Self Check 3·1

1. Here is a list of different types of energy.

Light energy	Chemical energy	Heat energy
Potential energy	Kinetic energy	Nuclear energy
Sound energy	Electrical energy	

Copy out and complete the following sentences.

(a) A toaster gives out .....energy.
(b) A lift gains .....energy as it goes up.
(c) Petrol has .....energy.
(d) A television uses .....energy.
(e) A car when it is moving has .....energy.
(f) An electric fire gives out two kinds of energy.

.....energy and .....energy.

(g) The sun gives out two kinds of energy.

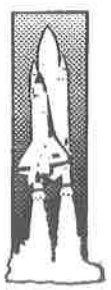
.....energy and .....energy.

2. Write down four things which:

(a) Use electrical energy.
(b) Produce heat energy.
(c) Have moving energy.

3. The unit of energy is the joule.

(a) What is the symbol for the joule?
(b) How many joules are there in 2.5 kilojoules?



Self Check 3·2

1. What energy changes occur when.

(a) Petrol burns.

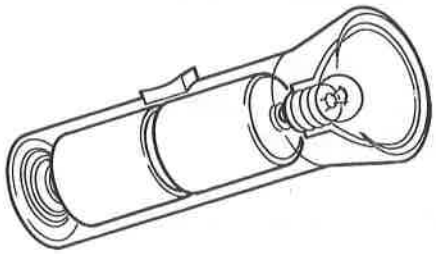
(b) A rubber band is being stretched.

(c) A brick is falling.

(d) A doorbell rings

(e) An electric motor is working

2. A torch contains batteries and a bulb



(a) What energy change occurs in the battery when the torch is working?

(b) What energy change occurs in the bulb when the torch is working?

3. Jack and Jill were sledging down the hill. Answer the questions below using the parts of the hill, top, middle, or bottom.

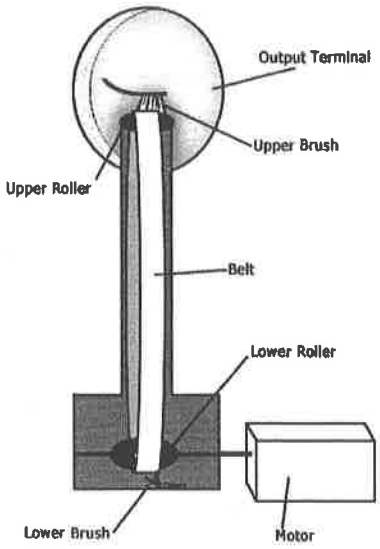
(a) Where did they have the greatest kinetic energy?

(b) Where did they have the most potential energy?

Self Check 3·3

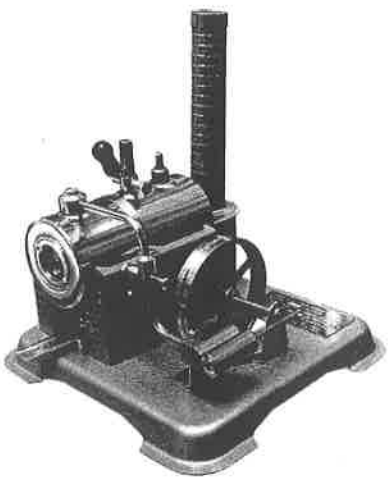
1. What form of energy is described as stored energy ?

2. The Van De Graaf generator stores energy.



(a) Where on the Van de Graaf generator is the energy stored ?
(b) What type of energy is stored ?
(c) In the base of the Van de Graaf generator there is an electric motor.
What energy change occurs in the electric motor ?

3. Your teacher showed you the model steam engine working.



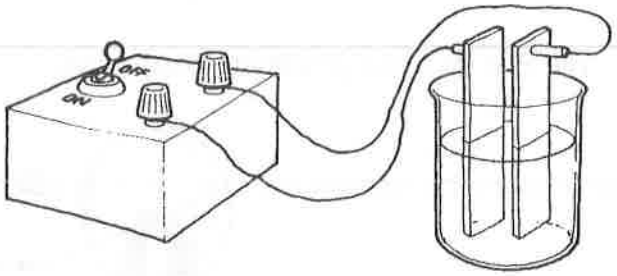
(a) What energy change occurred in the fuel when it was burned in the boiler ?

(b) In the boiler water turns to steam. This steam causes a wheel to turn. The wheel is connected to a dynamo.

What energy change occurs in the dynamo ?

Self Check 3·4

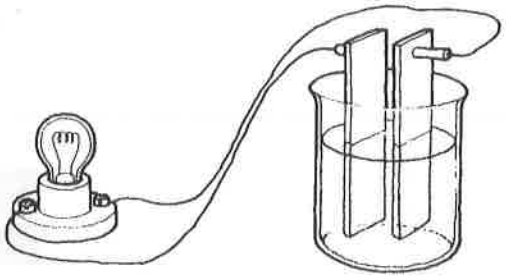
1. (a) A power pack is switched on and a battery is being charged. Write down the energy change which takes place.



