

Escuela Técnica N° 29

"Reconquista de Buenos Aires"




INGLES

Vocabulario técnico

4° 2° T.T. Eléctrica

4° 3° T.N. Electricidad

Listening 5  03 Play this game. Listen. Only follow the instructions if the speaker says *Please*.

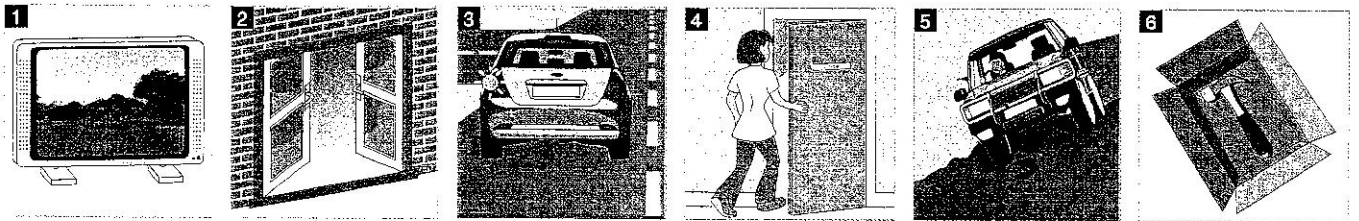
Vocabulary 6 Match the opposites.

pick up raise read say stand start

listen lower put down sit stop write

Example: stand ≠ sit

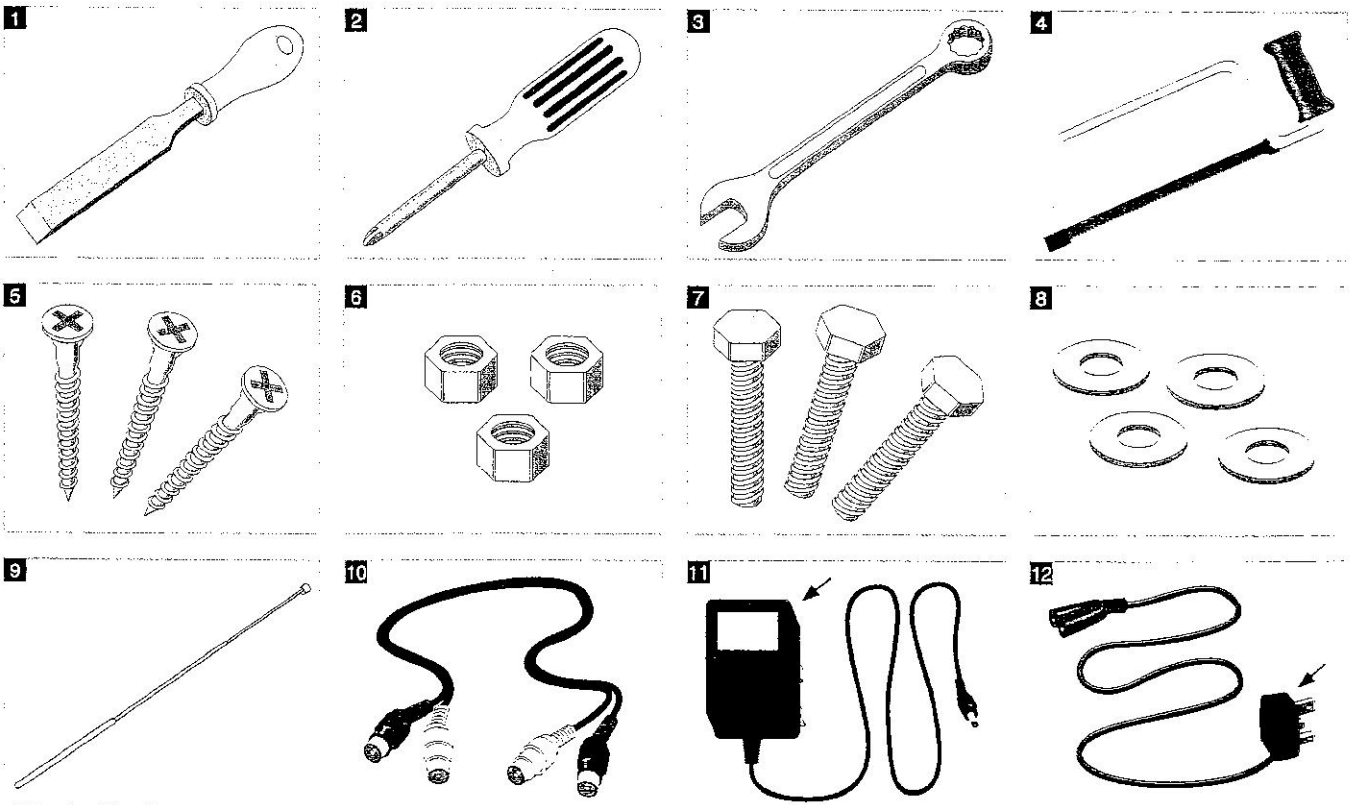
7 Try this quiz. Choose the correct answer.



- | | | | |
|-----------------|----------------|----------------|-------------------|
| 1 The TV is | a) on. | b) off. | |
| 2 The doors are | a) closed. | b) open. | |
| 3 Turn | a) left. | b) right. | |
| 4 Go | a) in. | b) out. | |
| 5 Drive | a) up. | b) down. | |
| 6 The hammer is | a) in the box. | b) on the box. | c) under the box. |

8 Match the pictures with the words in the box.

adapter antenna bolts cable chisel nuts plug
saw screws screwdriver spanner washers



Reading 5 Read this instruction manual and check your answers to 4.

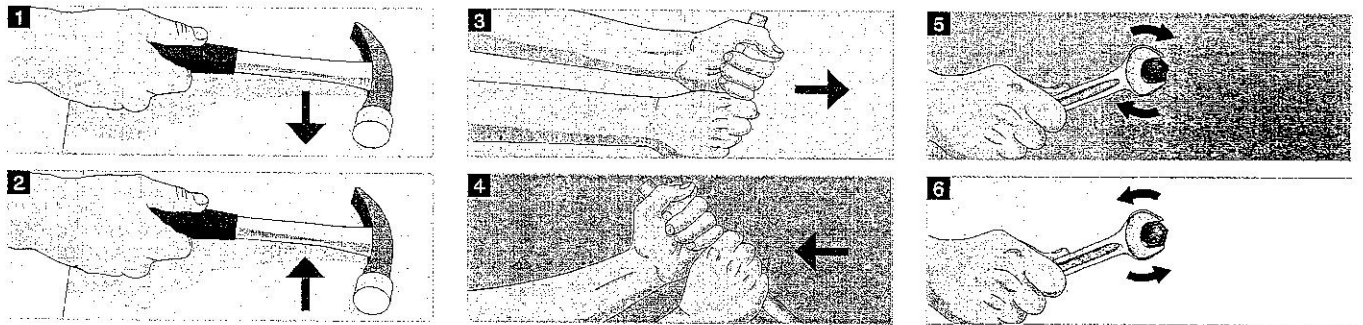
Language 6 Complete the table. Use the sentences from 5. Leave some spaces blank.

| Verb (action) | Object (thing) | Location (place) |
|---------------|----------------|--------------------|
| 1 Put | the plate | on the four bolts. |
| 2 Put | | |
| 3 | the nuts. | |
| 4 Put | | |
| 5 Put | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |

Vocabulary 7 17 Listen and repeat.

loosen ... pull ... push ... put ... take ... tighten

8 Complete the instructions. Use the words from 7.



1 _____ the hammer on the table.

2 _____ the hammer off the table.

3 _____ the lever.

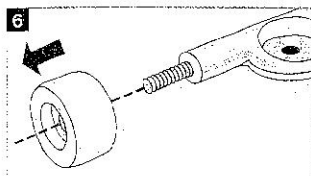
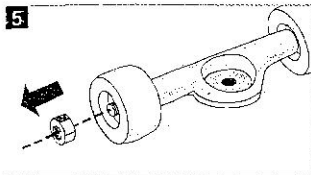
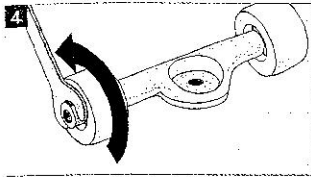
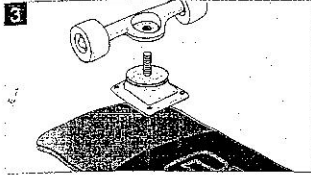
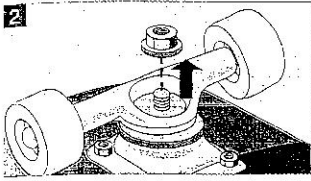
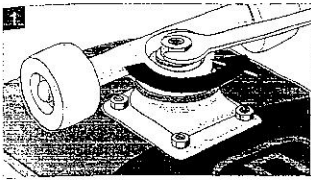
4 _____ the lever.

5 _____ the nut.

6 _____ the nut.

9 Complete the table.

| Verb | Opposite |
|----------|-----------|
| put (on) | (1) (off) |
| tighten | (2) |
| push | (3) |



17 Complete the instructions for these pictures. Use **SOME** of the words in the box.

loosen off on put take tighten use

How to take the truck off the skateboard

Step 1: (a) _____ the large nut. (b) _____ the large spanner.

Step 2: (c) _____ the large nut (d) _____ the bolt.

Step 3: (e) _____ the truck (f) _____ the bolts.

How to take the wheels off the truck

Step 4: (g) _____ the small nuts. (h) _____ the small spanner.

Step 5: (i) _____ the small nuts (j) _____ the axle.

Step 6: (k) _____ the wheels (l) _____ the axle.

18 Put the words in the instructions in the correct order.

1 screws the tighten

Tighten the screws.

2 the large hammer use

3 take off the car the old wheel

4 the new wheel put on the car

5 into the wood hammer the nails

6 through the holes the bolts push

Project 19 Find the meaning of the words *plate*, *truck* and *axle* for different technical fields, and write the results in a table.

| Search results for <i>deck</i> | Technical field |
|---|---------------------------|
| a floor or level of a ship | marine engineering |
| a floor or level of a bus or other vehicle | transport engineering |
| an outdoor floor attached to a building | building and construction |
| the road surface of a bridge | civil engineering |
| cement or tile area around a swimming pool | building and construction |
| flat surface of a skateboard | sports technology |
| flight deck – surface on an aircraft carrier | aerospace |
| component of music system – e.g. turntable, cassette deck | electronics |
| computer games console | T. entertainment industry |

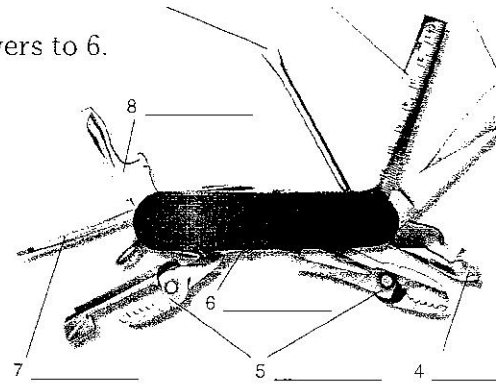
Reading 6 Complete the labels for this tool.

