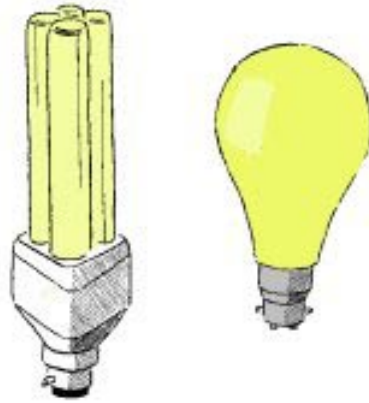
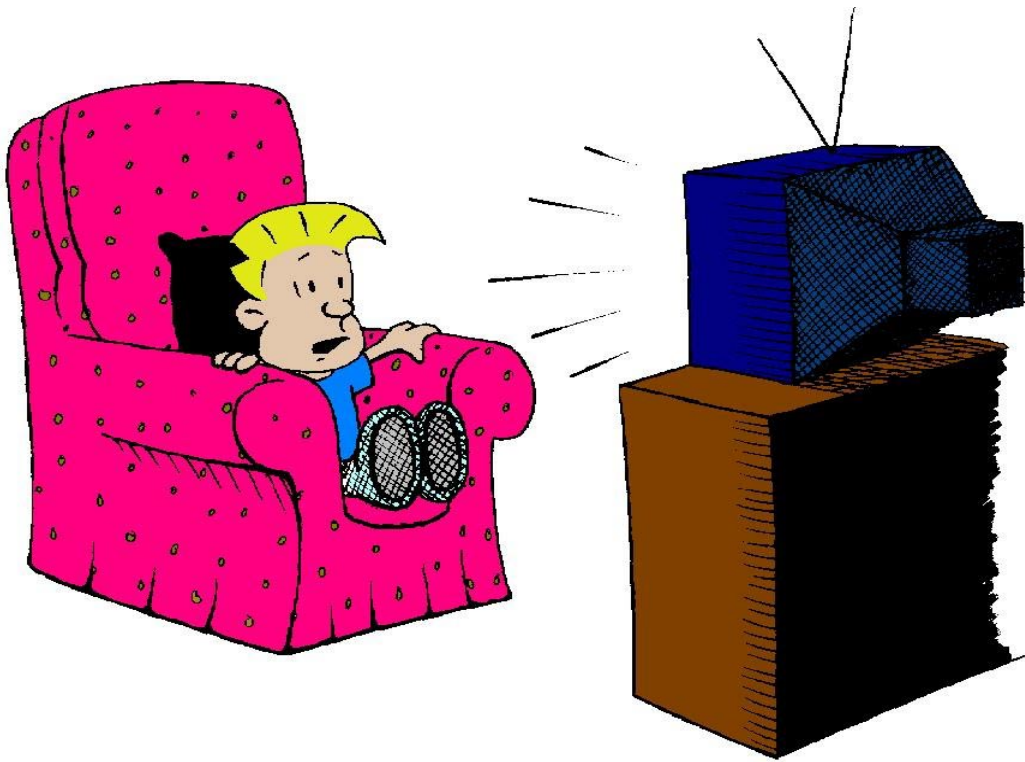


# Mission 7: Saving Energy



## How can we save energy?



Converting one type of energy to another often damages the environment. For example, burning coal to make electricity causes air pollution. That's why we should always use energy as wisely as possible. To meet this goal, we need to understand two concepts: **energy conservation** and **energy efficiency**.