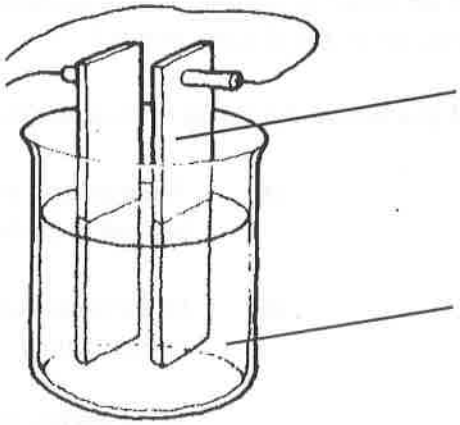
(b) The power pack is removed and a bulb connected in its place.
Two energy changes happen.

(i) What energy change happens in the battery?

(ii) What energy change happens in the bulb?



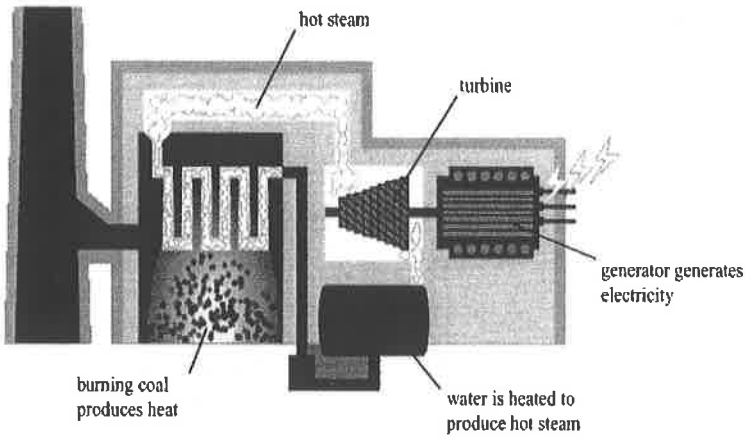
2. Copy and label the diagram of a lead acid battery below.



Self Check 3·5

1. Name **three** fossil fuels.

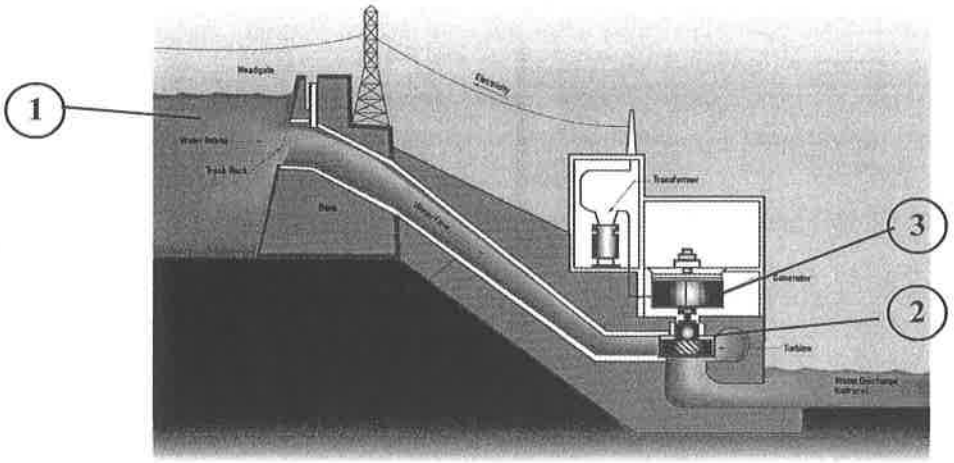
2. The diagram below shows a coal fired power station.



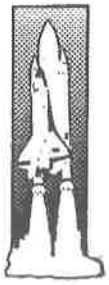
   (a) What energy change occurs when the coal burns?
   (b) What energy change occurs when the generator is working?
   (c) Why are alternatives to this method of generating electricity being developed?

