else can you do to save money when you are heating your home?

____

____

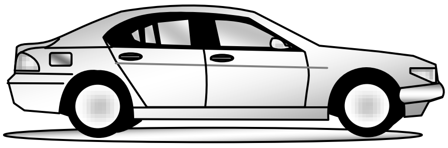
Teacher note

Students might find this clip entertaining – http://www.youtube.com/watch?v=1-g73ty9v04

13 Revision sheet: Forms of energy

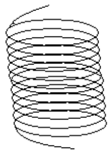
There are many different forms of energy:

Kinetic (movement) energy

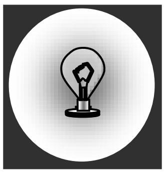


Potential (position) energy

e.g. a stretched or compressed spring



Light energy



Potential energy and kinetic energy are types of **mechanical** energy.

The box lists other types of energy.

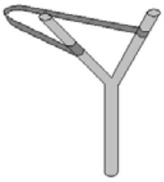
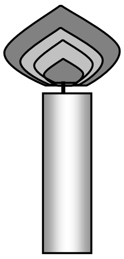
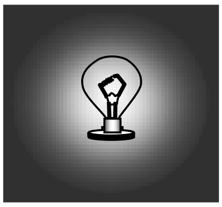
heat	**electrical**	**chemical**	**nuclear**	**sound**

Use the internet to find diagrams to show each of these in action.

14 Revision sheet: Energy transfers

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**	**chemical**	**heat**	**sound**


1. A catapult changes potential energy into ______________________ energy.

2. An electric kettle changes electrical energy into ______________________ energy.

3. A lamp changes electrical energy into ______________________ energy.

4. A hairdryer changes ______________________ energy into heat energy.

5. A singer changes chemical energy into ______________________ energy.

6. A buzzer changes ______________________ energy into ______________________ energy.

7. A candle changes ______________________ energy into ______________________ energy and ______________________ energy.

Look at the list of objects in the box below.

loudspeaker	**microphone**	**battery**	**electric fire**

Which of these objects changes:

8. chemical energy into electrical energy? ______________________

9. sound energy into electric energy? ______________________

10. electrical energy into sound energy? ______________________

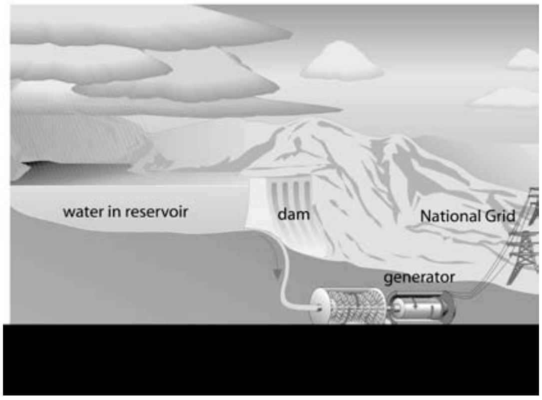
11. electrical energy into heat energy? ______________________

15 Sources of energy – 1

Some energy sources will not run out – these are called **renewable energy sources**.

Some energy sources *will* run out – these are called **non-renewable energy sources**.

Water (hydro)

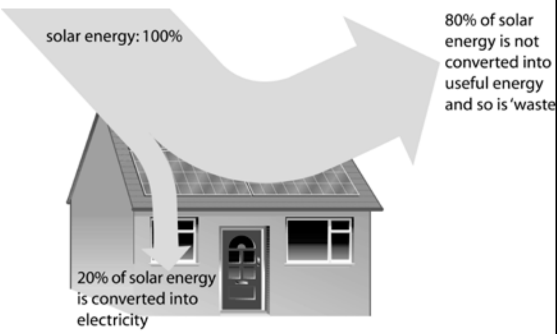


a

Wind

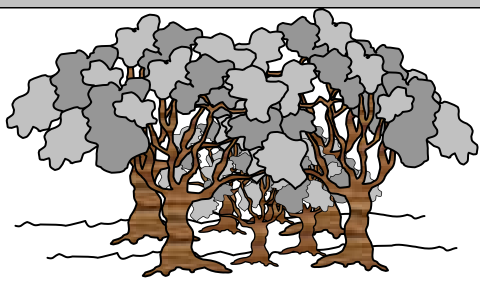
b

Sun (solar)



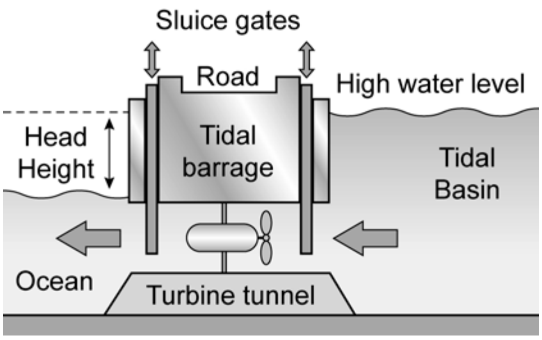
c

Biomass (plants, trees etc.)