7 Read this product review and check your answers to 6.

1 screwdriver 2 _____ 3 _____

Product review: **Survival Tool**

This tool has a ruler, a screwdriver, a pick and a blade. It also has two openers. One opens cans. The other opens bottles. It has two wrenches. It doesn't have a saw. And it doesn't have a hammer, because the tool is too small. It has a plastic cover. The cover comes in three colours: black, blue or red.



Speaking 8 Ask and answer questions about the Survival Tool and the Multi Tool. Use the words in the box.

blade can opener cover hammer pair / pliers pair / scissors ruler wrenches

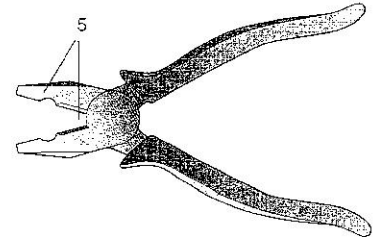
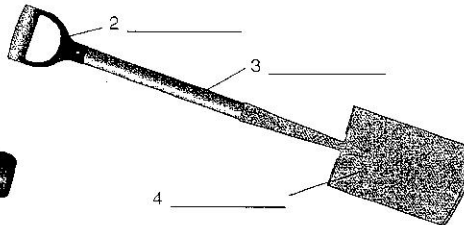
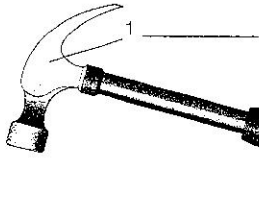
BrE *spanner*; AmE *wrench*

A: Does the Survival Tool/Multi Tool have ... ?

B: Yes, it does. / No, it doesn't.

Vocabulary 9 Match the parts to the words.

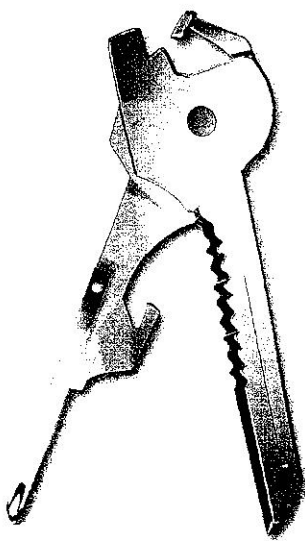
handle, shaft, head, blade, jaws



10 Draw some tools that you use in your work. Label some parts with words from 9. Then make sentences.

This is a ... It has a handle, a head and two jaws.

Speaking 11 Compare these three products.



| Product comparison | | | |
|--------------------|---------------|------------|----------|
| | Survival Tool | Multi Tool | Key Tool |
| knife blade | • | • | • |
| saw | | • | • |
| screwdriver | • | | • |
| bottle opener | • | • | • |
| can opener | • | • | |
| ruler | • | | |
| pick | • | | |
| wrench | • | | |
| hammer | | • | |
| pliers | | • | • |

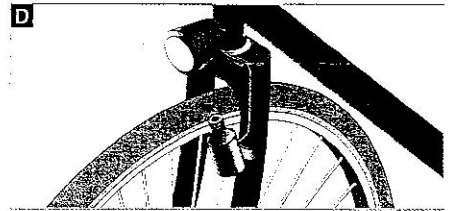
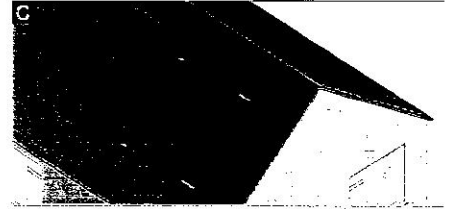
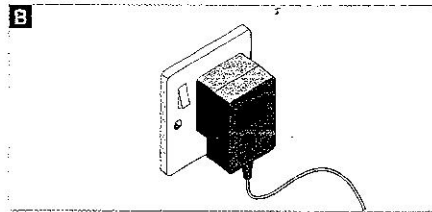
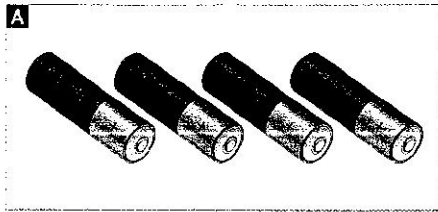
1 The Key Tool has a screwdriver, but it doesn't have a wrench.

2 The Survival Tool has a ruler, but the Multi Tool doesn't.

Writing 12 Write a short comparison of the three products in 11.

2 Functions

Start here 1 Match the words with the pictures.



Electrical power sources

- 1 mains electricity + AC adapter
- 2 solar power
- 3 dynamo
- 4 batteries

Reading 2 Label the photos of the emergency radio below with the words in the box.

alarm antenna clock compass handle thermometer torch

3 24 Listen and repeat.

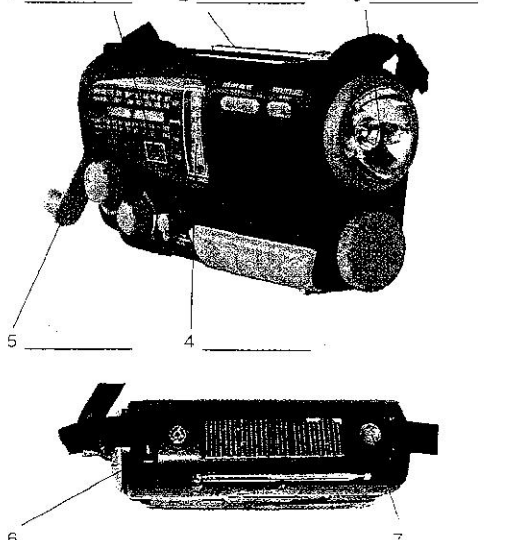
handle ... thermometer ... torch ... alarm ... clock ... compass ... antenna

4 Read the description and check your labels.

internal = external

Dynamo Solar Radio

1 clock
2 _____
3 _____



Key features: This equipment has

- a radio
- a thermometer
- a compass
- a torch
- a clock
- an alarm

Power sources

It uses electricity from four sources of power:

- an AC adapter. This connects the mains electricity supply to the radio.
- 3 external AA batteries.
- a solar panel. This changes the Sun's energy into electricity and charges an internal battery.
- a dynamo generator. The handle turns the dynamo. The dynamo produces electricity and charges the internal battery.


6 _____

7 _____

5 Explain the function of these parts.

- | | |
|------------------|-------------------|
| 1 the AC adapter | 3 the dynamo |
| 2 the handle | 4 the solar panel |

3 Locations

Start here 1  25 Listen to this computer lesson. Complete the dialogue with the words in the box.

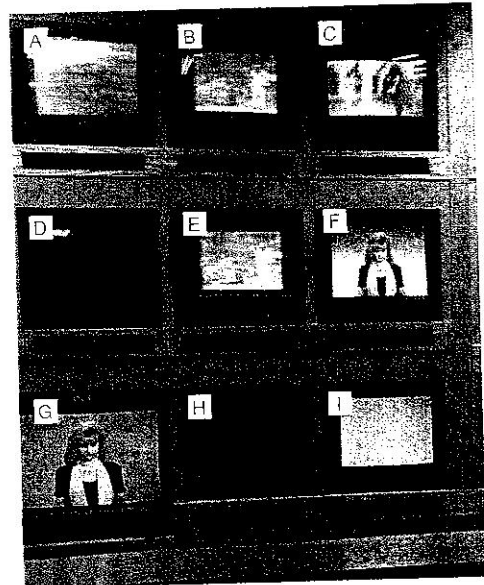
at bottom on left right top

- OK, now put the cursor on the START button.
- Where's the START button?
- It's _____ the _____. On the _____. Do you see it?
- Yes. Is that it?
- Yes, that's correct. ... Now, move the cursor up to the CLOSE button.
- Where's that?
- It's an X. It's _____ the _____. At the _____.
- Is that it?
- Yes, that's it. Now click.

Vocabulary 2 Match the TV monitors with their locations.

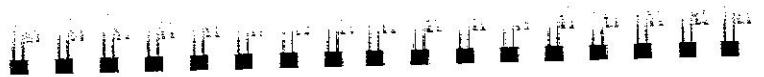
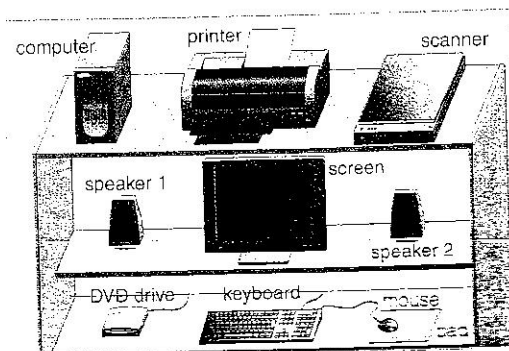
middle = centre
BrE centre, AmE center

- 1 bottom left ____
- 2 bottom right ____
- 3 centre bottom ____
- 4 centre left ____
- 5 centre right ____
- 6 centre top ____
- 7 top left ____
- 8 top right ____
- 9 centre ____



Language in in the middle, in the centre
at at the top, at the bottom
on on the left, on the right

Reading 3 Correct this description. There are six mistakes in location.



Here is one way to set up your computer station. Put your screen in the centre of the system. Then put one speaker in the centre on the left, and put the other speaker in the centre on the right. Put the scanner at the top on the left, and put the computer at the top on the right. Then put the DVD drive at the top in the middle and put the printer at the bottom on the left. Finally, put the keyboard at the bottom on the right, and put the mouse at the bottom in the centre.


2 Instructions

Start here **1** Try this quiz. Choose the correct answer.

km/h = kilometres per hour
(used by most countries)
mph = miles per hour (used
in some countries, including
the US and UK)
m/s = metres per second
rpm = revolutions per minute;
1 revolution = 1 rotation of
360°

What are the speeds?

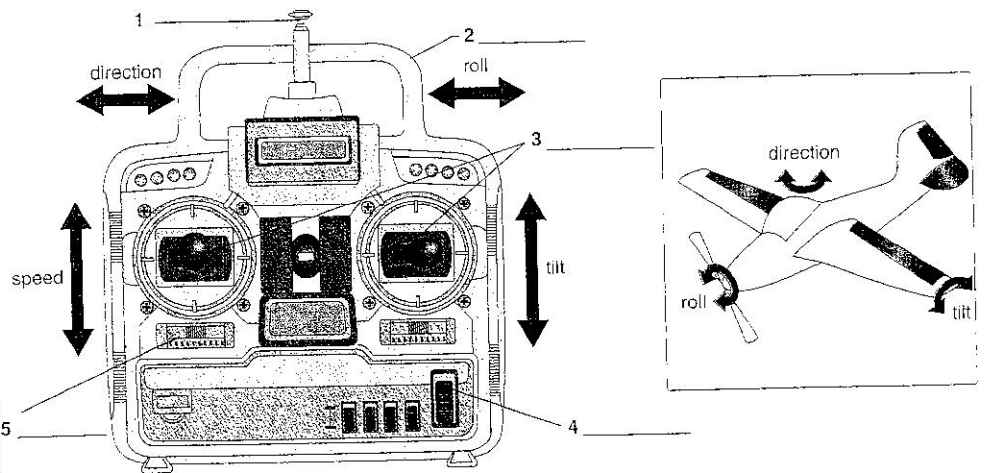
- 1 Rotation of a fast CD-ROM?
a) 98,000 rpm b) 9800 rpm
- 2 The speed of sound?
a) 746 km/h (464 mph) b) 1200 km/h (746 mph)
- 3 The maximum speed on land?
a) 1228 km/h (763 mph) b) 1228 mph (1976 km/h)
- 4 The maximum speed on water?
a) 154 m/s b) 154 mph c) 154 km/s
- 5 The rotation of the Earth?
a) 1000 mph (1609 km/h) b) 1000 km/h (621 mph)
- 6 The Earth moving around the Sun?
a) 67,000 mph (107,825 km/h) b) 67,000 km/h (41,631 mph)

Listening **2**  27 Listen and check your answers to 1.