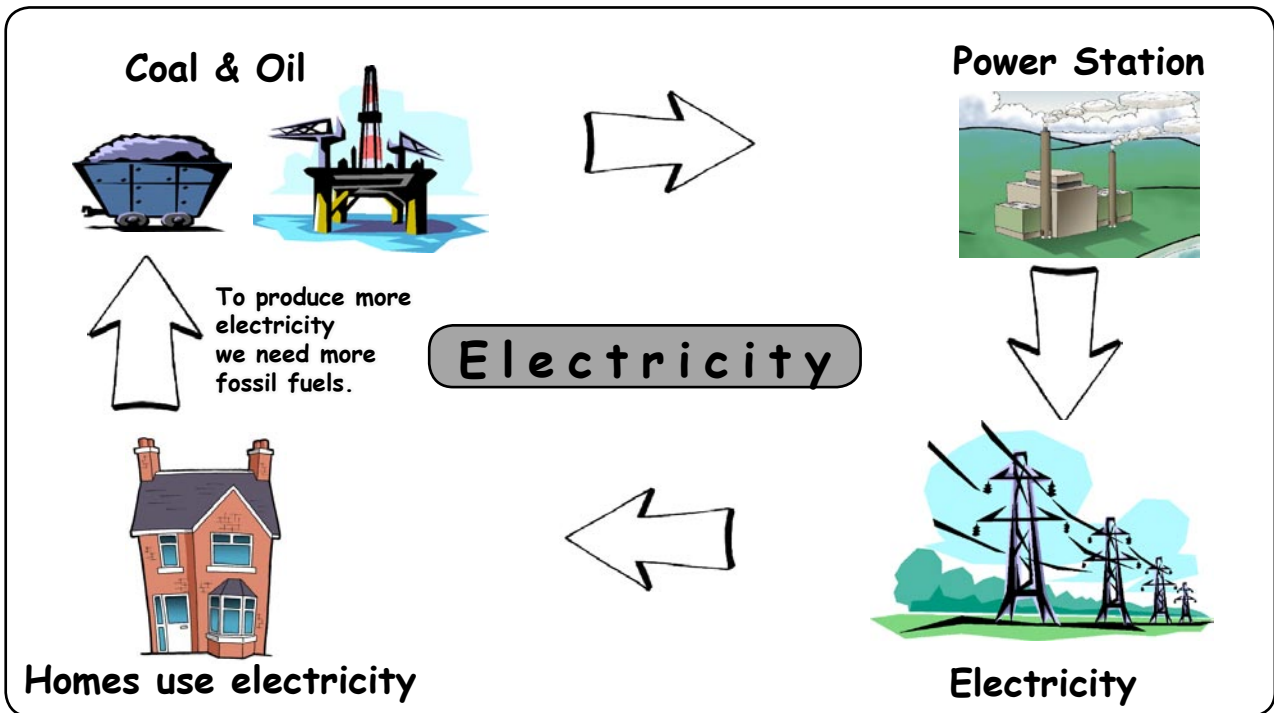


**Energy conservation** means using less energy whenever possible. We can all practice saving energy every day, for example by turning off lights when we leave the room. Every time we conserve energy we help protect the environment.

**Energy efficiency** means using energy as wisely as possible. Sometimes this means using less energy to do the same job. For example, an energy efficient light bulb gives off the same amount of light but uses less electricity than traditional bulbs. It uses less energy to do the same job.

# Electricity cycle

Study the diagram below of the Electricity Cycle.



By conserving energy and using it efficiently we can reduce the amount of electricity power stations have to make. This in turn helps to reduce the amount of pollution released into the environment.

Meet Mr.A and Mr.B. They have both received their electricity bill. One of them is happy and one of them is not.



a. Which one do you think has not been energy efficient? Explain your answer.

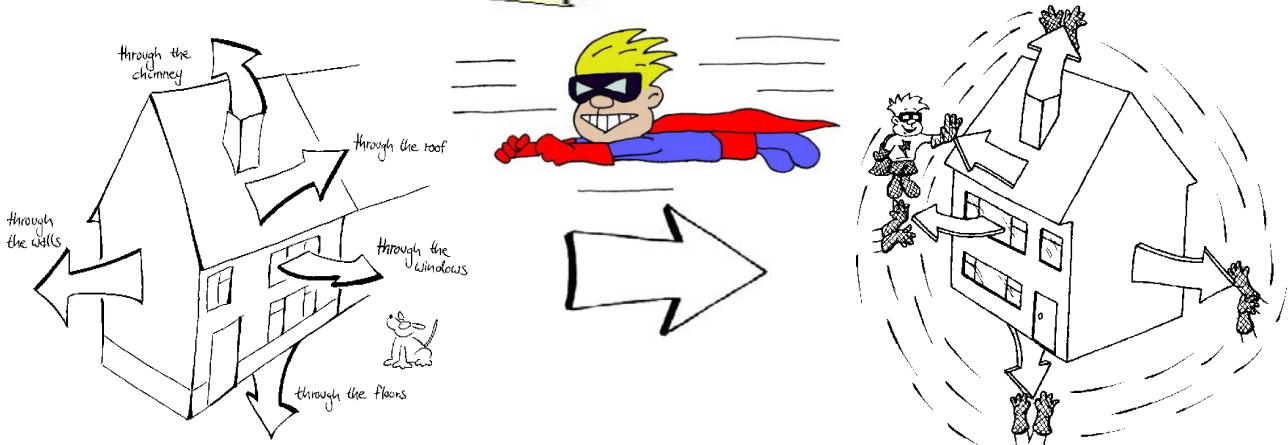
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b. Which one has caused the smallest amount of pollution? Explain your answer.