3. Power companies are investing in the renewable sources of energy.
   Name **three** renewable sources.

4. The diagram represents a hydroelectric power station.

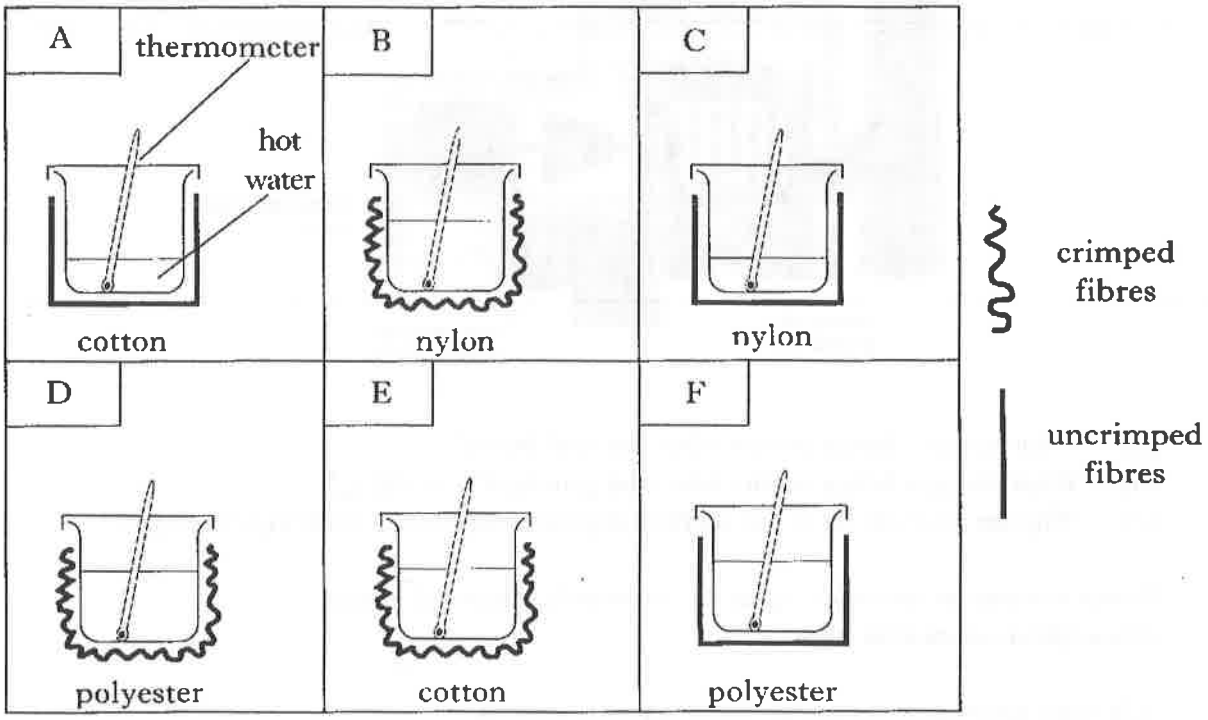


   (a) At stage 1 the water is stored behind the dam. Name this form of energy.
   (b) What form of energy does the water have as it flows down the slope ?
   (c) Stage 3 is the generator, what energy change happens here?
   (d) What is stage 2?



Self Check 3·6

1. Sandra was investigating the insulating properties of materials. She set up six covered beakers of hot water as shown.



(a) Sandra thinks that polyester is a better insulator than nylon. Which two beakers should she compare to find out if this is true?

(b) Sandra wants to find out if crimped fibres are better insulators than uncrimped fibres.
Which two beakers should she compare to find out if this is true?

(c) What would Sandra be investigating if she compared beakers A and C?

2. Which of these is the best conductor of heat?

A air
B iron
C water
D copper

3. Which of these is a bad conductor of heat?

A air
B iron
C aluminium
D copper

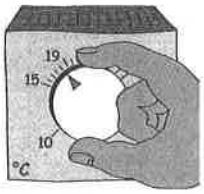
Self Check 3·7

1. What is energy conservation ?

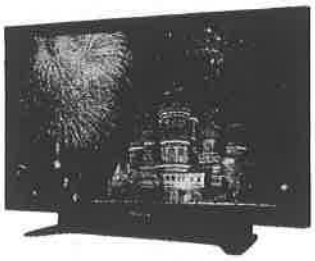
2. Explain why energy waste can be reduced by :-

(a) having showers instead of baths

(b) using the thermostat on heating systems



(c) turning off appliances after use



(d) fitting double glazing.

3. The diagram below shows the areas through which heat is lost from the home.
Give one way heat loss may be reduced from each of the following areas of the house:

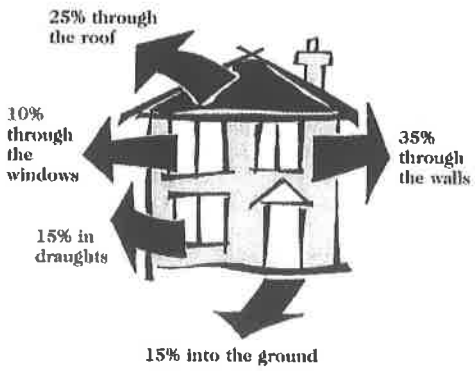
(a) roof

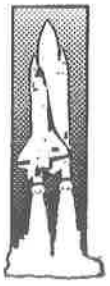
(b) windows

(c) floor

(d) walls

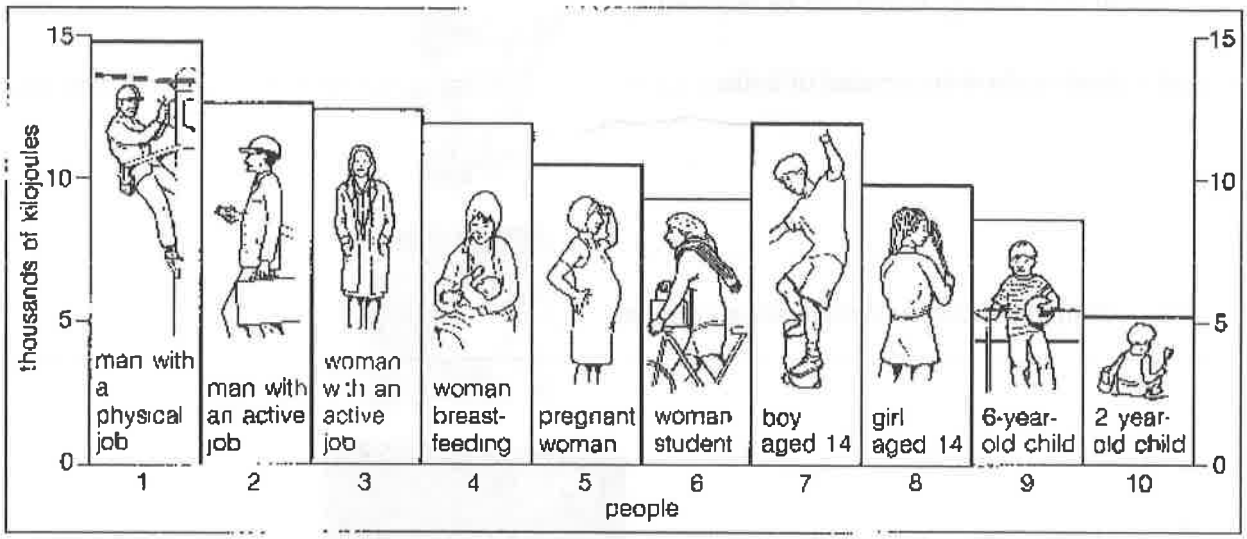
(e) doors





Self Check 3·8

1. Some people need more energy than others. The unit of energy is the joule (J).
The amount of energy we need in a day is measured in thousands of joules.
One thousand joules is one kilojoule (kJ).
The bar chart below gives some facts on how much energy people need per day.