3 Work in pairs. Write down some speeds. Dictate them to your partner.

Vocabulary **4** Label the diagram with the words in the box.

antenna handle joysticks slider switch



Task **5** Work in groups. What do you think the plane does when you move these controls?

Look at the joystick on the left.

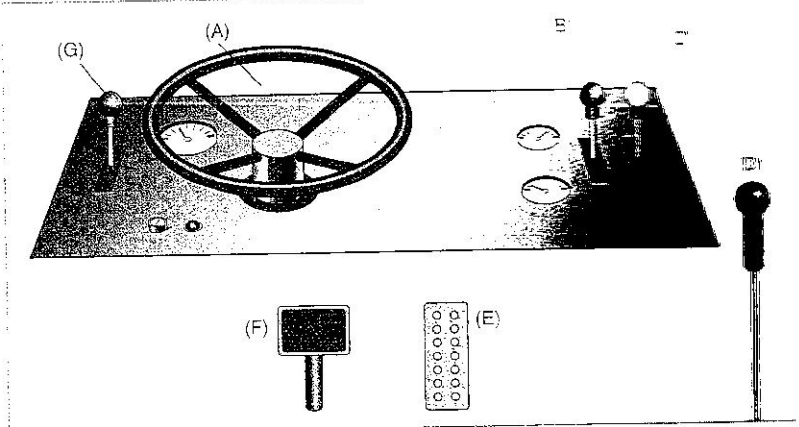
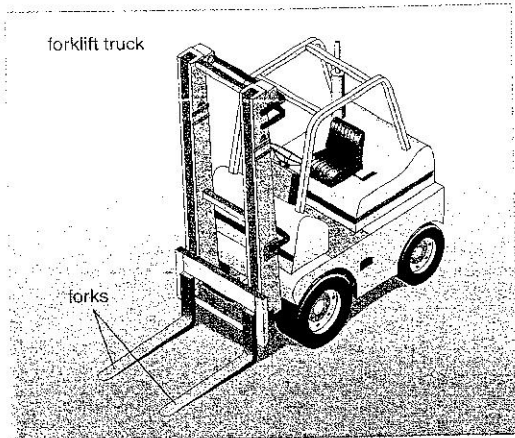
- 1 Push it up (away from you). Pull it down (towards you). What happens?
- 2 Push it to the left. Push it to the right. Now what happens?

Look at the joystick on the right.

- 3 Push it up. Pull it down. What happens?
- 4 Push it to the left. Push it to the right. Now what happens?

3 Actions

Start here 1 Look at the diagrams and answer the questions.



- 1 How many pedals does it have?
- 2 How many levers does it have?
- 3 Is the steering wheel on the left or on the right?

Reading 2 Read the manual. Write the letters (A–G) from the diagram next to the controls.

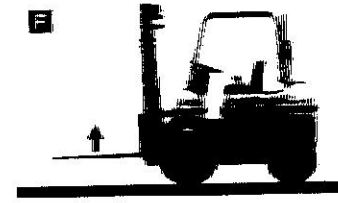
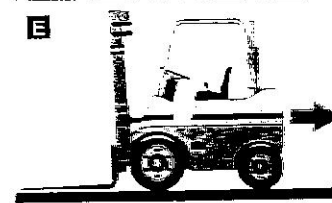
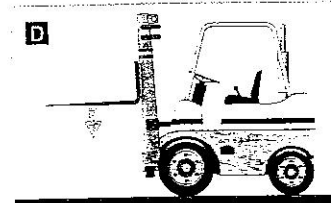
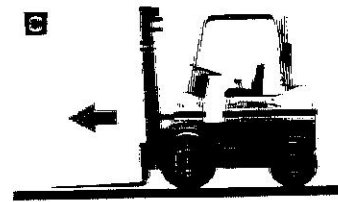
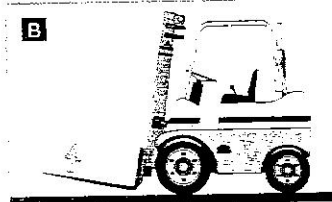
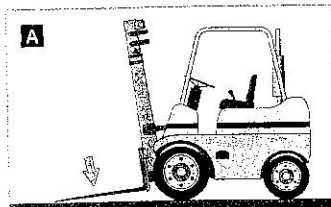
reverse = go backwards



In the diagram, you can see the controls of the forklift truck. On the left is a lever. This is the direction lever (1 _____). Push this lever forwards, and the truck moves forwards. Pull it backwards, and the truck reverses. Next you can see the steering wheel (2 _____). This turns the truck to the left and right. At the top, on the right, you can see two levers. Push the left-hand lever (3 _____) forwards, and the fork moves up. Pull it back, and the fork moves down. Push the right-hand lever (4 _____) forwards, and the fork tilts up. Pull it back, and the fork tilts down. At the bottom, on the right, you can see a lever. This is the parking brake (5 _____). At the bottom, you can see two pedals. The LH pedal is the brake (6 _____). The RH pedal is the accelerator (7 _____).

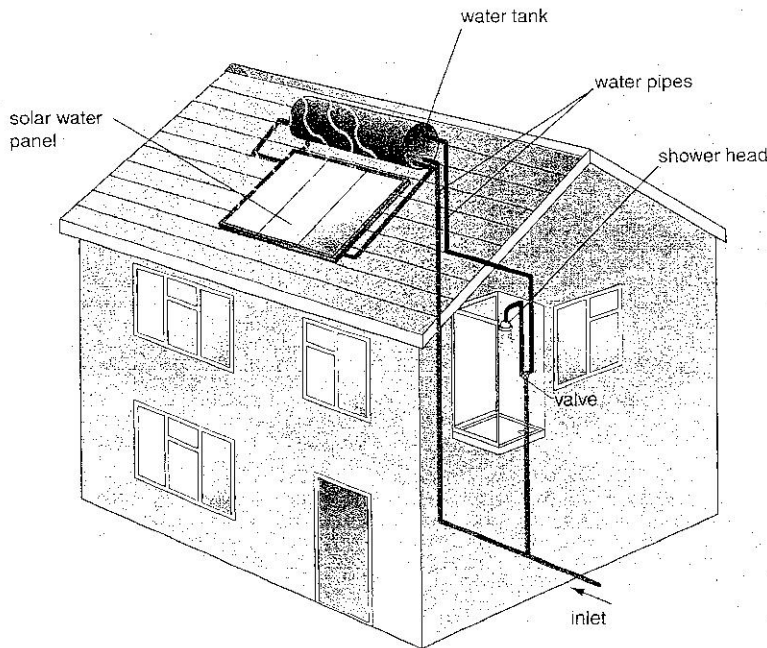
3 Describe these movements of the truck. Use words from the manual.

Example: A. The fork tilts down.



1 Heating system

Start here 1 Work in groups. Which way does the water flow in this system? Draw arrows to show the direction of the flow.



Solar water heater

The main parts of this system are water pipes, a solar water panel, a water tank, an inlet, a valve and a shower head. The tank is above the solar panel.

5 Cold water enters the system through the inlet. It then flows into the tank. From here, the water flows into the solar panel.

The Sun heats the water in the panel. 10 The hot water rises and flows from the panel into the tank. In the tank, hot water stays at the top and cold water sinks to the bottom.

When you open the valve, hot water 15 flows from the tank, through the valve, to the shower head. Here, it finally leaves the system.

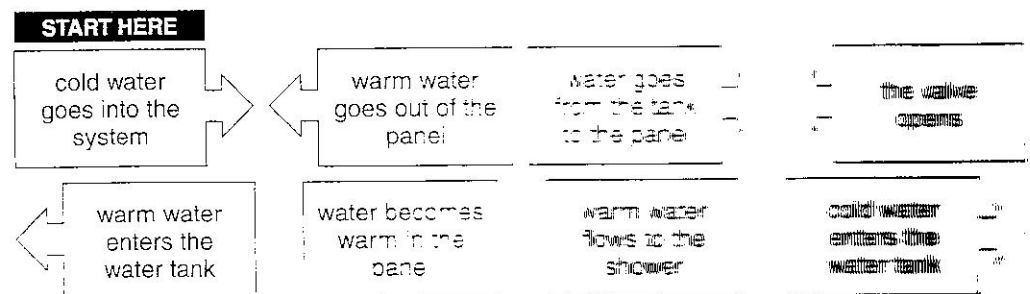
Reading 2 Read the text. Check the directions of your arrows in 1.

3 What do these words refer to?

- | | | | |
|------------------|----------------|---------------|----------------|
| 1 It (line 6) | a) inlet | b) cold water | c) system |
| 2 here (line 7) | a) tank | b) inlet | c) water |
| 3 Here (line 16) | a) tank | b) valve | c) shower head |
| 4 it (line 16) | a) shower head | b) valve | c) hot water |

Example: 1 Cold water enters the system through the inlet. It then ... In line 6, it refers to cold water.

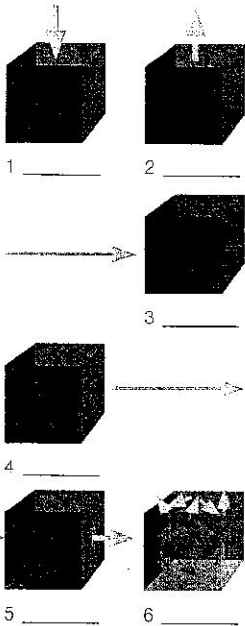
4 Draw the flow chart, putting these boxes into the correct order.



Language

| | | | |
|--------------|------|-----|-------------------------|
| The water | flow | -s | into the tank. |
| | move | | out of the tank. |
| | go | -es | through the pipes. |
| | pass | | around the solar panel. |
| The electron | flow | | to the outlet. |
| | go | | from the inlet. |
| | flow | -s | around the circuit. |
| | go | | through the cables. |

Vocabulary



5 Label the diagrams 1-6 with the prepositions in the box.

around from into out of through to

6 Complete the table with the verbs in the box.

enter leave rise sink

| | | |
|----|------------|-----|
| go | up | (1) |
| | down | (2) |
| | in/into | (3) |
| | out/out of | (4) |

7 Complete the sentences with the correct form of verbs from the table in 6.

- 1 Water _____ the house through the inlet pipe.
- 2 Water _____ the solar panel through the outlet pipe.
- 3 When you heat the water in a tank, the hot water _____.
- 4 When you cool the air in a room, the cool air _____.