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# How can we save energy at home?

No matter what we do, the heat inside our homes will eventually escape. The trick is to slow down this loss of heat energy as much as possible.



Look at the picture below. Where are the draughts coming in and the heat escaping from?  
Circle them and explain what they are under the picture.



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# How can we save energy at home?

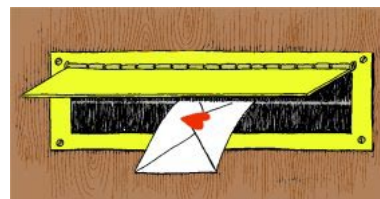
Hold your hand up at the edge of some of the doors and windows in your home or classroom. Can you feel a draught of cold air? Cold air comes in through lots of gaps and cracks, but warm air also gets out.



How can you stop all the draughts you found in the picture? Look at your draughty room again.

How does each of the solutions below stop one of the draughts?

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Brush seal around letter box.

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Double glazed windows or foam strips around the frame.

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Insulation in roof space.

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Brush seal on bottom of door.

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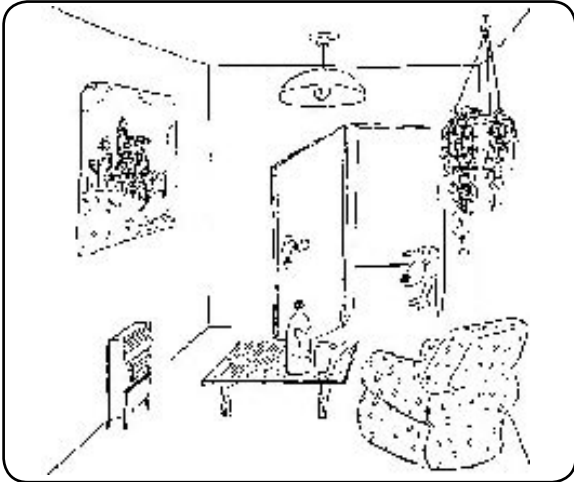
Curtains to pull over window.

## How can we be more energy efficient?



Now we need to look at how we can heat our homes as efficiently as possible. Houses are heated in different ways including coal, oil or gas fired boilers and electric heaters. Whichever way we do it we can keep the cost down, use less energy, cause less pollution and stay comfortable by controlling the heat properly.

This home is not using energy efficiently. Can you spot what they are doing wrong? Circle the mistakes and explain the problem.



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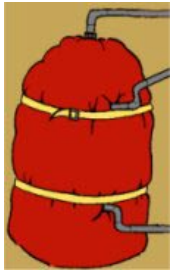
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The following pictures show simple ways to be more energy efficient. Beside each picture explain how they save energy.



A jacket for a hot water tank.

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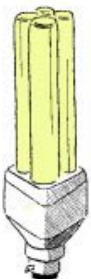
A timer which can turn the heating on and off.

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Energy efficient light bulbs.

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# How can we be more energy efficient?



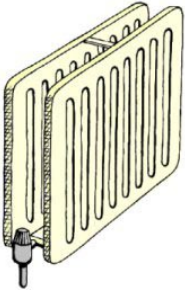
Thermostat to control the temperature of the house.

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Putting a shelf above a radiator. (Remember heat rises)

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Turn the television off when nobody is watching it.

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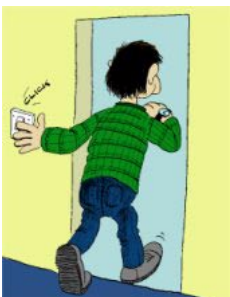
Hanging washing out instead of using a tumble dryer.

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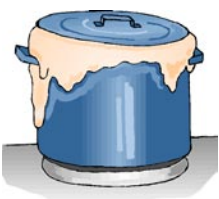
Switch off lights when they are not needed.