Use the bar chart to help answer these questions.

(a) How many kilojoules does a 2-year old child need
(i) in a day? (ii) in a week?

(b) How much energy does a mum-to-be need
(i) before the baby is born? (ii) after the baby is born?

2. One gram samples of different foods are burned and used to heat some water in a test tube. The results are given in the table below.

	Temperature of Water (°C)	
Food	Start	End
Crisps	20	25
Biscuit	22	30
Buttered bread	18	24
Nuts	24	31

(a) Calculate the change in temperature for each food sample.
(b) Draw a bar chart showing the change in temperature for each of the food samples.
(c) Which sample gives out the most energy?

Self Check 3·9

1. What is the energy change in a solar cell ?

2. What variables will affect the electricity produced by a solar cell ?

3. Explain why solar cells are normally placed on the roof of buildings.

4. What are the advantages and disadvantages of generating electricity using solar cells ?

PHYSICS

PHYSICS

Extra Work Self Check 3·1

1. Answer the following questions in sentences.

(a) At the top of a hill, what type of energy does a sledge have?
(b) What type of energy does the sledge have at the bottom of the hill?
(c) What type of energy do fuels, food and batteries contain?

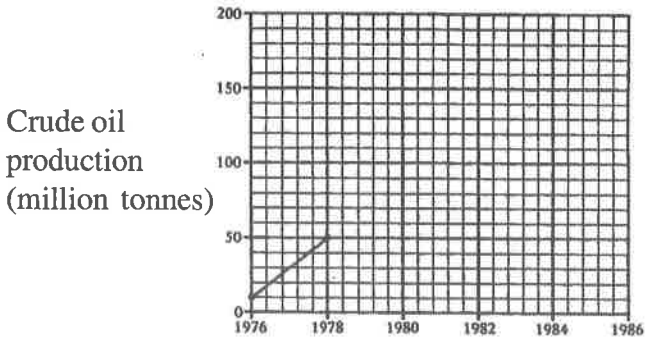
2. The unit of energy of energy is the joule. The symbol for Joules is J. Copy and complete the following table:

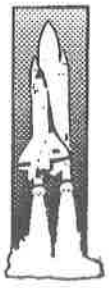
Joules (J)	**Kilojoules (kJ)**
4000	
	3.5
	0.5
100	
3750	
	5

3. The table gives information about crude oil production in Britain.

Year	Crude oil production (million tonnes)
1976	10
1978	50
1980	90
1982	110
1984	130
1986	140

Use the information on the table to copy and complete the **line graph**.





PHYSICS

Extra Work Self Check 3·2

1. What are the energy changes that take place when you:

(a) Strum a guitar.
(b) Slide down a chute.
(c) Strike a match.

2. What energy changes take place in:

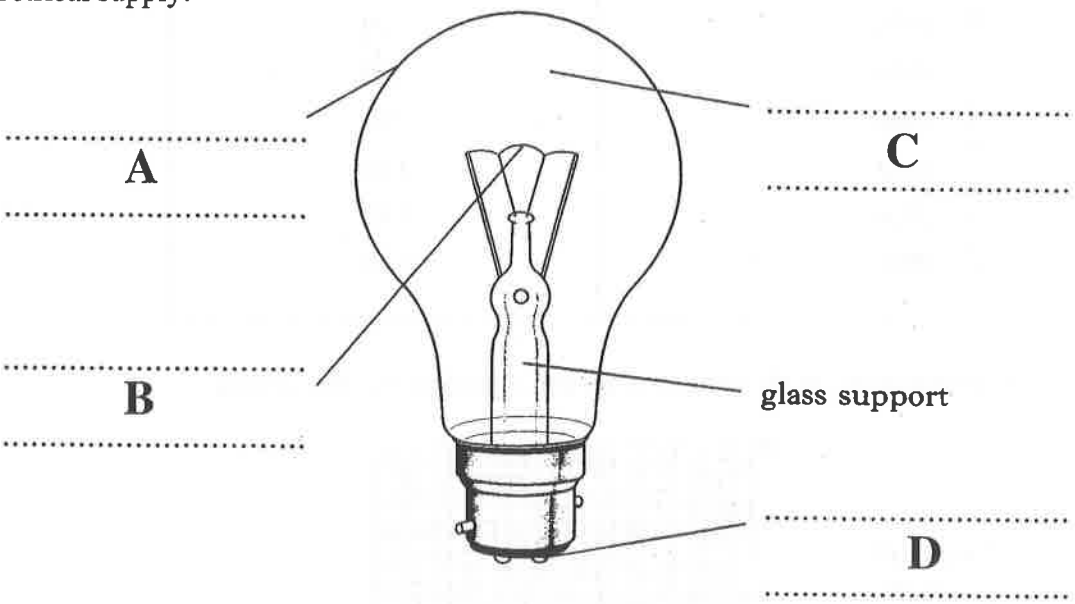
(a) A firework.
(b) An iPod.
(c) An electric car.