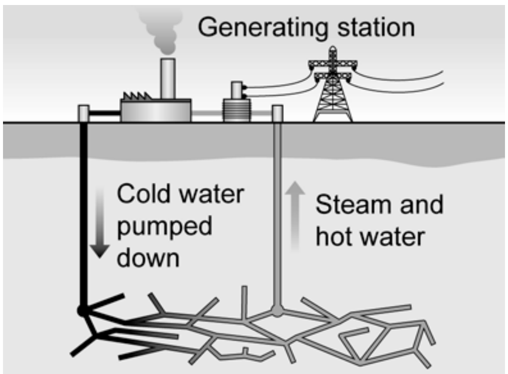
d

Geothermal



e

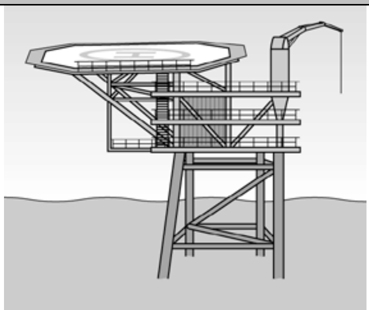
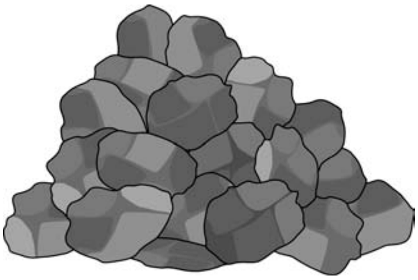
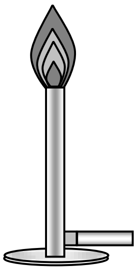
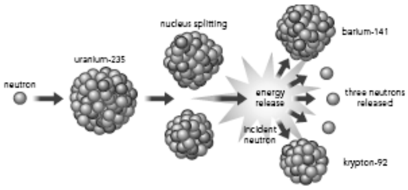
Tidal (wave)



f

16 Sources of energy – 2

Here are some other sources of energy.

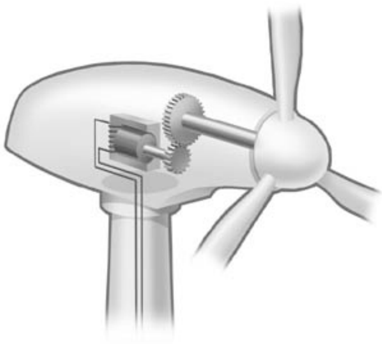
Oil	**Coal**
 **g**	 **h**
Gas	**Nuclear**
 **i**	 **j**

Oil, coal and gas are found in large, but decreasing, amounts underground.

They are formed from dead animals or plants that have been compressed over a long period of time.

Wind turbines

A wind turbine converts wind energy into electrical energy.



A wind turbine can power a single house.

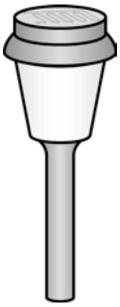
Many wind turbines can be connected to the National Grid to power whole communities.

17 Energy from the Sun

Solar cells

Solar cells can convert light energy into electrical energy.

Solar garden lamps



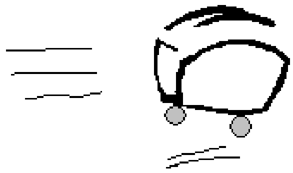
Solar garden lamps use photocells.

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 cars



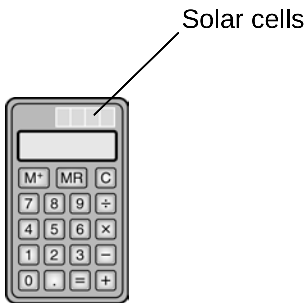
In August 2000, a group of students built a solar-powered car.

The car travelled at 50 miles per hour (75 km/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 up to 78 miles per hour (125 km/h).

Calculators



You may have a calculator that does not need batteries.

This type of calculator has some solar cells.

These calculators seem to work for ever –if you have enough light.

Satellites

Satellites have many solar cells that make up large solar panels to power their electrical systems.