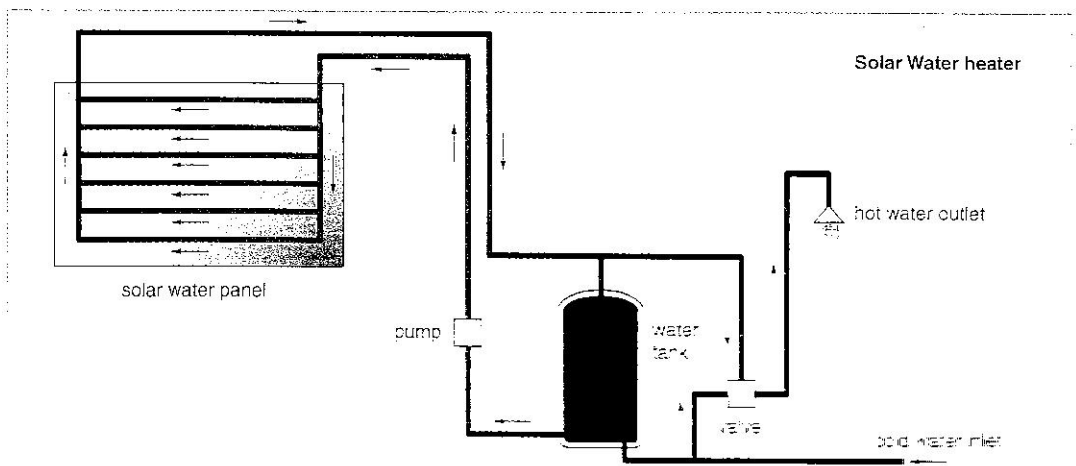
Task

8 Work in pairs. Explain your system to your partner.

Student A. Turn to page 65.

Student B:

- 1 Listen to Student A, and ask questions. Then draw a simple diagram of his/her system.
- 2 Explain your system to Student A.



Writing

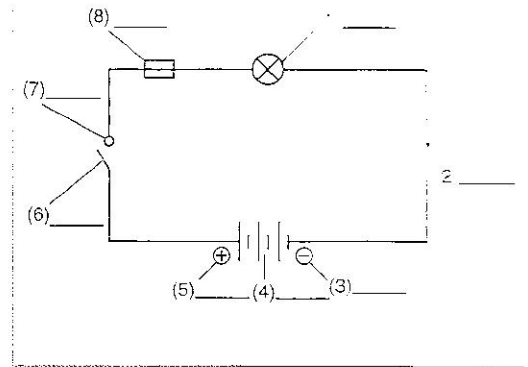
9 Write an explanation of your system.

2 Electrical circuit

- Start here** 1 Do you know these electrical symbols? Label the circuit diagram with the words in the box.

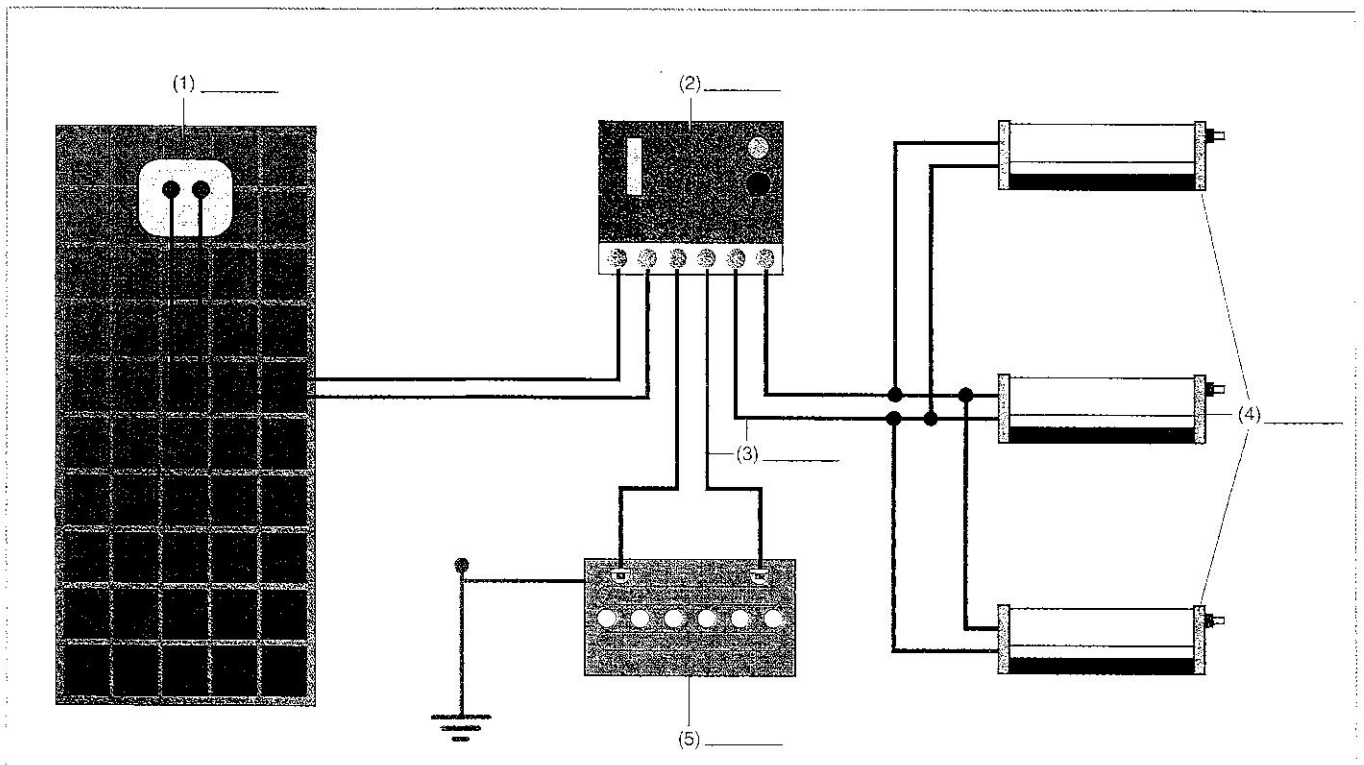
battery conductor fuse lamp
negative positive switch terminal

See the glossary of electrical symbols on page 59 for answers.



- Listening** 2 28 Listen and label the diagram with the words in the box.

battery cables controller lamps solar panel



- 3 29 Listen and match the items with their specifications.

- | | |
|----------------------|--------------|
| 1 solar panel | a) 12V 8W |
| 2 controller | b) DC |
| 3 battery | c) 5A |
| 4 lamps | d) 60W |
| 5 electrical current | e) 12V 100Ah |

- Task** 4 Work in pairs. Look again at the diagram in 2. Where does the current flow in these three situations? Draw arrows.

Situation 1: The Sun shines. The lamps are on.

Situation 2: The Sun shines. The lamps are off.

Situation 3: The Sun doesn't shine. The lamps are on.

convert = change

5 Read the manual for the solar panel and check your answers to 4.

How does the solar power system work? The panel converts the Sun's energy into a DC electric current. The current flows to the controller. Then it can flow from the controller to the lamps. Or it can flow from the controller into the battery. The battery stores the electricity. The current can flow from the battery into the lamps through the controller.

If the Sun shines, the DC current can flow from the panel, through the controller and into the lamps. If the Sun doesn't shine, the current can flow from the battery, through the controller and into the lamps. If the lamps are off, the current can flow from the panel, through the controller, and into the battery.

The controller controls the flow of the current. If the battery is full, the controller stops the flow from the panel into the battery. If the battery is empty, the controller stops the flow from the battery into the lamps.

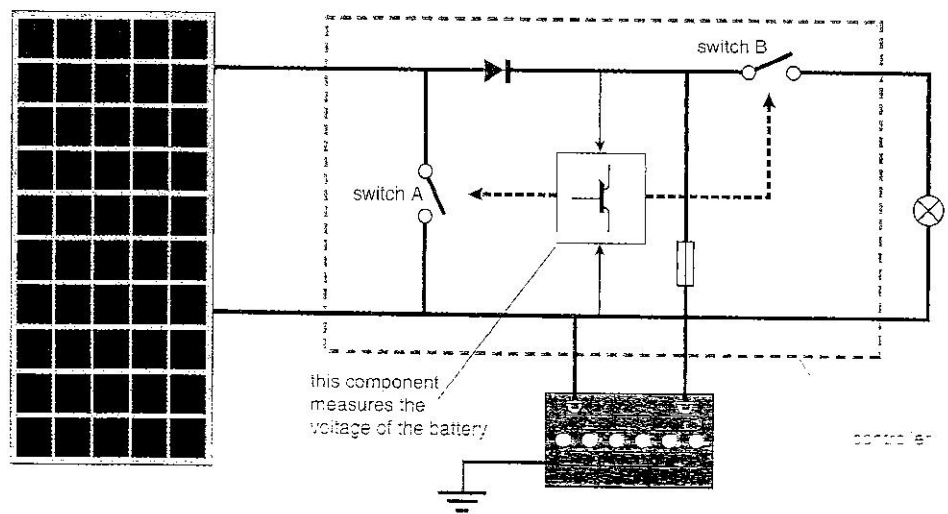
Language

| | | | | | |
|----|-------------|------------------|-------|---|--|
| if | the Sun | shine | -s | , | the current flows from the panel. |
| | the Sun | does not/doesn't | shine | , | the current flows from the battery. |
| if | the battery | is | full | , | the current doesn't flow into the battery. |
| | the lamps | are not/aren't | on | , | the current flows into the battery. |

- Task 6** Work in pairs. How do you think the controller below works? Make notes.
- 7** Complete the text explaining how the controller works. Choose the correct verb and use the correct form of the verb.

If the battery is full, switch A (1) _____ (open/close). Then the current (2) _____ (flow/not flow) from the panel to the battery. The controller short-circuits the panel.

If the battery is empty, switch B (3) _____ (open/close). Then the current (4) _____ (flow/not flow) from the battery to the lamp.



3 Cooling system

Start here 1 Try this quiz. Choose the correct answer.


What are the normal or average temperatures for these?

- | | | |
|---------------------------------|-------------------|-----------------|
| 1 Water from a shower? | a) 60°C (140°F) | b) 80°C (176°F) |
| 2 Food in a refrigerator? | a) 4.5°F (-15°C) | b) 40°F (4.5°C) |
| 3 Food in a freezer? | a) 0°C (32°F) | b) -18°C (0°F) |
| 4 Coldest air temperature ever? | a) -89°C (-128°F) | b) -20°C (-4°F) |
| 5 Hottest air temperature ever? | a) 156°F (70°C) | b) 136°F (58°C) |
| 6 Water in running car engine? | a) 110°C (230°F) | b) 45°C (110°F) |

$^{\circ}\text{F} = ^{\circ}\text{C} \times 9 / 5 + 32$.