3. Name a device which changes:

(a) Sound energy into electrical energy.
(b) Electrical energy into kinetic energy.
(c) Electrical energy into heat energy.

4. Read the information below and work out what should be written at parts **A** to **D** in the diagram below.

Most electric light bulbs have a **tungsten filament.** This is a very thin wire held on a glass support. The wire glows white-hot when an electric current passes through it. A **glass bulb** protects the filament. The bulb also contains **argon gas**, which prevents the hot filament from burning out. When the bulb is placed in a lamp socket, the **metal contacts** at the base connect the filament to the electrical supply.



Extra Work Self Check 3·3

1. Use the information in the passage to answer the questions.

Space probes are spacecraft used to explore the solar system. They carry cameras and instruments which gather information about other planets and moons. The information is sent back to earth as radio signals.

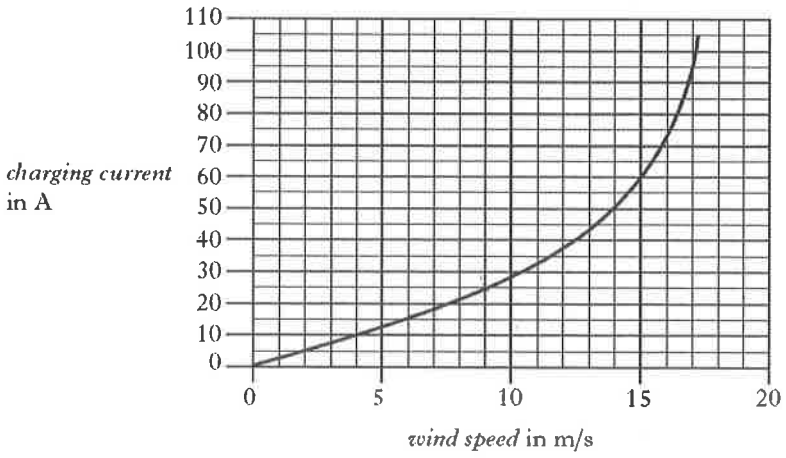
A space probe has a launch rocket to give it enough speed to escape from the earth. During the flight the probe is controlled by its own rocket motor. Probes which explore planets close to the sun use solar cells to provide electricity. For probes which travel to distant planets , where the sunlight is weaker, nuclear fuel is used to make electricity.

(a) How does a space probe send information back to earth?
(b) Why can probes which travel to distant planets **not** use solar cells?
(c) How does a probe sent to a distant planet get electricity?

2. Information about **hydroelectric dams**, the **number of generators** and the **power** in Megawatts (MW) generated is given below.
The Tucurui hydroelectric dam uses 18 generators to produce 7960 MW of power.
The 6 generators at the Ertan hydroelectric dam generate 3300 MW of power. 10 800 MW of power is produced by the 24 generators at the Grand Coulee hydroelectric dam. The Guri hydroelectric dam, which has 20 generators, produces 10 300 MW of power.

Present this information as a table with three suitable headings.

3. A wind generator is used to charge a battery. The charging current depends on the wind speed. The graph below shows the charging current at different wind speeds.



(a) What happens to the charging current as the wind speed increases ?
(b) What is the charging current at 15 m/s ?
(c) What is the wind speed when the charging current is 20 A ?

[Turn over]