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Putting a lid on a boiling pan.

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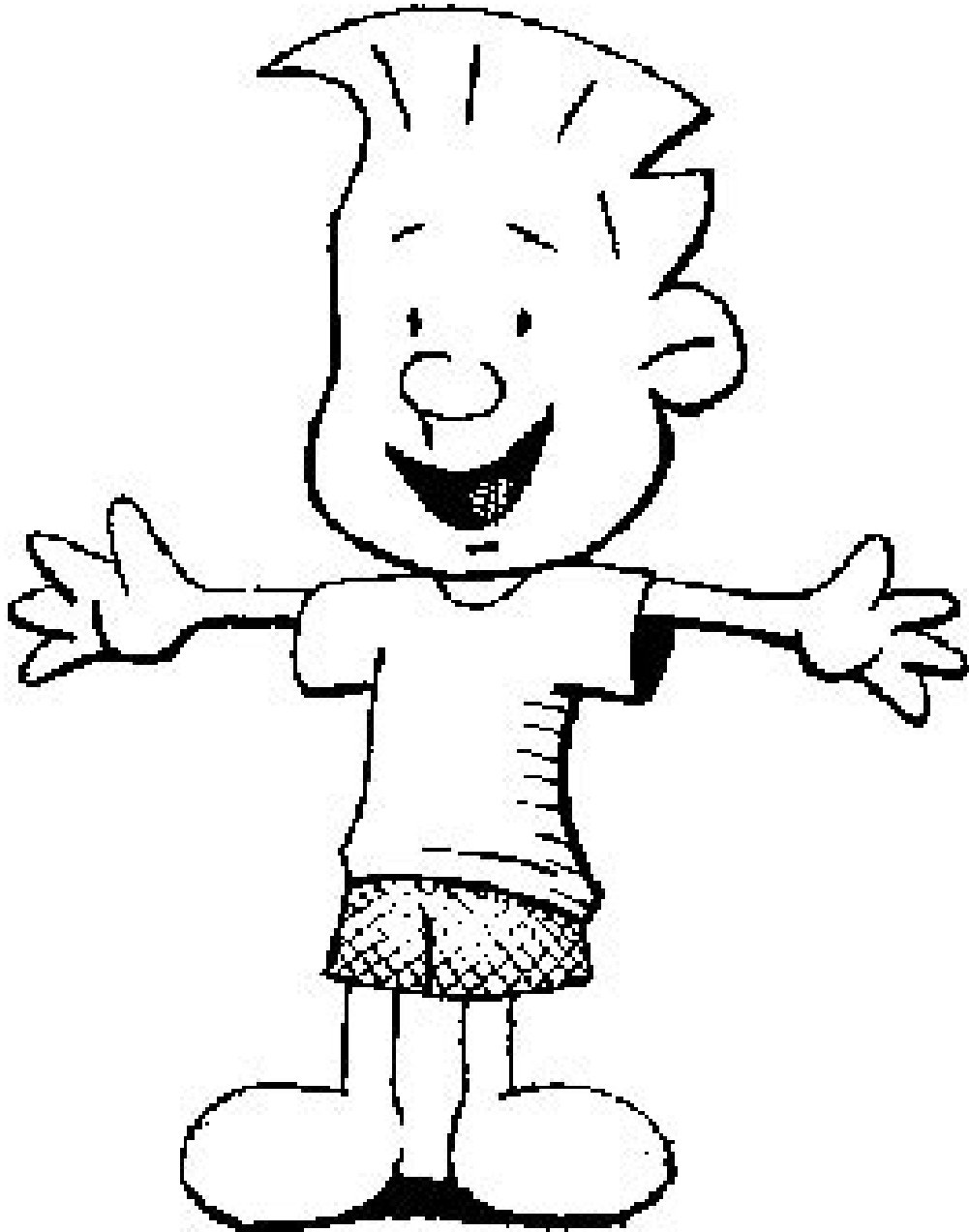
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## Keep warm

Nathan wants to be an Arctic explorer. He needs to keep warm when he's on his travels. Draw on the layers of clothes Nathan will need to wear. Make a list of all the clothes you have put on Nathan.