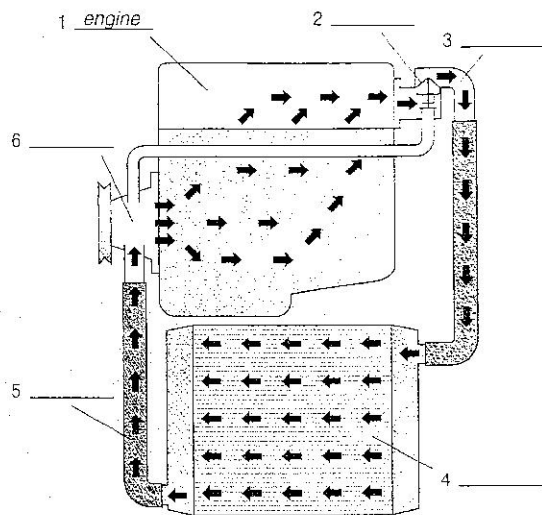
This converts Celsius to Fahrenheit.

$^{\circ}\text{C} = (^{\circ}\text{F} - 32) \times 5 / 9$. This converts Fahrenheit to Celsius.

Listening 2  Listen and check your answers.

Reading 3 Label the diagram with the words in the box.

bottom hose engine radiator thermostat top hose water pump



Car cooling system

The engine drives the water pump and the pump pushes cool water around the engine. This cools the engine. At the same time, the water becomes hot. The water in a hot engine is normally around 110°C.

- 5 The hot water then passes through the thermostat. This controls the temperature of the engine. From the thermostat, it flows through the top hose into the radiator. Here, a fan cools the water, and the cool water sinks to the bottom of the radiator.
- 10 The cool water then leaves the radiator. It flows along the bottom hose, passes through the pump and enters the engine again.

4 Read the text. Check your answers to 3.

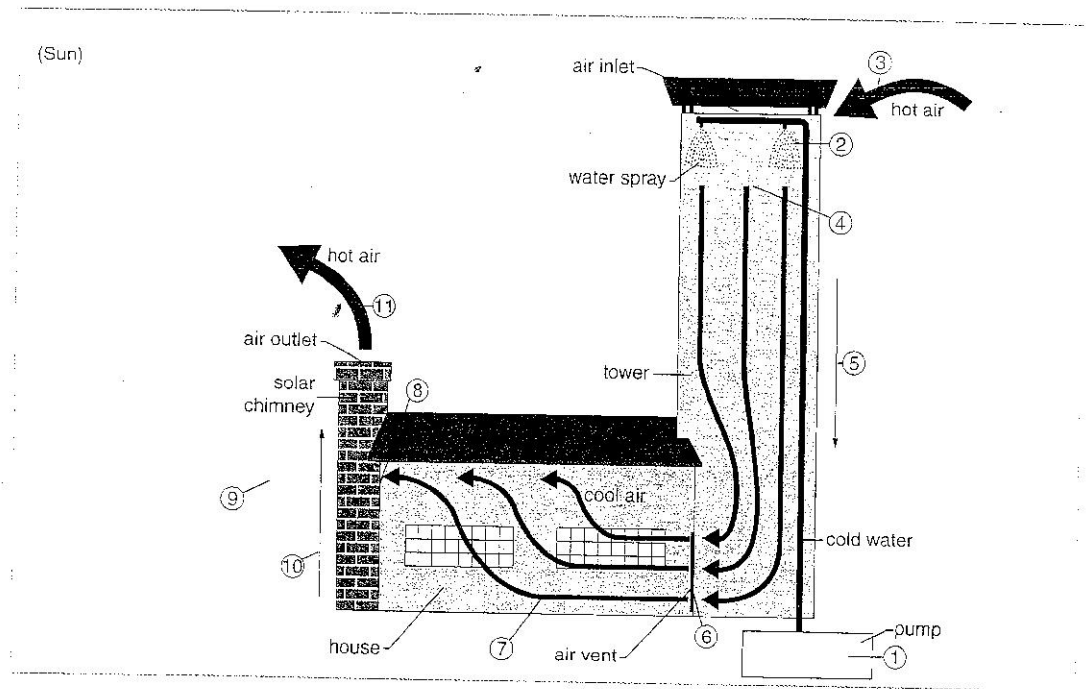
5 Which words in the text do these words refer to?

- | | | | |
|------------------------|--------------|----------------------|----------------|
| 1 <u>This (line 6)</u> | a) hot water | <u>b) thermostat</u> | c) temperature |
| 2 <u>it (line 7)</u> | a) engine | b) thermostat | c) water |
| 3 <u>Here (line 8)</u> | a) top hose | b) radiator | c) fan |
| 4 <u>It (line 10)</u> | a) water | b) radiator | c) bottom hose |

Speaking 6 Make true sentences.

| | | |
|--------------------|------------|--------------------------------|
| (1) The water pump | control(s) | the radiator to the engine. |
| (2) The thermostat | connect(s) | air onto the radiator. |
| (3) The two hoses | push(es) | the hot water from the engine. |
| (4) The radiator | cool(s) | water around the engine. |
| (5) The fan blades | flow(s) | to the bottom of the radiator. |
| (6) Cool water | riser(s) | the temperature of the water. |
| (7) Hot water | sink(s) | through the two hoses. |
| (8) Water | blow(s) | to the top of the engine. |

Task 7 Work in groups. This is a simple way to cool a house in a hot country. How does it work? What happens at each stage (1-11)?



Writing 8 Complete this description of how the cooling system works with the verbs and prepositions in the box.

cool enter flow heat leave rise sink
around into out of through to

The pump pushes cold water through the pipe to the top of the tower (1). Here, the water leaves the pipe through small holes. It's like a cold shower. (2). Hot air _____ the tower _____ the air inlet (3). The shower of cold water _____ the air (4). The cool air then _____ to the bottom of the tower (5). The cool air _____ the house, (6) and then it _____ (7). It _____ the house and _____ the solar chimney (8). The Sun _____ the chimney, (9) and the hot air _____ (10). The hot air finally _____ the chimney _____ the air outlet (11).

Social English 9 31 Listen and read.

Dan is an electronics student. He also works part-time in an electronics workshop.

- *I work in the electronics workshop every Thursday and Friday.*
- When do you attend lectures?
- *Every Tuesday morning.*
- What do you do on Tuesday afternoons?
- *I do my practical work then.*

10 Work in pairs. Practise the dialogue.

11 Work in pairs. Discuss your own weekly schedule.

on Mondays = every Monday
on Monday mornings = every Monday morning

Vocabulary 7 Match the sentences.

- | | |
|--|------------------------------|
| 1 This material doesn't burn or melt if you heat it. | a) It's rigid. |
| 2 This material doesn't break if you strike it or drop it. | b) It's hard. |
| 3 You can't bend this material. | c) It's tough. |
| 4 This material doesn't corrode if you put it in water. | d) It's heat-resistant. |
| 5 You can't scratch this material or cut it. | e) It's corrosion-resistant. |

8 Match the words with their opposites.

- | | |
|----------|-------------|
| 1 tough | a) soft |
| 2 hard | b) heavy |
| 3 rigid | c) weak |
| 4 strong | d) brittle |
| 5 light | e) flexible |

Reading 9 Read the text and complete the table below.

This racing car is made from the latest hi-tech engineering materials. It's made from metals, alloys, ceramics, plastics and composites. Many materials in the car are light, but very strong.

The nose cone of the vehicle is made of strong, light fibreglass.

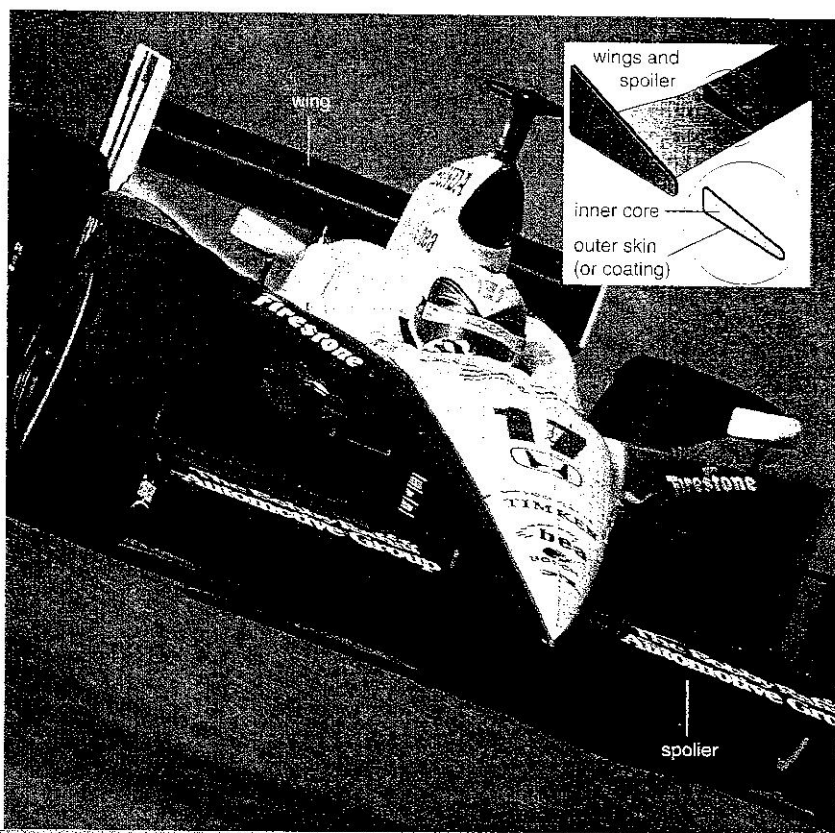
The spoiler and the wings are made from two materials. The inner core is light. It's made of polystyrene. The outer skin is hard and made of fibreglass.

The frame is light, but very tough and rigid. It's made of cromoly, a steel alloy.

The radiator is made of aluminium. The aluminium is coated with ceramic. These two materials are corrosion-resistant.

The engine and pistons are made of a light aluminium alloy. Each piston inside the engine is coated with a heat-resistant ceramic.

The wheels are made of a strong, light aluminium alloy. The tyres are made of a tough rubber composite.