PHYSICS

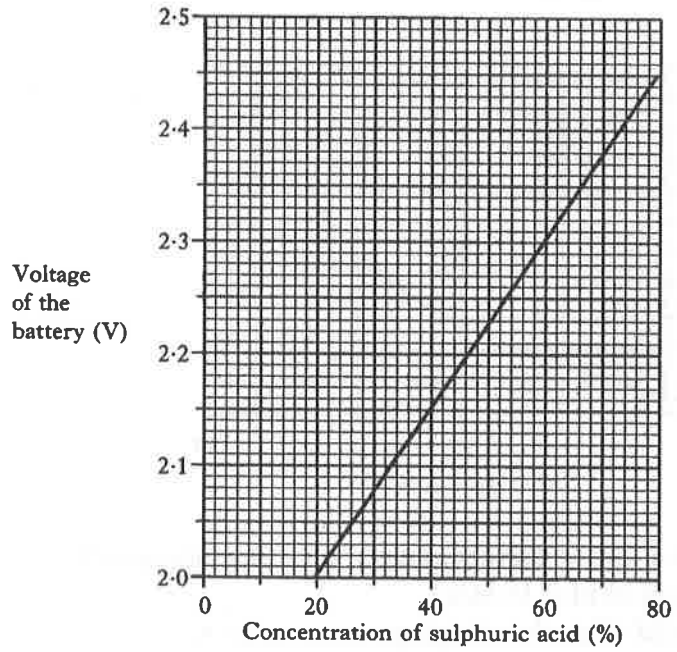
Extra Work Self Check 3·4

1. Read the following passage carefully and then answer the questions.

A battery is a device in which chemical energy is converted directly into electrical energy. Most batteries consist of two metals separated by a conducting solution, or paste, called an electrolyte. The first battery was made by Alessandro Volta in 1790. Volta's battery used the metals zinc and silver and the electrolyte was salt water.
A battery which cannot be recharged is called a primary battery. One of the first primary batteries was developed by John Daniell in 1836. The Daniell battery used the metals copper and zinc with an electrolyte of sulphuric acid. It had a long life as the copper metal was treated to prevent it becoming coated with other chemicals. A Daniell battery produced 1.06 volts.
Most modern day batteries have a thick paste of ammonium chloride or potassium hydroxide instead of a liquid electrolyte. They are called dry batteries because they have no liquid electrolyte. A zinc-carbon dry battery produces 1.5 volts.
A rechargeable battery is known as a secondary battery. The most commonly used secondary battery is the lead-acid battery. A lead plate forms the negative terminal and a lead plate coated in lead dioxide forms the positive terminal. The electrolyte is sulphuric acid. A lead-acid battery produces 2 volts.

(a) When did Alessandro Volta make the first battery?
(b) What is the voltage of a lead acid battery?
(c) What is the other name of a rechargeable battery?
(d) Which two batteries mentioned in the passage use sulphuric acid as the electrolyte?
(e) Which battery has a voltage of 1.5 volts?

2. A battery can be made from lead and sulphuric acid. The graph below shows the voltage produced by a battery with different concentrations of sulphuric acid.



(a) As the concentration of the acid increases what happens to the voltage of the battery?
(b) What is the voltage of a battery with a sulphuric acid concentration of 60%?
(c) What concentration of sulphuric acid would be needed to give a voltage of 2.2V?

Extra Work Self Check 3·5

1. Read the following passage and use the information to answer the questions.

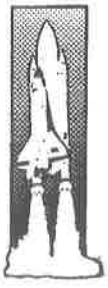
Biomass fuel is the name given to renewable fuels obtained from living things. The most commonly used biomass fuel is wood. In many parts of the world, wood is the main fuel used for domestic heating and cooking.
Charcoal and wood-alcohol are biomass fuels made from wood. Charcoal can be used in solid fuel heaters, while wood-alcohol is used as a liquid fuel. Charcoal is produced by heating wood in the absence of air. This process is called destructive distillation. The process also produces a mixture of gases which can be condensed to form an oily liquid. Wood-alcohol is obtained from this liquid.
Sugar cane can be used to produce another liquid biomass fuel called ethanol. Sugar, which is extracted from sugar cane plants, is converted to ethanol by the process of fermentation. Ethanol can be burned to produce heat energy or used in a fuel cell to produce electrical energy.

(a) What is the most commonly used biomass fuel?
(b) Describe how charcoal is produced.
(c) What happens during the process of fermentation?
(d) Name **two** liquid biomass fuels.

2. Use the information in the passage to answer the questions.

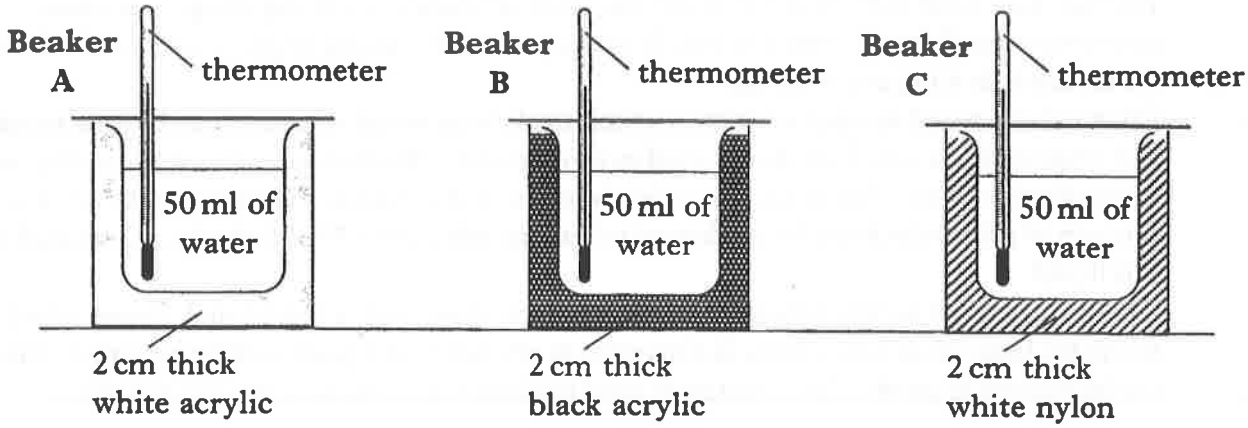
Traditional windmills use the power of the wind to turn mill stones and drive water pumps. Modern wind turbines also use the power of the wind. However, a modern wind turbine turns a generator which produces electricity.
The electricity produced by wind turbines goes into the National Grid. The National Grid then carries the electricity to homes and industries throughout Britain.
A 600 kW wind turbine can supply the electricity needed for 400 households. Although wind speeds are always changing, there is usually enough wind to operate the turbine for 70% of the time. A wind turbine is designed to last for about 20 years. However, moving parts such as blades and gearboxes must be regularly maintained to prevent the wind turbine from breaking down.