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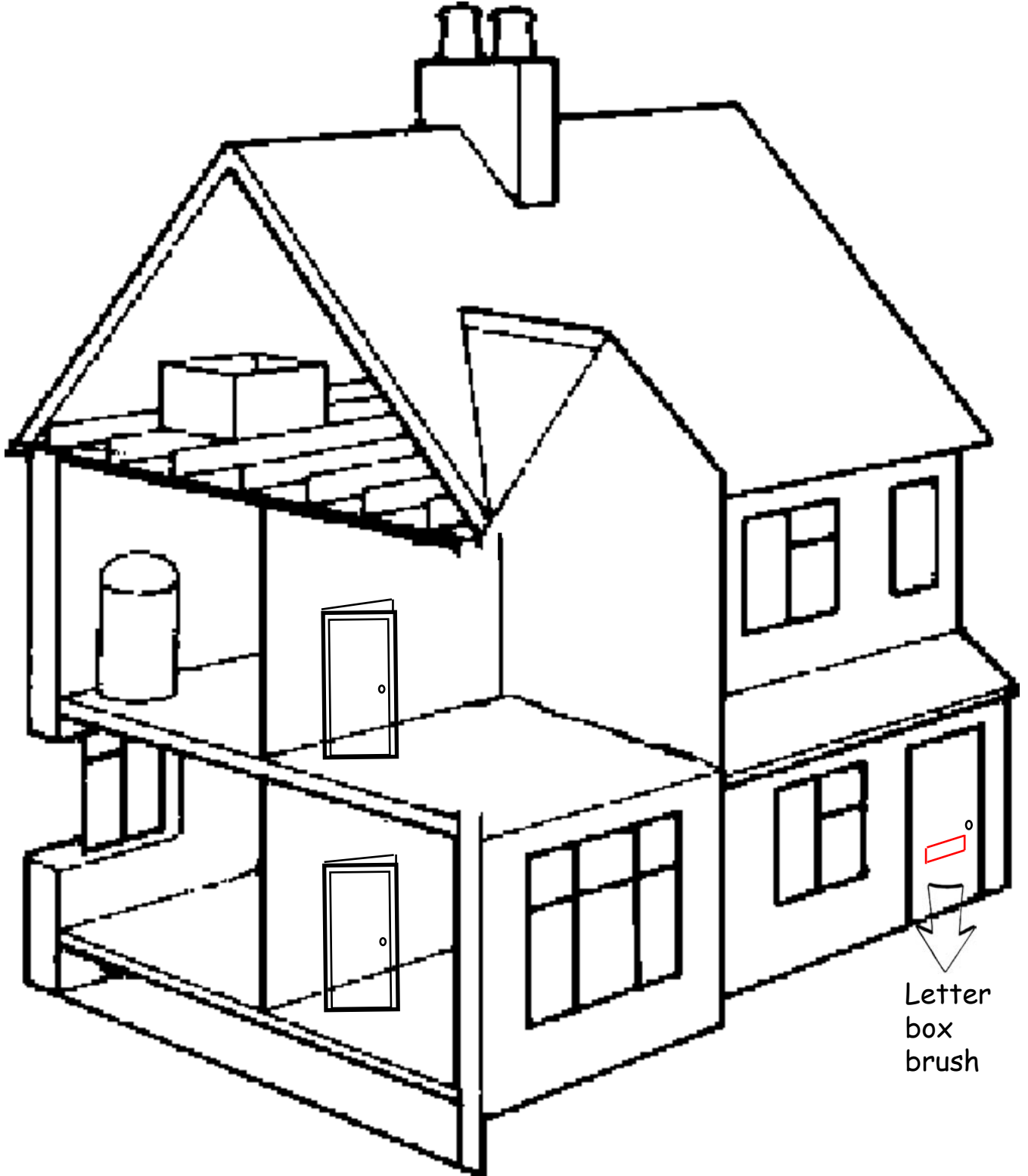
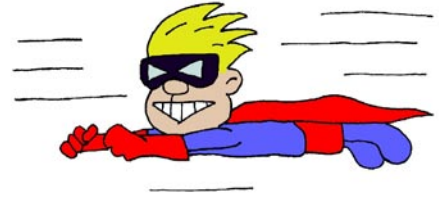


## Insulation - keeping in the heat

Think about how you kept Nathan warm on his Arctic adventure. Now try and keep the heat in the house by doing the same thing.

Where can heat escape from the house?

Colour in red all the places heat can escape, then write beside each what can be done to slow down the heat loss. One has been done for you.