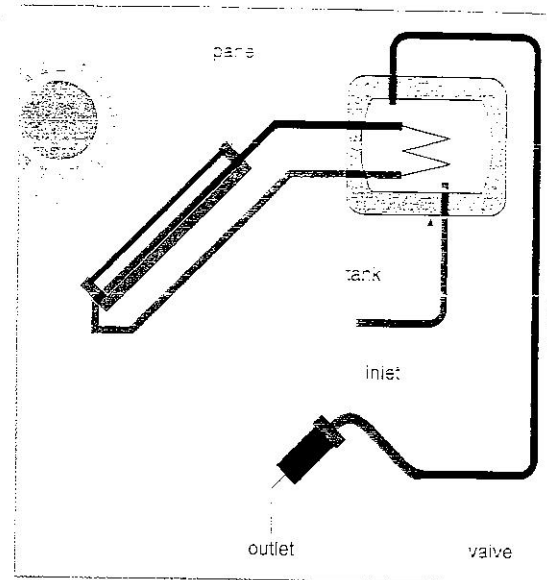
an *alloy* is a mixture of two or more metals
 a *composite* is a mixture of two types of material
fibreglass is a composite. It is a mixture of a plastic and a ceramic

| Part | What's it made of? | What are its properties? |
|-------------------|--------------------|--------------------------|
| nose cone | (1) | (2) |
| spoiler and wings | coated with (3) | (4) |
| wheels | (5) alloy | 6) |
| tyres | (7) composite | 8) |
| pistons | coated with 9) | 10) |
| frame | 11) | 12) |
| radiator | 13) | 14) |

BrE tyre; AmE tire

4 Complete the dialogue with the correct form of the verbs in brackets.

- How does the thermosiphon (1) _____ (work)?
- Well, the cold water (2) _____ (enter) the system through the inlet. The water pressure (3) _____ (push) the water around the system.
- So how (4) _____ (do) the water (5) _____ (become) hot?
- It (6) _____ (flow) into the panel and the sun's rays (7) _____ (heat) it. The warm water (8) _____ (rise) to the top of the panel and it (9) _____ (pass) from the panel into the tank.
- (10) _____ (do) the tank (11) _____ (have) a heater?
- No, it (12) _____ (do not). The hot water (13) _____ (stay) at the top of the tank. If you (14) _____ (open) the valve, the hot water (15) _____ (flow) from the top of the tank to the outlet.



5 Identify the equipment from the description.

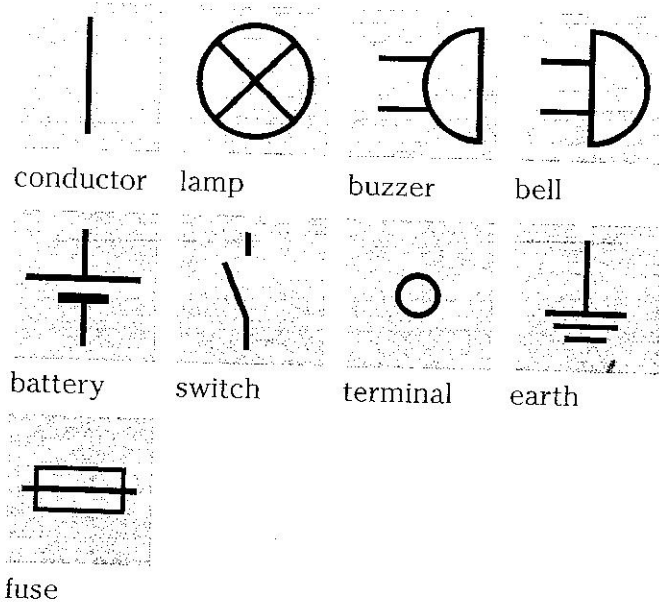
cable fan pump radiator solar panel thermostat

- 1 It converts energy from the Sun into heat or electricity.
- 2 It pushes water around a water supply system, or around a car engine.
- 3 It blows cold air onto a car radiator and cools the water inside it.
- 4 It controls the temperature of water or air in a heating or cooling system.

6 There's a problem with the forklift truck. Say what's going wrong.

- 1 I'm pressing (press) the accelerator pedal, but the truck isn't going (not go) faster.
- 2 He _____ (pull) the lever back, but the forks _____ (not rise).
- 3 You _____ (push down) the brake pedal, but the truck _____ (not slow).
- 4 I _____ (slide) the lever forwards, but the forks _____ (not tilt) upwards.
- 5 He _____ (pull) the direction lever backwards, but the truck _____ (not reverse).
- 6 You _____ (move) the direction lever forwards, but the truck _____ (not go) forwards.

Some electrical symbols



conductor

lamp

buzzer

bell

battery

switch

terminal

earth

fuse

Other symbols

- + plus/positive
- minus/negative
- # hash/number
- ° degree(s)
- ± plus or minus
- = equals
- ≠ does not equal
- ≥ at least (also more than or equal to)
- ≤ up to (also less than or equal to)
- ≈ approximately/about (also has other uses)
- < less than, under
- > more than, over
- ✓ tick
- × cross
- .

Currency symbols

- € euro(s)
- \$ dollar(s)/peso(s)/real(s)
- £ pound(s)
- ¥ yen
- ¥ renminbi/yuan
- ₪ rial(s)/riyal(s)
- Rs Rp rupee(s)

Internet symbols

- @ at
- .com dot com
- A-B A hyphen B / A dash B
- A/B A slash B / A forward slash B
- A_B A underscore B

4 Useful words

Industries and technologies

- aerospace
- agriculture
- automotive engineering
- biotechnology
- chemical engineering
- civil engineering
- building and construction
- electrical engineering
- electronics/electronic engineering
- environmental engineering
- information technology/IT
- information and communications technology/ICT
- manufacturing
- marine engineering
- materials testing
- mechanical engineering
- petroleum
- public health
- security
- telecommunications/telecoms
- transport

Names of jobs

- engineer
- manager
- technologist
- technician
- supervisor
- team leader
- mechanic
- operator

Materials

Metals: aluminium, titanium, copper, iron, lead, tin

Alloys: steel, chrome, cromoly

Plastics: polycarbonate, polyester, polystyrene, nylon

Composites: fibreglass, graphite

ENERGY

electricity stored in batteries
doesn't last long and
on cloudy days
or days with no
wind people
can't charge
them - these
people don't
use much
electricity.

Electrical appliances need electricity.
Electrical power reaches our homes
through cables from power stations. But
people live in the mountains, on
islands or on small islands far from power
stations. They haven't got mains
electricity and they use natural power -
power from the sun or the wind.
Solar collectors and windmills charge
batteries with energy and then batteries



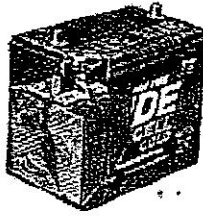
Energy is everywhere

Energy is the capacity of matter to do work and drive machines, and it exists in many forms. Electrical energy is an important form of energy in the modern technological world.

Today, we use electrical appliances all the time. We have got televisions, video players, radios and stereos in our homes. There are refrigerators in our kitchens, and vacuum cleaners and washing machines are a big help. At home and at work, people use telephones, computers and fax machines.

Electric Battery

It's not often that a frog makes a breakthrough in technology but in 1785, the frog happened to be lying dead on a zinc tray about to come under the knife. Luigi Galvani's wife was using the same steel scalpel he used for slicing into cadavers, only this time it was being used for making dinner. Luigi was lecturing to his students in the next room when the scalpel slipped. It fell across the frog and simultaneously touched the zinc tray. The dead frog jumped. Luigi's wife screamed, and everyone ran into the kitchen.



Now Luigi had a problem. He had little idea why the frog jumped, even though he could make it jump at will by dropping the scalpel across it. And there were his students who assumed he knew everything, standing in his kitchen, waiting for him to explain what happened. He took a guess, and said that he had discovered "animal electricity, the primary source of life" and that there was electricity in the frog. He was half right. Animals, including humans, do use electricity to carry messages from the brain to the muscles, but there was no electricity in the dead frog. With his reputation on the line he tried lots of experiments with frogs, without proving anything. Bravely or foolishly, he published his findings anyway.

When Alessandro Volta saw the claims about animal electricity, he couldn't believe it. He had been tinkering around with various kinds of metals in attempts to create electricity, but he had not made much progress. Still, he was sure that Luigi was wrong that a dead frog had electricity in it. So Alessandro told him so. And Luigi shared his feelings that Alessandro Volta did not know what he was talking about. They were instant rivals.

That rivalry motivated Alessandro, who set out methodically to create animal electricity without the animal. In the beginning of the next 18th century, to be exact 1800 Volta stacked zinc discs and copper discs separated by cloth soaked in acid, and it produced the first steady source of electricity known, which was converting chemical energy into electrical energy formed. Previously, the only sources of electricity had been lightning or the static discharge from rubbing a carpet or animal fur. The world had its first battery a year after Luigi had died, still believing in animal electricity...

1 INDUSTRY

Historians think that beer is more than 10,000 years old. The first beer makers used a simple process. They heated grain over open fires. The malt was dark and the beer was dark too. After the Industrial Revolution in the mid-1800s grain was heated in *rotating drums*. It was lighter in colour and it produced *golden beer*. With technological developments, *breweries* started producing large quantities of beer.



SALES

- If a company invests in advertising, sales increase.
- If there is a good distribution system, product turnover will be higher.

3 TECHNOWORLD

Hard technologies satisfy human needs through the design and production of technological products - for example, books, clocks, machines or cars. Soft technologies deal with the organization, management and administration of an industry or business. Hard and soft technologies always work together and they have an effect on each other. If, for example, industrial management and administration are not appropriate, productivity will not increase. [B]

2 Electronics

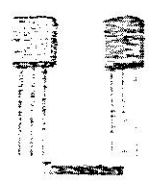
The transistor has changed the electronics industry. It was invented in 1948 and today it is present in most electronic devices including *video-cassettes*, televisions, computers and *satellites*. It can control an electric current passing through it. It can be used, for example, for turning devices on and off or for amplifying signals. Transistors are commonly used in *stereo amplifiers*.



4 INTRODUCTION TO ELECTRONICS

Electronics is a general word for the *electronic devices* used to generate, transmit, receive and store information. It includes signals, voices or music on a radio, the images on a screen or the data in a computer. The basic *electronic circuit* is the *electronic signal*, an electric current that carries the information.

Electronic circuits consist of *electronic components* connected together. The main electronic components are the transistor, the resistor, the capacitor and the diode.



The Holographic Television

Think Reality TV Isn't Realistic? Watch This

Even if you had free run of any skybox in Madison Square Garden, you still wouldn't see half the action that you will in your own living room, one day soon, on a large-screen holographic television. Without ever leaving your chair, you'll be poised to watch each play unfold from whatever perspective you choose, gazing into the depths of your TV. The only thing lacking will be the soggy cheese fries.

Although this scenario is a decade away, a small-scale version exists today in the Dallas laboratory of Harold Garner, a tireless 51-year-old medical doctor, plasma physicist and biochemist at the University of Texas Southwestern Medical Center. The prototype he built is the first machine ever to generate holographic movies—true 3-D without special glasses or nausea.

How did a guy who works in a medical center discover the key to depicting holographic objects in motion? Garner's chair in developmental biology at UT is endowed in part by the founders of Texas Instruments, and the company gave him early access to a digital micromirror device (DMD) that is now used in high-end video projectors. It is made up of nearly a million reflective panels, each of which can be angled by a computer several thousand times per second to reflect or deflect beams of light, producing moving pictures. Garner's big idea was to blast the DMD with a laser rather than with a typical projection bulb. He programmed the DMD to reflect a sequence of 2-D interference patterns (called interferograms) that disrupt the laser light in such a way that it reflects a 3-D hologram.

Garner's biggest challenge has been to find a suitable screen. To unfold the 2-D interference patterns into true 3-D images, the projection surface must have volume. A column of mist will work, as will a tub of Jell-O, but both diffuse the projected image, marring sharpness. So Garner is working with a display composed of layers of microthin LCD panels, each of which can, when electrically charged, be made clear or opaque. When the panels flash on and off in quick succession to assemble the hologram, the speed is more than sufficient to convince the eye that it's seeing a solid object.