(a) What were traditional windmills used for?
(b) What happens to the electricity after it goes into the National Grid?
(c) How many households can a 600 kW wind turbine supply?
(d) Name **two** parts of a wind turbine that must be regularly maintained



Extra Work Self Check 3·6

1. The following investigation was carried out to find the best type of clothing material to keep a person warm.



The results are shown in the table.

Beaker	*Temperature of water* (°C)	
	at start	*after 10 minutes*
A	80	71
B	80	68
C	80	66

(a) Which material is best at keeping in heat, acrylic or nylon?
(b) Which material loses heat fastest, white acrylic or black acrylic?
(c) The experiment was repeated using a 2 cm layer of black nylon.
Predict the temperature of the water after 10 minutes.

2. Adam investigated how quickly a mug of coffee cooled .
His results are shown below.

Time (minutes)	0	5	10	15	20	25
Temperature (°C)	90	54	32	20	18	18

Draw a **line** graph to show his results.

Extra Work Self Check 3·7

1. Use the information in the passage to answer the questions.

Loft insulation is an effective way of keeping houses warmer and reducing heating costs. Up to 20% of heating costs can be saved by installing effective loft insulation. The three main types of loft insulation are blown insulation, blanket insulation and loose-fill insulation. Blanket and loose-fill insulation can be easily installed, but blown insulation must be installed by a specialist contractor.

Most houses have blanket insulation. Blanket insulation can be made from mineral fibre or rock fibre and is supplied in rolls. Mineral fibre and rock fibre are non-flammable but must be treated to protect them from rot, vermin and dampness. When installing blanket insulation, protective clothing including gloves and a face mask must be worn to prevent fibres damaging skin and lungs. Loose-fill insulation can be made from cork granules, vermiculite or cellulose fibre. This type of insulation is not advised for use in a draughty loft because the material can blow about.

(*a*) By how much can heating costs be reduced by installing effective loft insulation?

(*b*) Which type of insulation must be installed by a specialist contractor?

(*c*) Why must protective clothing be worn when installing blanket insulation?

(e) Why should loose-fill insulation **not** be used in a draughty loft?

2. The table below shows the percentage of heat lost from different parts of a house

Part of house	*Percentage of heat lost (%)*
Roof	25
Walls and Floor	45
Windows	20
Door	10

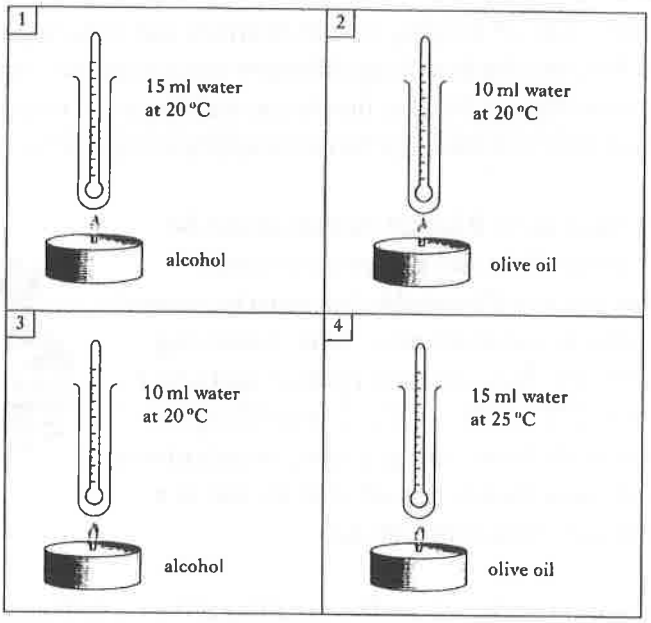
(*a*) Present the information in the table as a **bar graph**.

(*b*) In one second, the heat lost from a house is 10 000 Joules. How many joules of this heat is lost through the roof ?

(c) If you were the owner of this house and you could afford to buy double glazing for your windows or insulation for your loft (but not both), which would you choose ? Explain your answer.

Extra Work Self Check 3·8

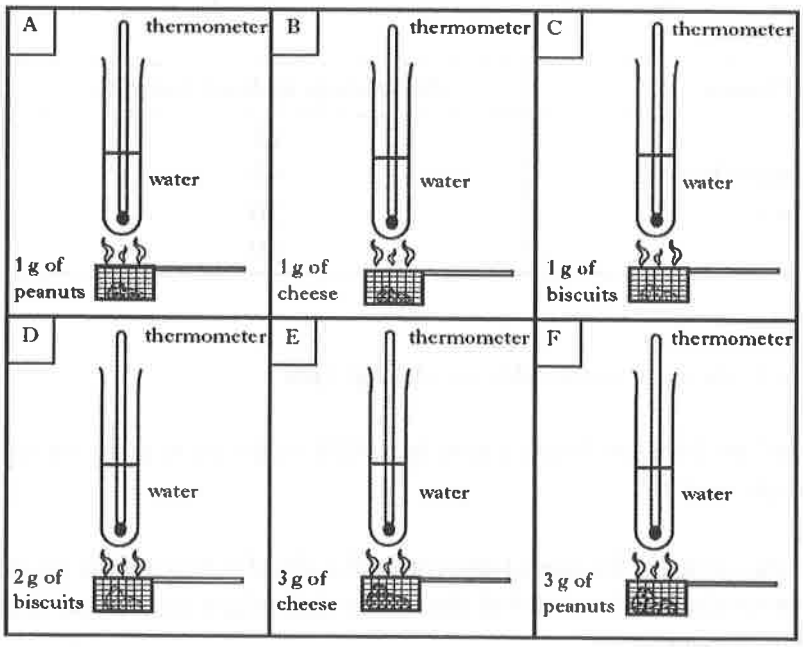
1. Craig investigated how quickly water could be boiled using liquid fuels. He carried out the experiments shown below.