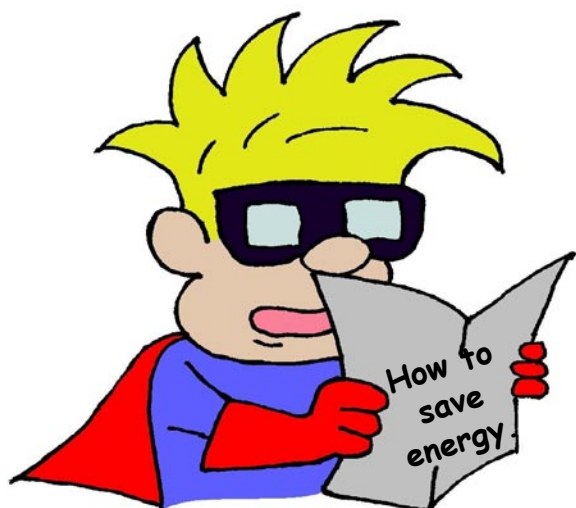
Letter  
box  
brush

## Design a leaflet about saving energy

We waste energy in our homes and schools due to a number of things.

1. Being lazy or forgetting to turn things off.
2. Using things that are inefficient, like normal light bulbs.
3. Poor insulation and draughts.

You have to design a leaflet to encourage your family and friends to save energy.

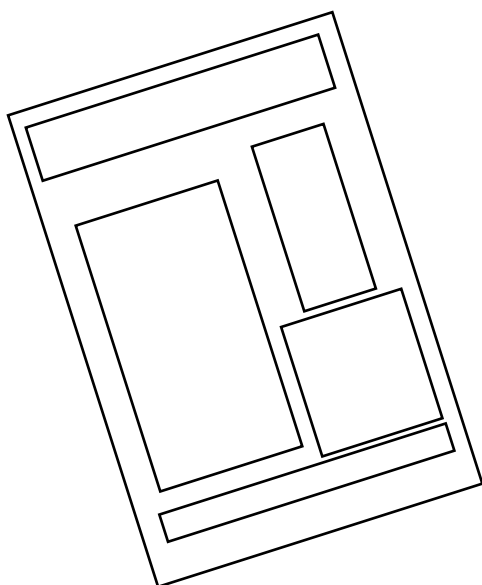


### What information should you include?

The most important information is why we need to save energy and how to do it. Include facts and figures, pictures, diagrams anything that will illustrate the important points of energy conservation and efficiency.

### What should the leaflet look like?

Decide what size it should be and use both sides of the paper. Lots of colour and pictures will make your leaflet more interesting to look at.



## Design and make a draught excluder

Draw your design out in the box below.

Think about its job, stopping draughts coming into rooms under doors.

Should it be light or heavy?

What material should you use to fill the draught excluder?

What are you going to use to make the draught excluder?



Test it out to see if it works!

# Insulation materials activity sheet



Materials have different qualities. Some are shiny, some are waterproof and some make good insulation. Insulation is good at keeping heat in, increasing the time it takes something to cool down.



Complete the table below, tick the box or boxes to show the properties of the materials.

Material	Shiny	Waterproof	Good insulation	Flexible	Strong
Aluminium foil					
Newspaper					
Plastic					
Polystyrene					
Cotton					
Wool					
Steel					
Rubber					

Some of these qualities are important for energy conservation materials used in our homes and in other buildings (these are materials that are used to insulate buildings).

1. Which qualities are important for insulation?

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2. Which of the materials tested could be used to reduce heat loss from a building? Explain your answer.

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# Insulation materials experiment

Experiment to test how well different materials keep water warm.

**Equipment-** warm water  
measuring jug  
thermometer  
stop watch or clock  
take away coffee cup  
bottom of a large plastic drinks bottle  
different materials



## Instructions

1. Split into groups of 2-3 people.
2. Each group should have a different type of material to use as insulation.
3. Complete the table by listing your insulating material.
4. Line the plastic bottle with at least 5cm of insulation.
5. Measure out 100 millilitres of warm water and **carefully** pour into the cup. Place the cup into the plastic bottle with the insulation.
6. Using a thermometer measure the temperature of the water. This is the starting temperature so record it in the table below.
7. Measure and record the temperature every 5 minutes for 15 minutes (3 measurements).
8. Compare your data with that from the other groups.