Such displays exist today, but they work without the benefit of holography; instead they have to slice up a 3-D image and send it sliver by sliver to the LCD screens. The picture is almost the same as Garner's would be, but this method requires far greater processing power, because you need the x, y and z coordinates for every slice. This is why Garner's approach is the most viable solution for 3-D TV. "We're sending the 3-D images as a 2-D interferogram," Garner says, pointing out that this doesn't require any more bandwidth than today's television signals. "so we can use the current broadcast infrastructure." As for creating holographic content, it would have to be recorded with a series of cameras shooting from different viewpoints.

The first application of Garner's technology may be in the holographic imaging of W.R. In fact, he had discussions with the U.S. Air Force and Lockheed Martin, so it may be a while before this TV makes the Circuit City Shop. It may well happen before the Knicks win the NBA title again. —JONATHAN KEATS

THE ULTIMATE 3-D TV CAN'T HANG ON YOUR WALL, BUT YOU'LL BE TOO ENGROSSED TO NOTICE

THE ROAD TO 3-D TV

[1947]

While working for the Thomson-Houston Electric Company in Rugby, England, Hungarian physicist Dennis Gabor invents the hologram, for which he is awarded the Nobel Prize in 1971.

[1987]

TI engineer Larry Hornback invents the digital micromirror device, an optical semiconductor used in video projectors and TVs starting in 1996.

[2003]

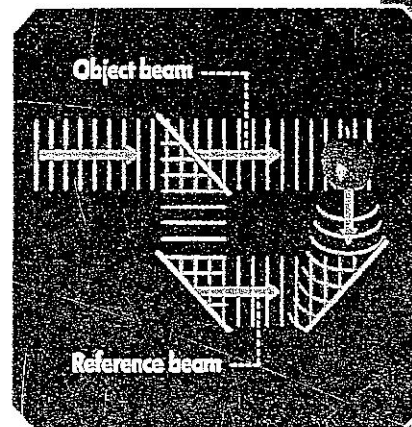
University of Texas Southwestern Medical Center researcher Harold Garner demonstrates the first holographic video-projection system, screening hazy red images of a helicopter circling a jet.

[2008]

The U.S. Air Force installs holographic head-up displays in fighter jets, bringing aviators 3-D images of battlespace positions.

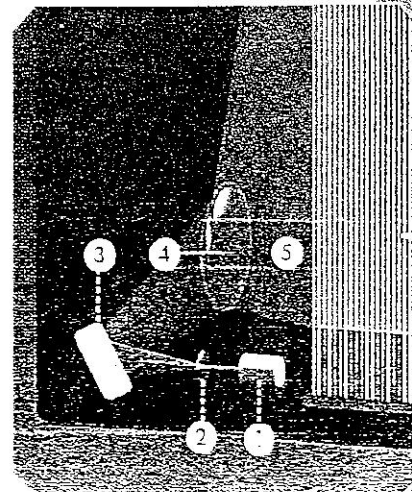
[2015]

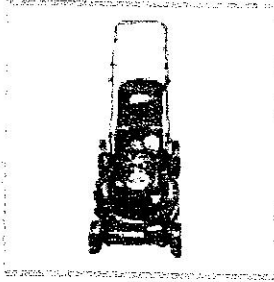
Holographic TV goes live with a pay-per-view satellite broadcast of the heavyweight boxing championship.



HOW TO RECORD A HOLOGRAM

Shine a laser at an apple through a partially transparent mirror that splits the light into an object beam and a reference beam. The object beam scatters when it hits the apple and then recombines with the undisturbed reference beam. This creates an interference pattern that is recorded on a piece of film. Illuminate the film with a reference beam, and it reproduces multiple 2-D images that look like one three-dimensional image.





We Test 8 Top Front-Drive Lawnmowers

Our testers put these push mowers through their paces to evaluate power, bagging, handling, leaf mulching, cut quality, and even ease of storage....[Read More](#)



The 10 Best Cars Designed by Bertone

Iconic Italian design house Bertone is reportedly on the cusp of bankruptcy. Its history includes some of the greatest automotive designs ever committed to sheetmetal. Let's revisit 10 favorites from the company's epic highlight reel....[Read More](#)



Everything You Need to Know About America's Next Space Plane

Mark Sirangelo, corporate vice president and head of SNC's Space Systems, has a better than front-row seat for America's historic private space movement—he's a player on the main stage. Sirangelo heads one of three companies that is designing spacecraft to bring humans into orbit for NASA.... [Read More](#)



9 Things That Didn't Happen to Malaysia Airlines Flight 370

The evidence is mounting that a deliberate action by someone on board caused the diversion and disappearance of Malaysia Airlines Flight 370. But over the past week and a half since the plane vanished, as contradictory information came in from various sources, people floated plenty of crazier ideas about the plane's fate. ... [Read More](#)

It even looks like Martians took their idea of what a car should be and fashioned it into sheet metal.

1 Heating system

1 Draw a line from each word to its opposite.

sink above bottom out of cold cool enter outlet push

hot inlet leave heat pull rise top below into

2 Rewrite the sentences. Change the words in *italics>*. Use words with opposite meanings from question 1.

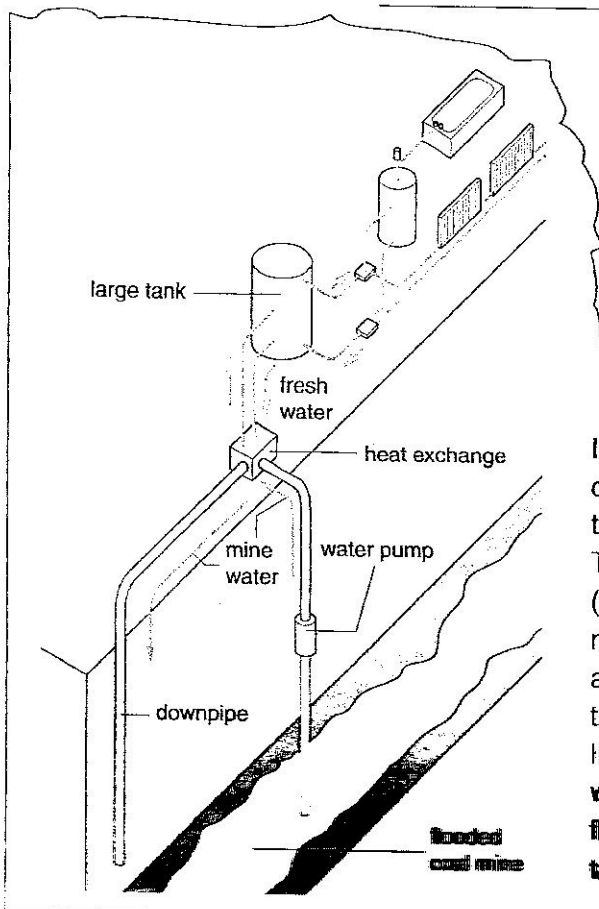
1 A solar panel *heats* water. A fridge ... → *A fridge cools water.*

2 *Hot* water rises to the *top* of a water tank. →

3 The *inlet* pipe for *cold* water is *below* the pump. →

4 Water *enters* the tank through the *inlet* pipe. →

5 *Push* the shower head *into* the pipe. →



3 Look at the diagram. Warm water comes up from underground and heats water for the houses. Use the verbs and prepositions in the box to complete the description of the heating system.

flow leave push rise above
below into through to out of

In this system, there are houses (1) a flooded coal mine. At 170 metres (2) _____ ground, the temperature of the mine water stays at 14.5 °C. The water pump brings up the mine water and (3) _____ it (4) _____ the heat exchanger. The mine water comes (5) _____ the heat exchanger and (6) _____ back into the coal mine (7) _____ the downpipe.

In the heat exchanger, the temperature of the fresh water (8) _____ to 55 °C. This warm water then flows to a large tank. Then it (9) _____ the large tank and goes (10) _____ the houses.

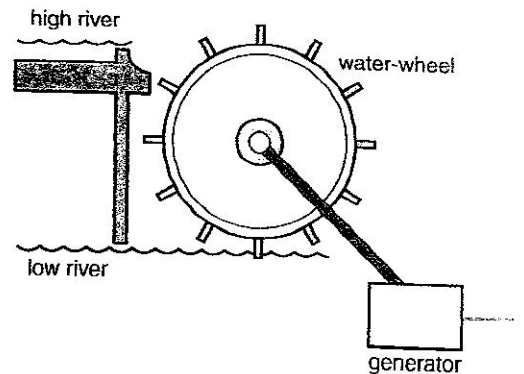
2 Electrical circuit

1. Match the words in the box to sentences 1–7.

battery cable controller lamp solar panel electrical current switch

- 1 shines a light when the switch is on: *lamp*
- 2 converts the sun's energy into an electrical current: _____
- 3 stores electricity: _____
- 4 When a _____ is closed, the electrical current can flow.
- 5 DC is a type of _____.
- 6 Electricity passes through the _____ to the lamp or the battery.
- 7 carries the electrical current: _____

2. Look at the diagram for a water-wheel and a generator which supplies current to a workshop next to the river. Complete the sentences with the present simple. Then listen and check your answers.



- 1 If the river is high, and the workshop is open, *the current flows from the generator into the workshop.* (current / flow / generator / workshop)
- 2 If the river is high, and the workshop is closed, _____
_____. (current / flow / generator / batteries)
- 3 If the river is low, and the workshop is open, _____
_____. (current / flow / batteries / workshop)
- 4 If the river is low, and the workshop is closed, _____
_____. (current / not / flow)
- 5 If the batteries are full, _____
_____. (current / not / flow / generator / batteries)
- 6 If the batteries are empty, _____
_____. (current / not / flow / batteries / workshop)

3. Listen to the dialogue. Circle the correct specifications for the items.

- 1 Solar panels a) 4 × 16 W b) 40 × 60 W c) 4 × 60 W
- 2 Controller a) 1 × 3 A b) 1 × 5 A c) 1 × 15 A
- 3 Batteries a) 4 × 12 V, 50 Ah b) 4 × 12 V, 100 Ah c) 4 × 15 V, 150 Ah
- 4 Lamps a) 6 × 20 V, 8 W b) 16 × 12 V, 18 W c) 6 × 12 V, 8 W
- 5 Cable a) 2.5 mm, 30 amps b) 6 mm, 53 amps c) 16 mm, 100 amps
(12 metres)

3 Cooling system

1 Complete these sentences for a world weather forecast. Write the temperatures as words.

- 1 The night-time temperature in Helsinki will be *minus two degrees Fahrenheit*.
(-2 °F)
- 2 The day-time temperature in Mexico City will be *twenty-one degrees Celsius*.
(21 °C)
- 3 The day-time temperature in Los Angeles will be _____ (75 °F)
- 4 The coldest night-time temperature in Moscow will be _____ (-8 °C)
- 5 The day-time temperature in Tunis will be _____ (24 °C)
- 6 The highest day-time temperature in Karachi will be _____ (33 °C)

2 Use the words in the box to answer the questions with short answers. Use some of the words twice.

cool water engine fan hot water thermostat two hoses water pump

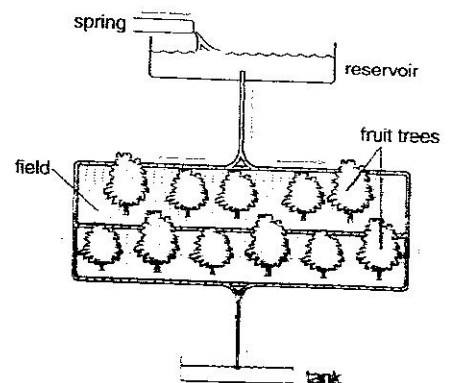
- 1 What pushes cool water round the engine? *The water pump*
- 2 What connects the radiator to the engine? _____
- 3 What controls the temperature of the engine? _____
- 4 What flows from the engine to the radiator? _____
- 5 What blows air through the radiator? _____
- 6 What sinks to the bottom of the radiator? _____
- 7 What cools the water in the radiator? _____
- 8 What passes along the bottom hose and back to the engine?