(a) Craig wanted to find out whether alcohol or olive oil would boil the water faster. Which **two** boxes should he choose for a fair test?

(b) Craig compared the experiments in boxes 1 and 3. What was he trying to find out?

2 Sajeed investigated the energy content of foods. He set up six experiments. In each experiment he measured the rise in temperature of the water.

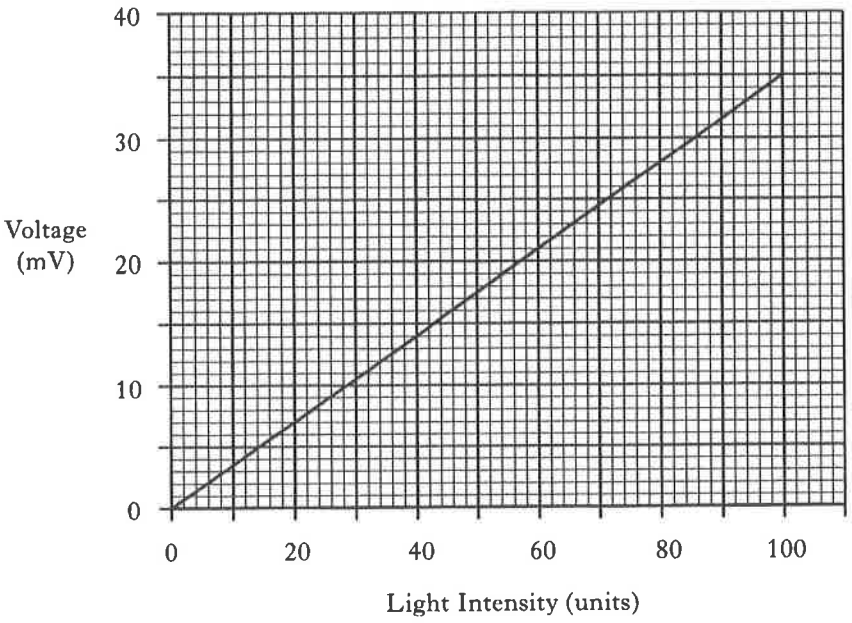


(a) Which **two** experiments should Sajeed compare to find out whether peanuts or biscuits have more energy?

(b) Sajeed compared experiments B and E. What was he trying to find out?

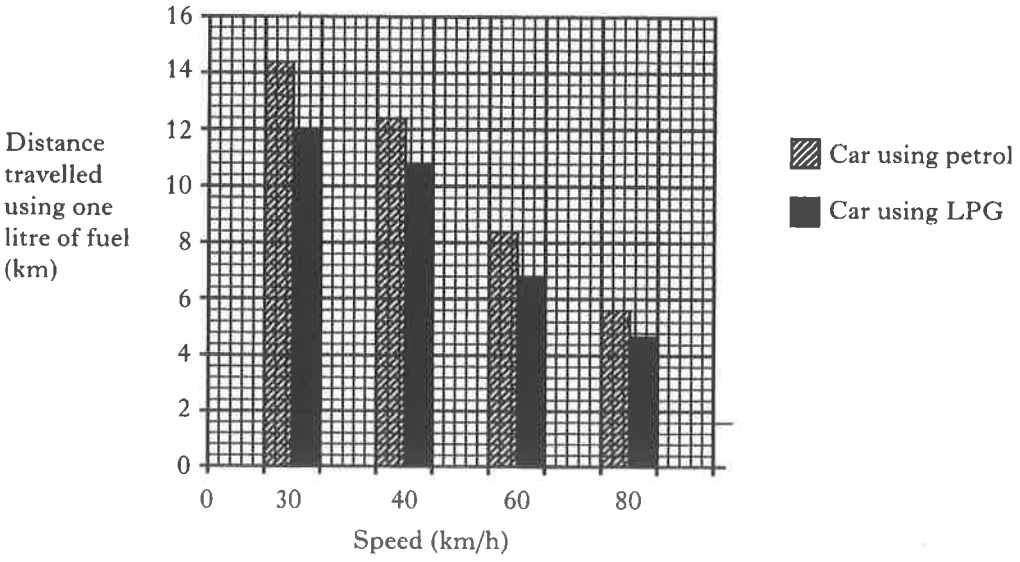
Extra Work Self Check 3·9

1. A pupil measured the voltage produced by a solar cell at different light intensities. The results are shown below.



(a) As the light intensity increases what happens to the voltage?
(b) What is the voltage produced when the light intensity is 80 units?
(c) What light intensity gives a voltage of 14mV?

2. The distance a car travels using one litre of fuel (its fuel efficiency) depends on the speed and type of fuel used.
The bar chart shows the results for two cars using petrol and liquified petroleum gas (LPG) as fuels at different speeds.



(a) What happens to the fuel efficiency as the speed increases?
(b) Which fuel is more efficient?
(c) How far will an LPG car travel using one litre of fuel at a speed of 30 km/h?