Material	Start Temp C	Temp 5 mins	Temp 10 mins	Temp 15 mins	Difference in temp.	Rank

## Energy detective at home

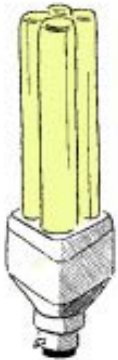
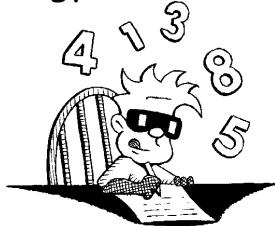
### LIGHTING CHECK

Look at all the different lights you have at home.

1. How many light bulbs do you have in your home?

2. How many are energy efficient light bulbs?

Now for some maths.

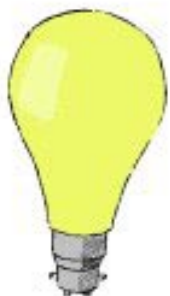


A 20 watt energy efficient light bulb costs £7.50. It can last for 8 years.

If the bulb was left on for 12 hours a day for one year, it would use £7.53 of electricity.

What is the total cost of this compact fluorescent bulb over the 8 years?

total cost=



To last the same time and give the same light, you would need 8 ordinary 100 watt bulbs. A total cost of £3.50.

If an ordinary bulb was left on for 12 hours a day for one year, it would use £37.67 of electricity.

What is the total cost of the 8 ordinary bulbs over the 8 years?

total cost=

Which bulb is more energy efficient? Explain your answer.

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## Energy detective at home



Lets check to see how warm our houses are.

Get hold of a thermometer and try these temperature experiments around your home.



a.	Day	Night
Outside		
Hall		
Kitchen		
Living room		
Bedroom		

b. Living room	Temperature
Near door	
Near window	
Middle of room	
Near fire/radiator	
Where you usually sit	

c. Different heights	Temperature
At floor level	
At eye level	
Near the ceiling	

## Energy detective at home



Using the information from part b. of your temperature experiments, draw a plan of your living room to show the different places you measured the temperature. At each place write what the actual temperature recorded was.



What did you learn from parts a. and c.?

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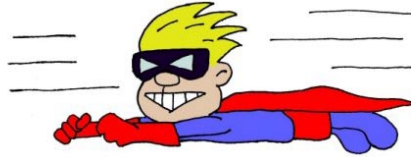
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## Energy detective at home

Which energy efficiency measures do you have at home?  
Tick them off in the table below.



Energy efficiency measure	Yes	No
Letter box draught excluder		
Door brush draught excluder		
Hot water tank jacket		
Hot water pipes lagged		
Thermostats on radiators		
Energy efficient light bulbs		
Double glazing		
Loft insulation		
Radiator foil		

What could be done in your home to make it more energy efficient?

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## School energy survey

Look around your school and fill in the table to discover how energy efficient your school is.

Give your school a score **0 for none**, **5 for some** and **10 for all**.

### Insulation



1. Do the windows have draught proofing?

2. Are the windows double glazed?

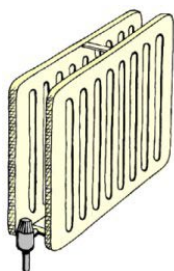
### Lighting



3. Are there any energy efficient light bulbs fitted?

4. Are the lights switched off in empty rooms?

### Heating



5. Are any of the radiators fitted with thermostats?

6. Do any of the radiators have foil sheets behind them?

### Electrical appliances



7. TVs, video, etc. switched off if not in use?

**Total**

The maximum score is 70. If your school scores over 50 you are doing well. If the score is lower, what could be done to make it more energy efficient.

## Energy detective at school

Now that you know something about how your school uses energy, what can you do to make it even more energy efficient?

Some of the main ones are:-

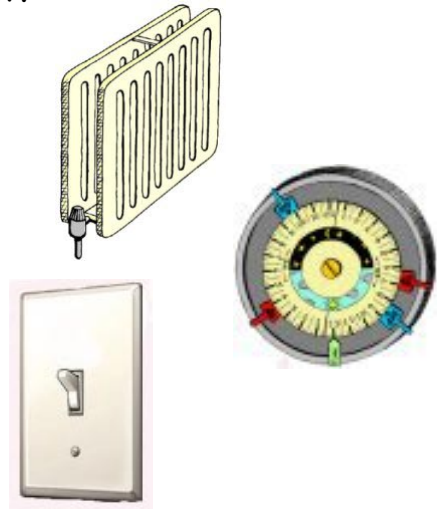
Use thermostats to control heating.