- 9 What drives the water pump? _____

3 Look at the diagram for a watering system. Complete the sentences with the words in the box. Put the verbs into the present simple.

around at the top at the bottom from into out of through

- 1 From the spring, water (flow) *flows* to a reservoir *at the top* of the hill.
- 2 _____ the reservoir, water (pass) _____ a pipe to the field.
- 3 The pipe (go) _____ a field of fruit trees.
- 4 Water (leave) _____ the pipe _____ small holes.
- 5 The water then (flow) _____ the fruit trees.
- 6 A little water (flow) _____ the bottom of the field.
- 7 This water (enter) _____ a tank _____ of the hill.



4 Word list

| | | | |
|-------------|---------|---------|--------------------|
| engine | blow | around | battery |
| fan | connect | into | cable |
| hose | control | out of | conductor |
| inlet | cool | through | controller |
| radiator | drive | to | electrical circuit |
| shower head | enter | | electrical current |
| solar panel | flow | | energy |
| thermostat | go | | lamp |
| valve | heat | | solar panel |
| water pipe | leave | | switch |
| water pump | move | | |
| water tank | pass | | convert |
| | push | | flow |
| | rise | | shine |
| | sink | | short-circuit |

Complete the sentences with verbs from column 2.

- 1 Cold water _____ the system through the inlet.
- 2 Water _____ into the tank through a pipe.
- 3 The sun _____ the water in the solar panel.
- 4 Hot water _____ to the top of the tank.
- 5 Cold water _____ to the bottom of the tank.
- 6 Hot water _____ the system through the shower head.

Match the sentence halves.

- | | |
|---------------------------|-----------------------------------|
| 1 The water pump pushes | a) the temperature of the water. |
| 2 The thermostat controls | b) air through the radiator. |
| 3 The two hoses connect | c) the hot water from the engine. |
| 4 The fan blows | d) water around the engine. |
| 5 The radiator cools | e) the radiator to the engine. |

9 Things That Didn't Happen to Malaysia Airlines Flight 370

The evidence is mounting that a deliberate action by someone on board caused the diversion and disappearance of Malaysia Airlines Flight 370. But over the past week and a half since the plane vanished, as contradictory information came in from various sources, people floated plenty of crazier ideas about the plane's fate.

By Joshua A. Krusch

8+1

March 18, 2014 3:30 PM

TEXT SIZE: A . A . A



How Foo Yeen/Getty Images

Iranian Terrorists Stole (or Blew Up) the Airplane

You can't blame the United States for hearing about a missing jumbo jet and immediately thinking "terrorism." Only hours after MH370 went missing, rumors began to circulate that two Iranian nationals aboard the flight had been traveling with stolen passports, as did speculation that these passengers pointed to an Iranian terrorist plot.

Now it looks as if they were just two guys traveling with stolen passports. Interpol investigated both travelers and did not find any evidence that linked

them to a terrorist group. As Ronald K. Noble, secretary general of Interpol, told *The New York Times*, "The more information we get, the more we are inclined to conclude it is not a terrorist incident."

The Passengers are Safe ... and Taking Calls

Perhaps the saddest—and eeriest—Flight 370 theory is that the passengers are safe but unable to answer their cellphones. When the airplane first went missing, several of the passengers' families announced that their loved ones' mobile phones rang repeatedly, instead of going straight to voicemail. Add that to reports that the passengers' instant messaging accounts remain online and active, and some began to suspect that the passengers were alive, albeit with spotty Internet access.

Although we'd like to believe that the 227 souls aboard MH370 are alive and well, the phantom cellphone theory has been effectively debunked. Even if a phone is completely destroyed, a few rings on the caller's end are fairly typical while the network searches for a connection, Jeff Kagan, a wireless analyst, told NBC News.

Chinese Satellites Found the Wreckage

One of the most promising leads so far was the rumor that Chinese military satellites had spotted the wreckage. This news spread like wildfire last week, only to fizzle just as rapidly. Malaysian officials announced that the Chinese images did not contain signs of debris, and that search planes have already scoured this region of the South China Sea, to no avail.

The World's First Cyber Hijacker Is in Control

This week a theory has gained traction that a malicious hacker infiltrated the airplane's electrical system, echoing earlier claims by Hugo Teso, a technology consultant who announced last year that he could theoretically disable an aircraft with a cellphone.

It's a wild theory, and one that would fundamentally change how we view cyber security. But the FAA vehemently denies that a hacker could gain control over a passenger jet. "The hacking technique described during a recent computer security conference does not pose a flight safety concern because it does not work on certified flight hardware," the FAA said in an official statement it released.

A Meteor Hit the Plane

CNN raised the possibility of a meteor strike after noting that a meteor had been reported in the area around the same time that Flight 370 took off. The odds of a meteor taking out an airplane are pretty slim, and, ironically, the odds of being hit by a meteor are less than the odds of dying in a plane crash.

Just Another Zionist Plot

Unaware that they were citing a satirical post, conspiracy theorists have been promoting the theory that Israeli intelligence blew up Flight 370. Snopes caught on and debunked the rumor, but that didn't stop some people from taking to social media to prove that the Mossad had performed yet another vicious (if not terribly covert) assassination.

Missing Engineers and Their Invisibility Cloaks

Amidst tired conspiracy theories that point fingers at the Illuminati, aliens, and the Mossad, one novel take on the missing flight caught our attention. Last week skeptics discovered that 20 of the missing passengers on board Flight 370 were engineers at Freescale Semiconductor, a technology firm that develops components for military aircraft weapons systems. The resulting conspiracy theory: MH370 is cloaked, as part of either a wacky publicity stunt or a very sophisticated terrorist plot.

Although stealth technology could theoretically render an airplane invisible to radar, we're not convinced. Business associates often travel in groups, and Freescale Semiconductor has issued a statement expressing grief over the loss of its 20 employees.

An Elaborate Insurance Fraud

When a house catches fire, insurance companies investigate for signs of arson. But when a plane goes missing, how many insurers cry foul? Last week Malaysian officials investigated the insurance policies of each passenger on board MH370, searching for signs of recently purchased life insurance as a motive for suicide.

Malaysian police chief Khalid Abu Bakar has not ruled out an elaborate insurance scheme, although we have no indication that any one passenger is suspected. While Malaysia claims to be examining all leads, we are fairly confident (read: hopeful) that one passenger didn't murder some 240 people to collect on his life insurance policy.

Obscure Airborne Chinese Martyrs

Days after the Malaysian Airlines flight went missing, the Chinese Martyrs' Brigade claimed responsibility. No one had ever heard of the Chinese Martyrs' Brigade, so officials were skeptical, but the brigade's menacing email sent to Chinese journalists read, "You kill one of our clan, we kill 100 of you".

Malaysia's minister of transportation, Datuk Seri Hishammuddin Hussein, told reporters that "there is no sound or credible grounds to justify their claims."

147 ROAD SAFETY

Road safety depends on how people drive and how quickly they can react in emergencies. The design of a car and the materials used to build it can be made to improve safety.

Stopping distance includes thinking time

The acceleration of a car or bicycle tells you how quickly its velocity is changing. At higher velocities, a greater deceleration is needed to stop the vehicle in the same time. You saw in Topic 146 how doubling the velocity would need twice the force if you were to stop in the same time. In an emergency at any velocity, most people would apply the maximum braking force. Because you can't increase this maximum braking force, you will take more time to stop from a higher velocity. The shortest possible **braking distance** is four times greater at twice the velocity. (It takes twice as long and the vehicle starts at twice the velocity – see Q1.)

To calculate the total **stopping distance**, you have to allow for the length of time it takes to start applying

the brakes. An alert driver will take around 0.7 s to react to an emergency. This is the **thinking time**. (How does this compare to reaction times calculated in Topic 140? Can you explain the difference?) At 67 mph a car will travel 23 metres before the driver can even start braking. Table 147.1 shows how the stopping distance varies with speed. This assumes an alert driver with good brakes and tyres and a dry road.

Although the grooves in a tyre help to channel water out from underneath the tyre, water still reduces friction between the road and the rubber. This means the maximum stopping force that can be used is reduced. For safety in wet weather, a driver should stay at least twice as far behind other vehicles as is safe in dry weather.

| Speed in mph | Shortest distances in metres | | |
|--------------|------------------------------|------------------|-------------------|
| | Thinking distance | Braking distance | Stopping distance |
| 10 | 3 | 1.5 | 4.5 |
| 20 | 6 | 6 | 12 |
| 30 | 9 | 14 | 23 |
| 40 | 12 | 25 | 37 |
| 50 | 15 | 39 | 54 |
| 60 | 18 | 56 | 74 |
| 70 | 21 | 76 | 97 |

Table 147.1 Overall stopping distances in metres. At 70 mph the stopping distance is about 24 car lengths.



Fig. 147.1 The type of surface a tyre runs on affects the grip. On a dry surface a racing tyre doesn't need any grooves; the flat surface gives maximum contact with the track. A road tyre needs grooves to channel water out from between the rubber and the road. As the tyre wears, the tread depth decreases and its ability to stop the car in the wet is reduced. It is illegal to drive on the road if a car tyre tread is less than 1.6 mm deep across most of the centre of the tread.

A driver's reaction time affects the stopping distance

It is important that the interior of a car is designed so that the driver is not distracted from the road. Some cars even allow the driver to shut down unnecessary instruments. If the driver is not alert, it can take longer to react to emergencies. If you are tired or even have a bad cold your reaction times will increase and with it, your stopping distance. This increases the chance of having an accident. Motorists are recommended to take regular breaks when driving on motorways and should stop for a rest at least every two hours.

It is illegal to drive while under the influence of drink or drugs. Alcohol and other drugs can increase your reaction time. Many legal drugs (medicines) carry warnings about drowsiness and its affect on driving or use of machinery. As well as increasing reaction times, drugs are dangerous because they can also affect the way you feel and act. Alcohol also affects coordination, eyesight and the ability to judge speed and distance. Alcohol also increases confidence and the driver often thinks that they are driving better than they really are. At the **legal limit** (80 mg of alcohol per 100 cm³ of blood) some drivers are 5 times as likely to have an accident. Any amount of alcohol will affect driving and the best advice is not to drink at all if you intend to drive.