Use timer controls.

Get better, more efficient equipment.

Insulation and draught-proofing.

Switch off unnecessary lights.



Most of these can only be done by your Principal and teachers, but there are still lots of ways for you to help.

What about . . .



Designing energy efficiency posters, stickers, badges and slogans.

Having an energy efficiency essay competition.

Designing and keeping up to date an **Energy Performance Progress Chart**. This could be kept in the entrance hall of the school and have graphs showing fuel and electricity used and a record of inside temperatures.

Appointing everyone in turn as **Energy Monitor** to check doors and windows are closed in cold weather; lights are not left on and equipment is switched off after use.

You'll be able to think of loads of other ideas yourselves!

If you do decide to go ahead with the project, be sure to let us know. We would be very interested in how it turns out.

# Quiz sheet

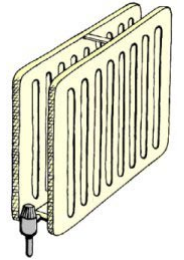
## MIX AND MATCH

Read these two lists and then match each way energy is lost in our homes with the right way to stop it.

To start you off, the first one is already done.

Gaps round doors and windows.

Adjust thermostat.



Warm air rising through the roof.

Draught-proofing.

Radiators are too warm.

Double glazing.



Heat escaping through window glass.

Timer switch

Immersion heater left on.

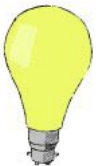
Loft insulation.



## TRUE OR FALSE

Read these sentences. They are either true or false. Cross out the false ones.

- (a) Dust on a light bulb has no effect on the amount of light it gives out.
- (b) Lighter coloured walls reflect light better than darker colours.
- (c) Energy efficient light bulbs last up to 8 times longer than ordinary bulbs.
- (d) Energy efficient bulbs use more electricity than ordinary bulbs.

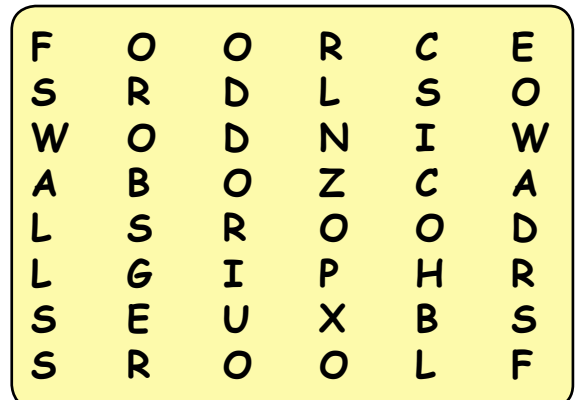


## WORDSQUARE

Hidden in the square are 5 ways that heat escapes from a house -

DOORS, WINDOW, ROOF, FLOOR and WALLS.

Some of them are written backwards!



## Did you know....?



Loft insulation can reduce your heating bill by 20%.

For every minute that a fridge door is open it takes three minutes for the fridge to regain the correct temperature.

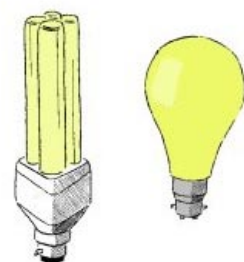
The UK wastes £6.5 billion worth of energy each year.

A shower uses 2/5 of the water needed for a bath.

If every household in the UK fitted a hot water jacket, we would save enough energy to heat over 60,000 households for one year.

New energy efficient fridges and freezers use up to 50% less energy than older models.

Energy efficient light bulbs last up to 8 times longer than ordinary light bulbs.



## Key words and definitions

<b>appliance</b>	a machine that helps us to do something e.g. a kettle.
<b>conservation of energy</b>	the practice of using less energy.
<b>efficiency</b>	producing something with very little waste.
<b>environment</b>	our surroundings.
<b>immersion</b>	the name given to an electric water heater that acts like a large kettle in the hot water tank.
<b>timer</b>	a clock that is linked to the boiler and switches it on at a certain time.
<b>thermostat</b>	a device that keeps the temperature the same all the time.

